
R G U H S · M O D E L A N S W E R B A N K

The questions RGUHS repeats — fully answered

RGUHS MD Forensic Medicine — Paper III



R E C U R R I N G - Q U E S T I O N A N S W E R B A N K

2 0 1 6 – 2 0 2 5

570 recurring topics · textbook-verified · verbatim statute · BNS/BNSS/BSA-current · cited Recent Advances

G R O U N D E D I N :

KS Narayan Reddy — The Essentials of Forensic Medicine & Toxicology 36e — spine text

Gautam Biswas — Review of Forensic Medicine & Toxicology 6e

Anil Aggrawal — Textbook of Forensic Medicine & Toxicology

S Chand — Forensic Medicine & Toxicology (topic monographs)

Ludwig — Handbook of Autopsy Practice

Verbatim statute: India Code (indiacode.nic.in) & Gazette of India — BNS 2023 · BNSS 2023 · BSA 2023



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Forensic pathology & thanatology



Artifacts due to animals and insect bites

Asked in: Paper III Apr 2018 — RGUHS MD Forensic Medicine

Definition

- ▶ A **postmortem artefact** is any change in the body after death that was not present at the time of death.
- ▶ It can be mistaken for a true antemortem finding.
- ▶ **Artefacts due to animals and insects** are a subgroup, caused by scavengers feeding on the corpse before autopsy.
- ▶ Scavengers include insects (ants, cockroaches, flies/maggots), terrestrial animals (rodents, dogs, cats), and aquatic animals (fish, crabs, turtles, leeches).
- ▶ Their danger is that they closely mimic abrasions, bruises, ligature marks, stab wounds, firearm wounds, and even sexual assault.
- ▶ Misreading them can give a wrong cause and manner of death and cause a miscarriage of justice.

General features of a postmortem animal/insect artefact

- ▶ **No vital reaction** — the single most important sign. There is no redness, no coagulated blood, and no healing, because circulation had already stopped.
- ▶ **Dry, parchment-like surface** — the lesion desiccates on exposure to air and turns yellow to brown.
- ▶ As it dries further, it can come to resemble a **brush (graze) burn**.
- ▶ **Irregular, scalloped margins** — no clean track or bevelling like a true wound.
- ▶ **Selective sites** — moist or exposed skin: eyelids, nose, mouth, ears, axillae, groin, scrotum, anus, and the edges of existing wounds.
- ▶ **Linear or grouped pattern** — often a trail from feeding insects, and lesions are usually multiple.
- ▶ **Enlarges existing wounds** — scavengers prefer already-broken skin, so an antemortem wound gets bigger and its true shape is distorted.

Artefacts due to insect bites

Insects are the earliest and commonest scavengers, and their activity also underlies forensic entomology.

- ▶ **Ants and cockroaches:** produce dry, brown marks with irregular margins.
 - Found on moist parts — ears, axillae, groin, scrotum, anus — and around the eyelids, nose and mouth.
 - They resemble antemortem **abrasions**, and dry further into **brush burns**.
 - No vital reaction is seen.
- ▶ **Linear ant lesions around the neck** can mimic a **ligature abrasion** of strangulation or hanging — a dangerous mimic.

- ▶ **Grouped insect bites** can mimic the **tattooing (powder stippling)** of a close-range firearm wound.
- ▶ **Flies and maggots:**
 - Flies lay eggs near the eyes, nostrils, mouth, genitalia, and any wound.
 - The larvae (**maggots**) eat soft tissue, leaving bone, cartilage and gristle behind.
 - Maggots pass through stages called **instars**, then crawl off to pupate in the soil.
 - **Small round maggot holes can simulate bullet entry wounds.**
 - Heavy maggot activity can also destroy or distort wound margins, including tattooing.
- ▶ **Forensic entomology:**
 - Insects arrive and mature in a predictable sequence, so their age helps estimate the postmortem interval.
 - Eggs are laid about **18–36 hours** after death.
 - Eggs hatch into maggots in about **12–24 hours**.
 - Maggots become pupae over **4–5 days**.
 - Pupae become adult flies over a further **4–7 days**.
 - Empty pupal cases at the scene show how many moults have occurred, helping estimate time of death.
 - The **Ruxton case** was the first where entomological evidence (blowfly maggot age) aided an investigation.

Artefacts due to terrestrial animals

- ▶ **Rodents (rats/mice):** the commonest postmortem scavenger in **urban** settings.
 - Produce shallow, irregular defects with finely serrated edges on exposed parts (face, fingers).
 - No vital reaction.
- ▶ **Dogs:** the commonest animal bite overall (**80–90%** of animal bites needing medical attention).
 - Usually affect the extremities, and in children the head, neck, nose, ears, lips and cheeks.
 - Postmortem dog bites are more pronounced, with deep small tooth impressions.
 - Can mimic **stab wounds**.
- ▶ **Cats:** the second commonest animal bite (**5–15%**).
 - Produce a small rounded arch of canine punctures with claw-scratch marks.
 - Postmortem bites affect the face and neck of a lying-down body.
 - Can mimic **knife wounds**, especially where they mark bone.
- ▶ **Jackals and other larger carnivores** (rural settings) can grossly mutilate or disarticulate a body and scatter the remains.

Artefacts due to aquatic animals

- ▶ **Crabs, turtles and fish** gnaw the soft tissue around the eyes, ears, mouth, genitals, anus, and wound edges.
- ▶ Their activity also accelerates decomposition.

- ▶ **Crabs** can produce injuries that **simulate stab wounds**.
- ▶ **Leeches** may attach around the eyes in water and detach on recovery, leaving a haemorrhagic lesion that **simulates a black eye**.
- ▶ **Marine/structural damage** — bumping against rocks or coral, **boat-propeller** injury, or loss of fingers, toes, eyelids, lips or genitals from marine-animal attack, must all be distinguished from antemortem trauma.

Differentiation from antemortem injury

Feature	Postmortem artefact	Antemortem injury
Vital reaction	Absent	Present
Colour/texture	Dry, yellow-brown, leathery	Moist, red-brown
Margins	Irregular, scalloped	Defined, per weapon
Site	Moist/exposed skin, wound edges	Anywhere, per assault
Microscopy	No leucocyte infiltration	Inflammatory response

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Face/head, front view** — label eyelids, nostrils, angle of mouth, ear (pinna) and axilla as sites of insect feeding.
- ▶ Annotate: "dry, brown, irregular margins, no vital reaction."
- ▶ **Comparison panel** — left box: antemortem abrasion (red-brown, moist, vital reaction). Right box: postmortem insect artefact (dry, yellow-brown, parchment-like, no vital reaction).

Medico-legal significance

- ▶ **Prevents wrongful conclusions** — mistaking these artefacts for injury can falsely suggest assault, strangulation (linear ant marks, leech "black eye"), firearm injury (maggot holes, grouped bites), stab wounds (crab, dog, cat bites), or sexual assault (genital/anal feeding).
- ▶ The autopsy surgeon must recognise them to avoid a miscarriage of justice and to withstand cross-examination.
- ▶ **Decision rule** — absence of vital reaction clinically, and absence of a leucocytic response on histology, are decisive in calling a lesion postmortem.
- ▶ **Documentation** — photograph and chart every such lesion.
- ▶ Collect insects, eggs, larvae and pupal cases for the forensic entomologist.
- ▶ Preserve adjacent tissue for histology to confirm the absence of vital reaction.
- ▶ **Time since death** — insect colonisation and maggot age give an objective postmortem interval, useful once early signs (temperature, lividity, rigor) are no longer reliable.
- ▶ These findings are recorded in a medico-legal postmortem done under inquest.
- ▶ A police inquest is held under **Section 174 CrPC 1973 (now Section 194 BNSS 2023)**.

- ▶ A magistrate's inquest is held under **Section 176 CrPC 1973 (now Section 196 BNSS 2023)**.
- ▶ The doctor's opinion is given as expert evidence under **Section 45 IEA 1872 (now Section 39 BSA 2023)**.
- ▶ Correctly attributing lesions to animal/insect activity — rather than to murder under **Section 302 IPC 1860 (now Section 103 BNS 2023)** — is what excludes homicide.



Socio-legal aspects of starvation deaths

Asked in: Paper III Apr 2021 — RGUHS MD Forensic Medicine

Definition and concept

- ▶ **Starvation** is a severe, progressive fall in food and nutrient intake.
- ▶ It results from either complete withholding of food or from unsuitable food.
- ▶ **Inanition** is the resulting state of extreme exhaustion and bodily wasting.
- ▶ Every hunger death carries a **socio-legal dimension**, since no citizen should die for want of food.
- ▶ The doctor must classify the death as accidental, suicidal or homicidal, exclude wasting disease, and place the finding within the right-to-food framework.

Types of starvation

- ▶ **Acute starvation:** sudden, complete stoppage of all food (entrapment, shipwreck, famine, abduction) — an acute, severe form of primary **Protein-Energy Undernutrition (PEU)**.
- ▶ **Chronic starvation:** gradual food deficiency over weeks to months; the socially loaded form seen in chronic malnutrition among the poor.

Causes, classified by manner of death

Classifying the manner is the single most important socio-legal task — it decides whether a crime occurred and who is culpable.

Manner	Typical setting	Socio-legal angle
Accidental	Famine, earthquake, landslide, shipwreck, being lost/marooned, mine entrapment	State's duty to provide food (Article 21)
Suicidal	Hunger strike, exhibition stunts, refusal by the mentally ill	Force-feeding dilemma; abetment-of-suicide law
Homicidal	Withholding food from infants, the aged, the disabled, jail inmates ("baby-farming")	Culpable homicide/murder, cruelty, abandonment

- ▶ **Poverty is the commonest cause of starvation death in India;** other causes are fasting and the accidental settings above.
- ▶ **Medical causes:** jaw ankylosis, oesophageal cancer or stricture, anorexia or bulimia nervosa, coma, diabetes mellitus, paranoid schizophrenia, senile dementia, major depression.

- ▶ **Drug-related:** addicts crave the drug more than food; alcoholics get calories from alcohol instead of food, causing protein malnutrition.
- ▶ **Baby-farming:** illegitimate infants were handed over with payment to caregivers who kept the money, withheld food, and let the child die — the term still applies to children starved by parents or guardians.

Clinical course and fatal period

- ▶ **Acute starvation:** hunger and upper-abdominal pain, relieved by pressure, for the first **30–48 hours**.
- ▶ From day 4–5: emaciation, sunken glistening eyes, dilated pupils, prominent bony points, scaphoid (boat-shaped) abdomen, dry cracked lips, coated tongue, intense thirst, weak voice, progressive weakness.
- ▶ *Bichat's buccal fat pad*, orbital fat and female breast fat disappear last — spared at autopsy too.
- ▶ **Chronic starvation** progresses in order:
 - Lethargy and fatigue.
 - Rapid weight loss, fastest in the first 6 months.
 - Polyuria (excess urination).
 - Cachexia with pigmentation and anaemia.
 - Hypothermia and hypotension.
 - Oedema starting at the feet.
 - Mental deterioration.
 - Reduced resistance to infection — diarrhoea, dysentery, tuberculosis.
- ▶ Body weight falls by about **40%** in chronic starvation.
- ▶ **Fatal period:**
 - Food and water both withdrawn: death in **10–12 days**.
 - Food alone withdrawn: death in **6–8 weeks** (about 60 days).
 - Water alone withdrawn, food available: death in about **10 days**.
 - Newborns may survive **7–10 days** with no food or water.
- ▶ Death occurs once about **70–90%** of body fat and **~20%** of body protein are lost.
- ▶ **What shortens the fatal period is itself a social fact:**
 - Age: the very young and very old die soonest.
 - Sex: females withstand starvation longer than males.
 - Body condition: the fat and healthy resist better than the lean and emaciated.
 - Environment: extreme cold or heat hastens death.
 - Exertion speeds death.
 - Famine and neglect therefore kill the weakest — infants, the aged, the destitute — first.

Cause of death and autopsy findings

- ▶ **Cause of death:** exhaustion, circulatory failure from **brown atrophy of the heart**, intercurrent infection, or multi-organ failure; dehydration and hypothermia contribute.

- ▶ **Decisive autopsy finding:** near-total absence of fat in subcutaneous tissue, omentum, mesentery and around the viscera — **never seen in wasting disease** such as tuberculosis or malignant cachexia.
- ▶ The heart is small, brown-atrophied, with empty chambers.
- ▶ The gall bladder is distended with bile — no food reaches the duodenum, so no cholecystokinin is released and the gall bladder cannot contract.
- ▶ The urinary bladder is empty; the brain keeps its weight while every other organ shrinks.
- ▶ Rigor mortis appears and passes off early; a ketone odour is characteristic.
- ▶ **Exclusion of disease is the crux of the opinion** — rule out Addison's disease, diabetes, hyperthyroidism, malabsorption, malignancy, pernicious anaemia, progressive muscular atrophy, chronic diarrhoea and tuberculosis.
- ▶ Marked weight loss with absence of fat, and no disease present, means the diagnosis is starvation.

Medico-legal duties and the hunger-strike dilemma

- ▶ A starvation death is an **unnatural or suspicious death** and must be reported to the police for a magistrate's inquest and medico-legal autopsy — **Section 194 BNSS 2023 (Section 174 CrPC 1973)**.
- ▶ **Custodial (jail) starvation death** additionally needs a judicial magistrate's inquest — **Section 196 BNSS 2023 (Section 176 CrPC 1973)**.
- ▶ **Hunger strike and force-feeding** is the key ethical-legal problem, and the law is genuinely ambiguous.
 - **Force-feeding** risks a charge of criminal force — **Section 129 BNS 2023 (Section 350 IPC 1860)**. Mere "force" (Section 128 BNS / Section 349 IPC) is only a definition, not a punishable offence.
 - **Declining to feed**, if the prisoner dies, risks a charge of abetment of suicide — **Section 108 BNS 2023 (Section 306 IPC 1860)**.
- ▶ **Article 21** guarantees the right to life but not a right to die; because the Constitution is supreme, **force-feeding of hunger-strikers is treated as lawful in India**, triggered in practice by **ketonuria** (ketones in the urine).
- ▶ This is the opposite of the **World Medical Association** position: the **Declarations of Tokyo (1975) and Malta (1991)** advise against force-feeding a competent hunger-striker.
 - Feeding is permitted only once the patient lapses into coma.
- ▶ **Homicidal starvation of a dependant** is charged as culpable homicide or murder — **Sections 100/101/103/105 BNS 2023 (Sections 299/300/302/304 IPC 1860)**.
- ▶ **Right to food** rests on Article 21 and the Directive Principle in Article 47, operationalised by the **National Food Security Act 2013**.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Labelled emaciated body (frontal view):** sunken glistening eyes with dilated pupils; sunken cheeks (Bichat's fat pad lost late); prominent clavicles and shoulder tips; prominent ribs with intercostal concavities; sunken supraclavicular fossae; scaphoid abdomen; thin flaccid limbs; oedema at the ankles and inner thighs; dry wrinkled pigmented skin.
- ▶ **Manner-of-death flow:** emaciated body → exclude wasting disease (absence of fat = starvation) → classify manner (accidental / suicidal / homicidal) → report to police → magistrate's inquest → autopsy.

Medico-legal significance

- ▶ **Manner-of-death determination drives everything:** accidental triggers State responsibility, suicidal raises the force-feeding/abetment debate, homicidal leads to murder and cruelty charges.
- ▶ **Absence of body fat with disease excluded** turns a clinical impression into a defensible cause of death.
- ▶ The doctor must report the death, document the degree of emaciation, photograph the body, take blood/urine ketone samples, and assist the inquest.
- ▶ **Right to food** — Article 21, Article 47 and the National Food Security Act 2013 — makes famine and neglect deaths a matter of legal accountability.

♦ ♦ ♦

Forensic traumatology

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Discuss vitriolage and possible punishments for it*Asked in: Paper III Oct 2025 — RGUHS MD Forensic Medicine***Definition**

- ▶ **Vitriolage** (vitriol throwing, popularly "acid attack") means deliberately throwing or pouring a corrosive substance on a person.
- ▶ The most common agent is concentrated **sulphuric acid** (oil of vitriol, H_2SO_4).
- ▶ The word comes from *vitriol*, the old name for sulphuric acid, from its glassy look (Latin *vitriolum*, glass).
- ▶ The intent is to **disfigure or maim**, not to kill.
- ▶ It is legally a severe form of **grievous hurt** with its own dedicated punishment sections.

Agents used and typical scenario

- ▶ **Most common agent:** concentrated sulphuric acid — cheap, easily available (battery acid is ~30–35% H_2SO_4), and rapidly destroys tissue.
- ▶ **Other corrosives used:**
 - **Acids:** nitric, hydrochloric, carbolic (phenol).

- **Alkalis:** caustic soda (NaOH), caustic potash (KOH).
- **Corrosive salt:** corrosive sublimate (mercuric chloride).
- **Plant irritants:** marking nut (*Semecarpus anacardium*), calotropis juice.
- ▶ **Target:** the face and eyes, because the aim is to disfigure, not to kill.
- ▶ **Typical perpetrator:** a jilted lover, or a jealous, vengeful or disgruntled person.
- ▶ **Other medico-legal uses of acid (not vitriolage proper):**
 - Self-defence by a woman against sexual assault.
 - As an abortifacient, injected into the vagina.
 - For disposal of a body (the "Acid Bath Murderer," John Haigh, 1949).

Features of the burns

- ▶ The burns are **painless** but **penetrating**, so infection sets in easily.
- ▶ **Discoloration of skin and clothing:**
 - Brown-black with sulphuric or hydrochloric acid.
 - Yellow with nitric acid (a xanthoproteic reaction with skin protein).
- ▶ **Trickle or splash marks** run down the face, neck and chest, showing the acid was thrown or poured.
- ▶ There is a **sharp line of demarcation** around the burnt area.
- ▶ The chemical agent itself is often detectable in the stains.
- ▶ Healing is slow, and **scarring causes contractures** that restrict joint movement.
- ▶ **Eye involvement, if the eyes are hit:**
 - Conjunctivitis, corneal oedema and ulceration.
 - Iridocyclitis — inflammation of the iris and ciliary body.
 - Necrotising keratitis — destructive death of corneal tissue.
 - Periorbital swelling, and ultimately blindness.
- ▶ Extensive burns can cause death from **shock or toxemia**.

Management

- ▶ **First aid:** irrigate the affected area with plenty of water and soap, or with sodium/potassium carbonate solution, for a prolonged period.
- ▶ **No chemical neutralising antidote** is used on skin — the neutralisation reaction is exothermic and would worsen the burn.
- ▶ **Skin:** later apply a thick paste of magnesium oxide or carbonate, and cover the raw area with antibiotic ointment.
- ▶ **Eyes:** wash with water, then irrigate with dilute sodium bicarbonate; later instil a few drops of olive or castor oil.
- ▶ **Supportive care:** analgesia, IV fluids for shock, broad-spectrum antibiotics, and later plastic/reconstructive surgery.

Punishments (criminal law)

- ▶ Vitriolage is legally a form of **grievous hurt** caused by "dangerous means."
- ▶ Before 2013 it was charged only under the general grievous-hurt sections of the IPC (§§ 320, 322, 325, 326).
- ▶ After the *Laxmi v. Union of India* case, the **Criminal Law (Amendment) Act 2013** created two dedicated offences: IPC § 326A and IPC § 326B.
- ▶ Since 1 July 2024 these are **Section 124(1) and Section 124(2) of the Bharatiya Nyaya Sanhita (BNS) 2023**.

Offence	Legacy (IPC 1860)	Current (BNS 2023)	Punishment
Causing grievous hurt by acid	§ 326A	§ 124(1)	10 years to life + fine
Throwing/attempting to throw acid	§ 326B	§ 124(2)	5–7 years + fine

- ▶ General grievous hurt by acid, where the specific section is not invoked, is punished under § 326 IPC, now § 118 BNS 2023.
- ▶ If the victim dies, the charge escalates to culpable homicide or murder (IPC §§ 299/300, now BNS §§ 100/101; punished under IPC §§ 304/302, now BNS §§ 105/103).
- ▶ Under the *Laxmi* directions, **sale of acid is regulated**: buyers must show photo-ID and state the purpose and quantity, sale to minors is barred, and sellers must declare their stock.

Medico-legal significance

- ▶ Permanent disfigurement of the face is itself grievous hurt (BNS §§ 116/117, legacy IPC §§ 320/322); the dedicated acid offence (BNS § 124) is the specific charge used.
- ▶ The examining doctor must photograph and describe the burns — site, extent, depth, trickle pattern, line of demarcation, eye involvement, and percentage of body surface area.
- ▶ The colour of staining can suggest the agent: brown-black for sulphuric/hydrochloric acid, yellow for nitric acid.
- ▶ Clothing and plain-water swabs from the affected area must be collected and sealed for chemical examination at the Forensic Science Laboratory.
- ▶ The scene should be searched for spilt corrosive on the ground, walls or vehicles, and for fragments of the container.
- ▶ The assailant is only rarely identified from acid burns on his own body — an occasional, not a reliable, finding.
- ▶ Vitriolage (external corrosion with trickle marks) must be distinguished from **acid ingestion**, which corrodes the mouth, oesophagus and stomach internally.
- ▶ On ingestion, the stomach becomes a soft, spongy, black, charred mass that disintegrates on touch; the fatal dose is about 10–15 mL, and the fatal period is 12–24 hours.
- ▶ Acid-attack is a **cognizable offence**: the doctor must inform the police, no hospital may refuse treatment, and free treatment (including reconstructive surgery) plus victim compensation are mandated under the *Laxmi* directions.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ A labelled face diagram of an acid-attack victim showing: trickle/splash marks over the cheek and neck, the area of corrosion with its line of demarcation, corneal opacity from eye destruction, post-healing contracture and scar, and brown-black or yellow staining of skin and clothing collar.
- ▶ A simple flow box: corrosive agent (usually conc. H_2SO_4) thrown on the face or eyes → painless penetrating burns → disfigurement and blindness → punishable under BNS § 124(1) (causing grievous hurt) and BNS § 124(2) (throwing/attempting to throw acid).



Skull fractures and types

Asked in: Paper III Apr 2019 — RGUHS MD Forensic Medicine

Definition / Introduction

- ▶ A **skull fracture** is a break in the continuity of a cranial bone (vault, base, or facial skeleton), caused by force exceeding the bone's elastic limit.
- ▶ The force needed varies with the bone's thickness, density, elasticity, scalp covering, and impact direction.
- ▶ There is **no fixed relationship between a fracture and the underlying brain injury** — extensive fractures may show no brain damage, and a fatal brain injury may occur with no fracture at all (~20% of fatal head injuries show no skull fracture).
- ▶ Fracture pattern and site help reconstruct the **weapon**, the **force direction**, and the **manner of death**.

Applied anatomy and force needed

- ▶ The vault has three layers: **outer table**, **diploe** (spongy bone), **inner table**.
- ▶ The outer table is twice as thick, but the **inner table is thinner and more brittle** — so it often fractures first.
- ▶ The **frontal and parietal bones** are 6–10 mm thick.
- ▶ The **occipital bone** is thickest, about 15 mm.
- ▶ The **temporal (squamous) bone** is thinnest — a frequent fracture site.
- ▶ An intact scalp-covered skull needs **400–600 psi** to fracture, but a bare de-fleshed skull needs only ~25 inch-pounds — the scalp protects the bone.

Mechanism of skull fracture

- ▶ **Direct violence** — fracture forms at the impact site.
 - **Compression:** obstetric forceps, vehicle wheel crushing the head.
 - **Object strikes a still head:** bullet, brick, stone, dagger.
 - **Moving head strikes an object:** falls, traffic injuries.

- ▶ **Indirect (transmitted) violence** — force travels from a distance, e.g. a fall on the feet/buttocks driving the spine into the base.
 - Mainly produces a **ring fracture**; rarely fractures the vault.
- ▶ **Local deformation** — a small, fast object hits a small area, producing a **cone-shaped indentation**.
 - Inner table fractures first at the apex; outer table gives a circular line at the periphery.
 - Continued force depresses fragments (a **depressed/comminuted fracture**).
- ▶ **General deformation** — the whole skull compresses: the pressure-line diameter shortens while right-angle diameters increase, so distant parts bulge and **fracture by bending** (often coexists with local deformation).

Classification of skull fractures

- ▶ **By communication with the exterior:**
 - **Simple (closed):** no communication with the outside.
 - **Compound (open):** communicates with the exterior (e.g. scalp laceration to bone, fractured sinus) — high infection risk (**leptomeningitis**).
 - A **penetrating** fracture is a compound fracture where the **dura** (outer meningeal layer) is also breached.
- ▶ **By site and appearance** — the main morphological types:

Type	Key feature	Typical cause
Fissured (linear)	Commonest (~70%); blood-stained hairline crack	Falls, broad weapon
Depressed	Bone driven inward; inner table comminuted	Hammer, axe (small striking surface)
Signature	Depressed fracture shaped like the weapon's face	Patterned weapon, high ID value
Comminuted	Intersecting lines, 3+ fragments, web/mosaic pattern	Crush, road accident, fall
Pond (ping-pong)	Concave dent, no true fracture line, outer table only	Infant/child skull
Gutter	Groove, outer table partly lost; graded 1st–3rd degree	Glancing bullet
Keyhole	3rd-degree gutter; entry/exit merge, beveled	Tangential firearm
Ring	Encircles skull near foramen magnum; usually fatal	Fall on feet/buttocks
Perforating	Clean hole through both tables, matching the weapon	Firearm, dagger, knife
Diastatic	Suture separation (usually sagittal); young persons only	Blunt trauma

Type	Key feature	Typical cause
Elevated	Bone fragment pushed outward; very rare	Weapon withdrawal, firearm exit
Blow-out	Orbital floor/wall fracture, contents herniate	Blunt trauma to the eye
Growing skull fracture	Enlarging fracture in children under 3 years	Childhood fracture, wide gap

Fracture of the base of the skull

- ▶ Basal fractures follow direct force to the base, general deformation, extension of a vault fracture, or force transmitted from the face or spine.
- ▶ Fracture lines are shaped by the **petrous (petrous-temporal) buttress** and tend to meet at the **pituitary fossa**, opening into the basal foramina.
- ▶ The **sphenoidal fissure** is most often involved; even the thick-margined **foramen magnum** is not spared.
- ▶ **Longitudinal**: right/left halves, from a front-to-back impact.
- ▶ **Transverse**: front/back halves, from a side-to-side impact.
- ▶ **Ring**: the third directional type (see table above).
- ▶ **Hinge fracture** — a complete basal fracture crossing the whole base, creating a "hinge."
 - **Type I**: coronal, ridge-to-ridge through the sella — the classic **motor-cyclist's fracture** (side-of-head or chin impact); commonest type.
 - **Type II**: front-to-back through the sella.
 - **Type III**: side-to-side, sparing the sella.
 - Hinge fractures cause **brain-stem (ponto-medullary) tears** and are usually rapidly fatal.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Diagram 1 — Vault fracture types**: a calvarium labelled with fissured, depressed (signature), comminuted (spider-web), pond, gutter, and diastatic fractures, plus a cone-of-fracture inset (outer table, diploe, inner table, apex, periphery).
- ▶ **Diagram 2 — Base of skull**: a superior view labelled the cranial fossae, petrous ridge, sella turcica, and foramen magnum, overlaid with the Type I hinge, longitudinal, transverse, and ring fractures.

Medico-legal significance

- ▶ **Weapon identification**: a *signature* depressed fracture reproduces the weapon's striking face — circular for a hammer, rectangular/triangular for a rifle butt.
- ▶ **Beveling** (widened inner-table defect) with radiating fissures localises a firearm entry; gutter/keyhole fractures indicate a **tangential** bullet path.
- ▶ **Sequencing blows (Puppe's rule)**: a later fracture line stops at an earlier one, revealing the order of impacts.

- ▶ **Manner of death:** multiple, localised, depressed fractures suggest **homicide**; most fractures are **accidental** (falls, vehicles); **suicidal** head injury is rare, clustered near the midline/vertex, usually in the mentally ill.
- ▶ **Signs of a basal fracture:**
 - **Raccoon/panda eyes** — anterior-fossa fracture.
 - **Battle's sign** (mastoid bruising) — posterior-fossa fracture.
 - **CSF rhinorrhoea/otorrhoea** with a **halo sign** on cloth.
 - **Haemotympanum** and facial/vestibulocochlear (VII/VIII) palsy — petrous-temporal fracture.
 - The **water test** confirms a Type I hinge fracture.
- ▶ **Complications to document:**
 - Intracranial haemorrhage (extradural, subdural, subarachnoid); cerebral contusion (coup/contrecoup).
 - Leptomeningitis, cranial pneumatocele (trapped air), CSF leak, fat/bone-marrow embolism.
 - Inhaled blood in the lungs — shows death was not instantaneous.
- ▶ **Ageing the injury:** edges adhere within a week, pitting/lime deposits by ~14 days, bony bridging by 3–5 weeks, smooth edges by 3 months.
- ▶ **Decompress the cranial vessels before opening the skull;** do not mistake a post-mortem saw mark or a **wormian bone** for a fracture.
- ▶ Any skull fracture is **grievous hurt** — clause (g), "fracture or dislocation of a bone or tooth" — **Section 116 BNS 2023 (legacy Section 320 IPC 1860)**; a **compound** fracture also satisfies clause (h), a hurt "which endangers life."
- ▶ A fatal head injury needs a police inquest under **Section 174 CrPC 1973 (now Section 194 BNSS 2023)**, and a magistrate's inquest under **Section 176 CrPC 1973 (now Section 196 BNSS 2023)** where applicable.
- ▶ If homicidal: **murder** — **Section 300/302 IPC 1860 (now Sections 101/103 BNS 2023)**, or **culpable homicide not amounting to murder** — **Section 299/304 IPC 1860 (now Sections 100/105 BNS 2023)**.
- ▶ The autopsy opinion is tendered as **expert evidence under Section 45 IEA 1872 (now Section 39 BSA 2023)**.



Vitriolage and medico-legal importance

Asked in: Paper III Oct 2018 — RGUHS MD Forensic Medicine

Definition and agents

- ▶ **Vitriolage** (acid attack) is the throwing of a corrosive substance on a person with malicious intent.
- ▶ The corrosive need not be sulphuric acid — any corrosive counts.
- ▶ The intent is to disfigure, maim or blind, not to kill.

- ▶ The name comes from *oil of vitriol*, the old name for concentrated sulphuric acid.
- ▶ **Sulphuric acid (H_2SO_4)** is the corrosive most commonly used.
 - It is oily, dense (specific gravity ~ 1.84 at 95%), and hygroscopic (absorbs moisture from air).
 - It chars (carbonises) organic matter on contact.
- ▶ **Other corrosives reported:**
 - **Mineral acids:** nitric acid, hydrochloric acid.
 - **Organic acid:** carbolic acid (phenol).
 - **Caustic alkalis:** caustic soda, caustic potash, ammonia.
 - **Corrosive salt:** corrosive sublimate (mercuric chloride).
 - **Other:** iodine.
- ▶ **Vegetable vitriolage:** irritant plant juices — marking nut (*Semecarpus anacardium*) and *Calotropis* (madar) — can be thrown to mimic an acid burn or fabricate an assault.

Mechanism and nature of the injury

- ▶ The corrosive is aimed at the **face**, so the eyes, nose, lips and cheeks bear the brunt.
- ▶ The burn is **painless at first** because nerve endings are destroyed rapidly.
- ▶ The corrosive **penetrates and devitalises tissue**, which predisposes to infection.
- ▶ Healing is **slow**, and the resulting scar **contracts**, producing disfiguring contractures.
- ▶ Contractures near joints can restrict movement.
- ▶ **Blindness** can follow eye involvement — conjunctivitis, corneal oedema and ulceration, iridocyclitis, necrotising keratitis, periorbital oedema.
- ▶ **Death** can result from shock or toxæmia if the burnt area is extensive.
- ▶ A thrown corrosive produces a **downward trickle/splash pattern** on the face and neck — this distinguishes throwing from ingestion.

Acid burns versus alkali burns

Feature	Acid (e.g. H_2SO_4)	Alkali (e.g. caustic soda)
Necrosis	Coagulative, with a dry eschar	Liquefactive (colliquative), soapy
Feel	Dry, leathery, charred	Slimy/soapy
Colour	Grey-white, then brown/black	Grey, translucent, soft
Depth	Self-limited by the eschar	Deeper, slower to demarcate

Clinical and autopsy features

- ▶ **Skin:** burns over the face, chin, angles of the mouth, lips, chest, neck and hands.
- ▶ **Trickle burns** run downward from the corners of the mouth.
- ▶ Burnt skin is grey-white at first, then turns **brown/black and leathery**.
- ▶ **Nitric acid** leaves a characteristic **yellow** stain on skin, teeth and clothing — a clue to the agent used.

- ▶ **Eyes:** corneal opacity, ulceration and scarring can cause partial or total blindness — a form of grievous hurt.
- ▶ **Late effects in survivors:** permanent scars, contractures, ectropion, microstomia, gross facial disfigurement, and severe psychological morbidity.
- ▶ **Clothing** carries acid stains and must be preserved as evidence.

Treatment / first aid

- ▶ **Skin:** wash immediately with plenty of water and soap, or with sodium/potassium carbonate solution.
- ▶ **Eyes:** irrigate with water, then with very dilute sodium bicarbonate (weaker than carbonate, so it does not injure the eye further).
- ▶ After eye irrigation, instil a few drops of castor oil or olive oil.
- ▶ After washing, a thick paste of magnesium oxide or magnesium carbonate can be applied to soothe the burn.
- ▶ Some authorities prefer copious water alone over chemical neutralisers, because the heat released on neutralisation can add to the injury.
- ▶ The doctor must also inform the police and provide free immediate treatment — a statutory duty (see below).

Medico-legal significance

- ▶ Vitriolage is **grievous hurt** because of permanent disfiguration of the face or permanent loss of sight.
 - **Section 116 BNS 2023 (formerly Section 320 IPC 1860)** lists these as grievous hurt: "permanent privation of the sight of either eye" and "permanent disfiguration of the head or face."
- ▶ It is now prosecuted mainly under **dedicated acid-attack offences**.
 - **Section 124(1) BNS 2023 (formerly Section 326A IPC 1860):** causing grievous hurt by acid — punishment is imprisonment of not less than ten years, extendable to life, plus a fine payable to the victim to cover treatment costs.
 - **Section 124(2) BNS 2023 (formerly Section 326B IPC 1860):** throwing or attempting to throw acid with intent to cause hurt — punishment is imprisonment of five to seven years, plus fine.
- ▶ **Section 397 BNSS 2023 (formerly Section 357C CrPC 1973)** makes it mandatory for every hospital, public or private, to give free immediate first aid/treatment to an acid-attack victim and to inform the police at once.
- ▶ **Section 38 BNS 2023 (formerly Section 100 IPC 1860)** extends the right of private defence of the body to causing death, when there is reasonable apprehension that acid is about to be thrown or administered.
- ▶ **Manner of incident:** typically homicidal/assaultive with intent to disfigure.
 - Commonly a jilted lover, or driven by jealousy, revenge, enmity or rivalry.
 - Most often directed at a woman's face.

- Occasionally used by a woman in self-defence against sexual assault.
- ▶ **Evidence at the scene:**
 - Collect the victim's **clothing** for chemical examination.
 - Take **water swabs** from the affected skin for chemical analysis.
 - Search the scene for **spilt corrosive** and any **broken glass** from the container that carried the acid.
 - Match residue on the glass chemically to the corrosive found on the victim.
 - Look for **splash marks on the suspect's own body** — these have helped identify an assailant.
- ▶ **Feigned injury:** irritant plant juices (marking nut, *Calotropis*) can mimic an acid burn; chemical analysis distinguishes a genuine mineral-acid attack from a fabricated one.
- ▶ **Doctor's duty:** treat the case as medico-legal.
 - Document and photograph every lesion.
 - Record the trickle/splash pattern.
 - Opine on whether the hurt is simple, grievous or dangerous, and on the permanency of disfigurement or loss of sight.
 - Collect and preserve trace evidence.
- ▶ The dedicated acid-attack provisions were inserted by the **Criminal Law (Amendment) Act, 2013**, following the *Laxmi Agarwal* case (2005).
- ▶ That case also led to Supreme Court directions regulating over-the-counter sale of acids and a victim-compensation framework.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Pattern of acid burns (frontal face):** splash/trickle marks running down from the cheeks and corners of the mouth to the chin and neck.
 - Mark destruction of one or both eyes (blindness).
 - Mark brown-to-black leathery eschar over cheeks and forehead.
 - Mark burns on the chest and the backs of the hands (raised in defence).
 - Mark sparing of areas shielded by hair or clothing.
- ▶ **Acid vs alkali necrosis (two boxes):** Box A — acid causes coagulative necrosis: dry, leathery, brown-black eschar, self-limiting. Box B — alkali causes liquefactive necrosis: slimy, soapy, penetrates deeper.

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Personal identification

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Dactylography

Asked in: Paper IV Oct 2022 • Paper III Apr 2019 • Paper IV Oct 2018 (3×) — RGUHS MD Forensic Medicine

Definition

- ▶ **Dactylography** (Greek: finger + to write) is the science of personal identification through fingerprints; also called **fingerprinting** or the **Galton–Henry system**.
- ▶ **Dermatoglyphics** is the wider study of all skin ridge patterns, not just fingertips.
- ▶ Identification relies on the **papillary (friction) ridges** on the fingertips, permanent for life with almost endless variation.
- ▶ Even identical (monozygotic) twins have different fingerprints.
- ▶ This makes dactylography the single most accurate method of **positive identification** — more reliable than DNA profiling for telling twins apart.

Historical milestones and basis

- ▶ **Nehemiah Grew** (1684) and **Johann Mayer** (1788) first described and recognised finger ridge individuality.
- ▶ **Sir William Herschel** first used fingerprints in India (West Bengal) in **1858**, on contracts and prisoner records.
- ▶ **Dr Henry Faulds** (1880, Tokyo) first identified a crime-scene fingerprint and suggested its forensic use.
- ▶ **Sir Francis Galton** (1892, monograph *Finger Prints*) systematised the method; **Sir Edward Henry** then devised the ten-print classification (British India and UK, 1899), and the world's first **Fingerprint Bureau** opened at **Kolkata** in **1897**.
- ▶ **Individuality**: the chance of two people sharing identical fingerprints is about **1 in 64 billion** (*Quetelet's rule*); patterns are **not inherited**, so paternity cannot be proved from a fingerprint.
- ▶ **Fetal development**: ridges form between the 12th and 16th week, complete by about **24 weeks** of intrauterine life (volar pads at 6–8 weeks); local amniotic-fluid pressure differences (10–16 weeks) explain why even identical twins differ.

Fingerprint classification (Galton–Henry)

- ▶ Two landmarks define every pattern: the **core** (a ridge curving on itself) and the **delta/triradius** (where ridges converge from three directions).
- ▶ **Rule**: arch = no core, no delta; loop = one core, one delta; whorl = one core, two deltas; composite = mixed.

Pattern	Approx. frequency	Sub-types
Loops (commonest)	~60–70%	radial, ulnar
Whorls	~25–35%	concentric, spiral, double spiral, almond
Arches	~6–7%	plain, tented, exceptional
Composite	~1–2%	central/lateral pocket loop, twinned loop, accidental

- ▶ *Memory aid*: Loops > Whorls > Arches > Composite.
- ▶ The **modified Henry system** (used in the US) classifies a ten-print card per person; AFIS now stores and matches these digitally.

Types of prints at a crime scene

- ▶ **Latent prints**: invisible sweat/oil deposits on a touched surface, the commonest type found, needs development to become visible.
- ▶ **Plastic prints**: moulded, three-dimensional impressions in a soft surface — soap, wax, putty, thick dried blood, mud — needing no development.
- ▶ **Patent prints**: left by a finger already coated in colour — *positive* when ridges deposit colour (blood, ink, paint, soot), *negative* when ridges remove dust or soot — and help reconstruct the sequence of events.

Mode of production and taking of prints

- ▶ Friction ridges carry **eccrine sweat-duct** openings; sweat (99% water, 1% solids: salts, amino acids, lactic acid, urea) mixes with facial/scalp sebaceous oil to form the latent print.
- ▶ **In the living**: hands are washed and dried, then printed in ink on unglazed white paper.
 - Plain (dabbed) and rolled (nail-to-nail) impressions are taken, all ten fingers in criminal cases, only the left thumb in civil cases.
- ▶ **In the dead**:
 - Severe rigor: finger incised at the proximal interphalangeal joint to straighten it.
 - Early putrefaction: palmar skin of each fingertip removed into separate **10% formalin** containers.
 - Advanced putrefaction/drowning: epidermis separates as a "**skin glove**," itself printable; ridge persists in the dermis to about **0.6 mm**.
 - Mummified fingers soften in **20% acetic acid** (24–48 hours); sodden ("washerwoman") fingers are restored by injecting **liquid paraffin, glycerine, or formalin**.

Development of latent prints

- ▶ Latent prints are located with oblique light, then developed by physical or chemical methods.
- ▶ **Powder dusting**: grey (chalk + mercury) or white (lead carbonate) powder, sticks to skin oils on most surfaces.
- ▶ **Ninhydrin**: reacts with amino acids to give **Ruhemann's purple** on paper, can reveal marks up to 40 years old.
- ▶ **Iodine fuming**: vapour absorbed by sebum turns the print brown, on porous and non-porous surfaces.
- ▶ **Silver nitrate (5%)**: reacts with chlorides in sweat, on paper, wood, and fabric.
- ▶ **Cyanoacrylate (superglue) fuming**: reacts with amino/fatty acids to leave a white deposit, on non-porous surfaces and even skin.
- ▶ Metal/glass need physical methods (SEM, laser); the print is then photographed, lifted with cellophane tape, and fixed onto a card.

- ▶ The FINDER system records eight fingers (excluding the little fingers) digitally.

Poroscopy, ridgeology and comparison

- ▶ **Poroscopy:** the study of microscopic sweat-gland pores on the ridges.
 - Each millimetre of ridge carries about **9–18 pores**, permanent and individual in size, shape, and arrangement.
 - Useful when only a fragment of a print survives, with no recognisable overall pattern.
- ▶ **Ridgeology / edgeoscopy:** studies ridge shapes and edge contours for further individualisation.
- ▶ **Comparison uses minutiae, not the overall pattern.**
 - Minutiae include ridge ending, bifurcation, lake/enclosure, island/dot, spur, and crossover.
 - Matching follows **ACE-V**: Analysis, Comparison, Evaluation, Verification.
 - Internationally, 16–20 matching points are generally required; in India the Supreme Court accepts a **minimum of 8 points**.

Alteration and persistence of fingerprints

- ▶ **Disease change:** pattern unaltered but ridge spacing changes in acromegaly, infantile paralysis, and rickets (*memory aid: AIR*).
- ▶ Ridges atrophy in coeliac disease, are altered in dermatitis, eczema, acanthosis nigricans, and scleroderma, and are **permanently damaged** in leprosy, electrical injury, and radiation.
- ▶ **Intentional mutilation:** self-inflicted wounds, burns, corrosives, abrasion, skin grafting, or rearranging ridge segments ("transmogrification").
- ▶ Ridges are well protected (in burns, fingers curl into the palm), so some pattern usually survives unless the dermis is destroyed, and mutilation often adds new features rather than erasing them.
- ▶ **Persistence:** prints kept undisturbed indoors, or on glazed paper, may last years, but weather away within weeks outdoors.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Cross-section of a friction ridge:** label epidermis (with Malpighian layer), dermis, dermal papillae, ridge, furrow, sweat gland, sweat duct opening as a pore on the ridge crest, and a subsidiary (incipient) ridge.
- ▶ **The four major patterns:** four panels labelled arch (no core, no delta), loop (one core, one delta), whorl (one core, two deltas), and composite; mark the core and delta(s) on each.

Medico-legal significance

- ▶ **Identification of:** criminals from latent prints (weapons, doors, glass), deserters, amnesiacs, the unconscious/injured, and dead, decomposed, or burnt bodies.
- ▶ Also detects exchange of newborns, prevents impersonation, maintains identity records (army, police, passports, licences), and authenticates documents — thumb impressions of illiterate persons, latent prints on cheques or bank notes.

- ▶ At autopsy of an unidentified body, identification marks, photographs, and fingerprints must be recorded; in mass disasters, bodies stay numbered until fingerprint, blood, and DNA testing confirm identity.
- ▶ Illustrates **Locard's exchange principle** (every contact leaves a trace); prints go to the Forensic Science Laboratory (FSL) as trace evidence.
- ▶ The fingerprint expert testifies as an **expert witness** under **Section 39(1), Bharatiya Sakshya Adhiniyam (BSA) 2023** (formerly **Section 45, Indian Evidence Act 1872**), naming identity of finger impressions as a matter for expert opinion.
- ▶ **Compared with teeth:** teeth resist fire and putrefaction but need ante-mortem records, while fingerprints are destroyed by both but have well-established proof criteria and may already exist in the person's own records.

Recent advances [RA]

Current as of 2026-07-04 · depth: elaborate · sources: PubMed

- ▶ **Chemical profiling** of fingermarks now reveals donor traits, not just ridge pattern.
 - Mass-spectrometry imaging (MALDI-MS, SALDI-MS) and Raman spectroscopy/SERS read mark chemistry non-destructively to infer sex, drugs, cosmetic contact, and time since deposition. [PMID 38647691; PMID 41932803]
 - Lipidomics, ToF-SIMS, and a field-portable immunoassay (serum albumin, up to 7 days old) add further donor information, complementing DNA. [PMID 39400253; PMID 39708708; PMID 41780251]
- ▶ **New development materials:** luminescent nanomaterials give high-contrast, low-toxicity results on coloured/transparent surfaces, though carbon-dot developers remain poorly validated for casework use. [PMID 39037456; PMID 39383882; PMID 39541801]
- ▶ **Micro-CT** visualises friction ridges and sweat glands in fresh or heat-damaged fingers within a 2-minute scan, but fails in advanced decomposition. [PMID 41801389]
- ▶ A validated "**lights-out**" **automated latent-to-tenprint search** identified up to 44% of marks with minimal human input, contributing roughly a quarter of real casework identifications. [PMID 35780517]
- ▶ **Population data:** finger type, not sex or geography, mainly drives pattern distribution (large-scale study); a twin/parent-child study found heritable ridge-count similarity, raising kinship-screening potential. [PMID 41950720; PMID 41916104]
- ▶ **Validity debate:** fingerprint evidence has long escaped rigorous court testing; the field is moving toward probabilistic reporting, examiner proficiency testing, and standardised test marks. [PMID 35033325; PMID 42161103]

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Forensic gynaecology & sexual offences

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Explain in detail the Medico legal aspects of family planning procedures

Asked in: Paper III Apr 2025 — RGUHS MD Forensic Medicine

- ▶ **Family planning** is the voluntary regulation of family size and spacing, using temporary contraceptive and permanent surgical methods.
- ▶ The medico-legally important procedures are **vasectomy** (male) and **tubectomy** (female) sterilization, plus **artificial insemination (AI)**, **ART** and **surrogacy** for the involuntarily childless couple.
- ▶ Each raises questions of valid **consent**, **duty of care**, **professional secrecy**, **legitimacy** of the child, and criminal/civil **liability**.

Sterilization — definition, types and methods

- ▶ **Sterilization** makes a person infertile **without affecting sexual potency**.
- ▶ **Direct sterilization**: the operation is intended to cause sterility.
- ▶ **Indirect sterilization**: sterility is an unintended result of surgery done for another reason (e.g. removing diseased organs).
- ▶ **Compulsory sterilization**: State-ordered, on eugenic or punitive grounds — **not practised in India**, and unconstitutional.
- ▶ **Voluntary sterilization**: done with informed, documented consent.
 - For **family-planning** reasons, to limit family size.
 - For **therapeutic** reasons, to prevent danger to health or life (e.g. removing testes in prostate cancer, ovaries in breast cancer) — legal worldwide.
- ▶ **Permanent methods**:
 - **Vasectomy** in the male.
 - **Tubectomy** in the female.
 - **Deep X-ray exposure** in either sex.
- ▶ **Temporary methods**: IUD (loop), oral pills, condoms, diaphragm, spermicidal jelly, coitus interruptus.
- ▶ **Vasectomy (male sterilization)** is the preferred method under the National Family Planning Programme:
 - Needs **no hospital admission** — an out-patient/clinic procedure.
 - Done under **local anaesthesia**, in about 20 minutes, at low cost.
 - Avoids entering the **peritoneal cavity** — fewer complications.
 - Can be performed by a **trained MBBS doctor**.
- ▶ **Eligibility**: married man, **under 60 years**, with at least one child older than 1 year.
- ▶ **Conventional vasectomy**: a ~2 cm incision, stitches removed after one week.
- ▶ **No-Scalpel Vasectomy (NSV)**: popularised by *Dr Li Shun Quiang* (China, 1991) — a tiny puncture replaces the incision.
 - The **vas deferens** is grasped, elevated, and ligated at two points 1.5 cm apart.

- A 1-cm segment is resected; **no skin suturing** is needed.
- ▶ **Histological confirmation** should prove the resected tissue is truly the vas deferens.
- ▶ **Tubectomy (female sterilization) techniques:**
 - **Laparotomy** (Pomeroy's and similar methods) — a loop of tube is ligated and a segment resected.
 - **Minilaparotomy** — under local anaesthesia, about 5 days' admission.
 - **Laparoscopic sterilization** — tube occluded with a *silastic ring* or *Filshie clip*, discharge in about 4 hours.

Medico-legal duties of the doctor in sterilization

- ▶ **Vasectomy does not give immediate sterility.**
 - Live sperm persist until the seminal vesicles empty, after roughly **10–30 ejaculations**.
 - The doctor must advise an additional contraceptive for about **3 months**.
 - **Azoospermia** must be confirmed on **two successive semen analyses** before declaring the man sterile.
 - Failing to give this warning is a recognised ground for a **wrongful-pregnancy claim**.
- ▶ **Tubectomy:** the woman must be told **pregnancy can still occur** (recanalisation/failure).
- ▶ Take **written consent** before contraceptive sterilization; it is **not unlawful** if done for therapeutic/eugenic reasons after valid consent.
- ▶ A death or injury from a **rash or negligent** sterilization is punishable under **causing death by negligence** — Section 304A IPC 1860 (now Section 106 BNS 2023), with up to 2 years' imprisonment for a doctor, besides civil compensation.

Consent — the central medico-legal pillar

- ▶ The patient must be **over 18 years**; sterilization of a **minor or an unmarried person is illegal**.
- ▶ The **patient's own informed consent is mandatory**.
- ▶ The **spouse's consent is NOT legally required** for a competent adult, though taking both is advisable to avoid matrimonial disputes.
- ▶ Consent must be **free, informed and documented** — covering permanence, failure rate, and need for post-op confirmation.
- ▶ Consent that hides these facts is **vitiated** (invalid).
- ▶ A failed or negligent sterilization, or a missed warning, can lead to a **wrongful-birth or wrongful-life suit**.

Artificial insemination, ART and surrogacy

- ▶ **Artificial insemination (AI):** introduction of semen into the vagina, cervix or uterus to achieve pregnancy.
- ▶ **AIH (husband's semen):**
 - The child is the biological product of both spouses and is **legitimate**.
 - AIH does **not amount to consummation of marriage**, so it does not defeat an impotence-based nullity petition.

► **AID (donor semen):**

- Needs the **written consent of husband, wife and donor**; the donor's identity is kept **secret**.
- The donor must be healthy, **HIV-screened (ELISA)**, blood-group matched, and unrelated to the couple.
- A donor's semen must not produce **more than 10 children**.
- **AID without the husband's consent** is a divorce ground; the wife/doctor may be sued.

► **Legitimacy of the AID child:**

- Under classical law the AID child is **illegitimate** and cannot inherit — the husband is not the biological father.
- The **ART (Regulation) Act, 2021** overrides this: a child from a **registered ART clinic** is **deemed legitimate**, and the donor has **no parental rights**.
- The old rule survives only for **informal, unregulated** donor insemination.

► **ART (Regulation) Act, 2021** also requires:

- Written informed consent of the couple/woman and donor.
- **12 months' insurance cover** for the oocyte donor.
- **Sex selection is prohibited**; not more than **3 embryos per cycle**.

► **Surrogacy (Regulation) Act, 2021:**

- Only **altruistic** (no payment beyond medical/insurance expenses) and **gestational** (embryo not genetically the surrogate's own) surrogacy is legal.
- **Commercial and traditional surrogacy are illegal**.
- The surrogate must be a **married close relative**, aged **25–35**, permitted only **once in a lifetime**, after a fitness certificate.
- The child is deemed the **biological child of the intending couple**.

Family planning and the Medical Termination of Pregnancy Act

- When contraception fails, the **MTP (Amendment) Act, 2021** links family planning to lawful abortion.
- **Failure of any contraceptive device or method** is a recognised social ground for termination, its anguish presumed a grave injury to mental health.
- Termination needs the opinion of **one RMP up to 20 weeks**, and **two RMPs for 20–24 weeks**.
- The **husband's consent is not necessary** — only the woman's (or her guardian's, if minor/mentally ill).
- **Professional secrecy** and the secret MTP register must be maintained; a doctor acting under the Act is **protected from the BNS abortion offences**.

Medico-legal significance

- **Criminal abortion sections** the doctor must know, in dual form:
 - **Causing miscarriage** — Section 312 IPC 1860 (now Section 88 BNS 2023).
 - **Miscarriage without consent** — Section 313 IPC 1860 (now Section 89 BNS 2023).
 - **Death from such an act** — Section 314 IPC 1860 (now Section 90 BNS 2023).

- **Act preventing a child being born alive** — Section 315 IPC 1860 (now Section 91 BNS 2023).
- **Causing death of a quick unborn child** — Section 316 IPC 1860 (now Section 92 BNS 2023).
- ▶ **Good-faith protection** — Section 92 IPC 1860 (now Section 30 BNS 2023) covers acts done in good faith; the MTP Act adds statutory immunity for lawful abortion.
- ▶ **Professional secrecy** binds all family-planning records — sterilization, the MTP register, ART/AID donor identity.
- ▶ **Historical caution:** the Emergency mass-sterilization drive (1975–77) coercively sterilized about **6.2 million** men — the classic reason family-planning surgery must be **voluntary and consented**.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **No-Scalpel Vasectomy (NSV):** scrotal skin puncture site, ringed fixation clamp on vas, dissecting forceps, isolated **vas deferens**, two ligatures 1.5 cm apart, 1-cm resected segment, "no skin suture / scrotal support."
- ▶ **Laparoscopic tubectomy:** fallopian tube, Filshie clip / silastic ring applied at the isthmus, occluded segment, laparoscope port; inset of **Pomeroy's method** (ligated loop + resected segment).



Types of hymen and its forensic importance

Asked in: Paper III Apr 2021 — RGUHS MD Forensic Medicine

Definition

- ▶ The **hymen** is a thin fold of mucous membrane, about **1 mm thick**, that partly closes the vaginal outlet.
- ▶ It has a connective-tissue core covered by squamous epithelium on both surfaces.
- ▶ The normal adult hymen is **annular or crescentic**, broadest posteriorly, and deficient (open) anteriorly.
- ▶ Its shape, mode of rupture, and healing are examined in alleged rape, defloration, and child sexual abuse.
- ▶ But the **status of the hymen alone is neither proof nor disproof of sexual intercourse**.

Anatomy and normal dimensions

- ▶ Hymenal orifice diameter grows by about **1 mm per year of age**, reaching **10 mm (1 cm)** in a prepubertal girl (admits a little-finger tip) and **1.2 cm** at puberty (admits one finger).
- ▶ An orifice **over 1 cm in a prepubertal child** is a soft pointer (not proof) of sexual abuse.
- ▶ **Anterior notches are congenital** and unchanged with age; **posterior/lateral concavities and tissue thinning** increase with age.
- ▶ Wooden conical measures or graduated globes gauge hymenal circumference.

Types of hymen

Shape depends on the hymen's thickness, elasticity, and the number and position of its openings.

Type	Defining feature
Semilunar/crescentic (<i>commonest</i>)	Single anterior opening, half-moon shape
Annular	Central oval/circular opening; common in children
Infantile	Small central linear opening
Septate	Two openings side by side, separated by a thin septum
Sub-septate	Septum hangs partway across, like a uvula
Cribriform	Several small perforations
Vertical	Vertical, slit-like opening (hymen labialis)
Microperforate	Tiny opening, large posterior part
Fimbriated/denticular	Fringed, tooth-like edges; notches do not reach the base
Imperforate	No opening at all; needs surgical incision

- ▶ An **imperforate hymen** is the only type with real clinical significance.
- ▶ Trapped menstrual blood causes **haematocolpos** (vagina), then **haematometra** (uterus), producing cyclical pain and a bulging bluish membrane.

Fimbriated (natural) hymen vs a ruptured hymen

- ▶ A natural **fimbriated** hymen must never be mistaken for a **torn** one — this is the most tested distinction.
- ▶ **Site**: notches sit anteriorly; a tear is posterior (6 o'clock) or at 5 and 7 o'clock.
- ▶ **Depth**: notches stop short of the base; a tear reaches the periphery.
- ▶ **Symmetry**: notches are symmetrical; a tear is asymmetrical.
- ▶ **Mucosa**: intact over a notch; torn over a genuine tear.
- ▶ **Rule of thumb**: if the cleft reaches the base, call it a tear, not a natural notch.

Causes of hymenal rupture

- ▶ **Sexual intercourse** is the usual cause; rupture at first coitus is called **defloration**.
- ▶ **Accidental straddle injury** — a fall on a projecting object, or slipping on furniture, a fence, or a pole.
 - Also involves the periurethral tissue, labia, and mons pubis, with other body injuries matching the history.
 - Does **not** show bruising of the hymenal margins.
- ▶ **Masturbation** usually spares the hymen (confined anterior to it) but may enlarge the clitoris/labia and scratch the edges.
- ▶ **Foreign bodies** — sola pith, sanitary tampons, gynaecological instruments, or surgery.

- ▶ **Disease or irritation** — ulceration (diphtheria, fungal), poor hygiene, or worm-infestation itching in children.
- ▶ **Does NOT rupture the hymen** (often misused in court): riding, jumping, dancing, exercise, or forced separation of a child's thighs, unless the perineum itself tears.

Healing of a torn hymen

- ▶ **Immediately after the act:** margins are red, sharp, swollen, tender, and bleed on touch.
- ▶ **2–4 days:** edges are congested and swollen, and may still bleed if touched.
- ▶ **About 7 days:** healing is largely complete.
- ▶ Torn margins do **not** reunite — they round off into **V-shaped defects**.
- ▶ After **childbirth**, or much-repeated intercourse, the hymen is nearly destroyed.
- ▶ What remains are small fleshy tags called **carunculae myrtiformes** — a sign of parity.

Examining the hymen

- ▶ Examine in the **lithotomy position** under good light; map injuries by the **clock-face** convention.
- ▶ **Glaister-Keene rods** — warmed rods with a small spherical head, passed through the opening to evert the edges painlessly; **Foley's catheter/balloon** is a ready substitute.
- ▶ **Per-rectal method** — a finger in the rectum pushes the hymen forward for view; avoid if rectal assault is also suspected.
- ▶ A **moistened swab** or warm saline reveals the edges of a lax, fimbriated hymen.
- ▶ A **colposcope** or magnifying glass, plus **toluidine blue dye**, detects microinjuries invisible to the naked eye.

Medico-legal significance

- ▶ An **intact hymen** is only a *presumption*, not absolute proof, of virginity; a **true virgin** may or may not have an intact hymen.
- ▶ A **false virgin** has had intercourse but keeps an intact hymen because it is lax, folded, or elastic — or after **hymenoplasty** (surgical repair), recognisable by a new narrow opening and stitch marks.
- ▶ **Genital injury is present in only about one-fifth of rape cases** — the act may be non-penetrative, the hymen elastic, or lubricant used.
- ▶ Its extent depends on the hymen's nature, the penis-introitus size mismatch, penetration depth, and force used.
- ▶ A torn hymen alone is **not proof of penile penetration**, since rupture by fingers or an object looks similar.
- ▶ In children, a **markedly enlarged hymenal opening with disruption** (absent hymen, healed transection, scars), without an accidental or surgical explanation, is diagnostic of sexual abuse.
- ▶ **Sola pith**, a spongy plant pith, is inserted by procurers to dilate an immature girl's vagina; done to a girl under 18 without valid consent, this amounts to **rape**.
- ▶ The **two-finger test** for vaginal laxity is unscientific and banned (Maharashtra 2013, then nationwide); *Lillu v. State of Haryana* (2013, Supreme Court) held it violates a survivor's dignity and cannot imply consent.

- ▶ WHO/UN (2018) called for an end to virginity testing; MoHFW protocol now treats hymen status as irrelevant, recording only assault-related injuries.
- ▶ Examine the **survivor before the accused** (before injuries fade), by a **female medical practitioner** with a chaperone, after informed consent.
- ▶ **Statutes:** victim exam §164A CrPC 1973 (now §184 BNSS 2023), report due in 7 days; accused exam §53A CrPC 1973 (now §52 BNSS 2023).
- ▶ Rape: §375 IPC 1860 (now §63 BNS 2023); punishment §376 IPC (now §64 BNS 2023).
- ▶ Emergency care without consent: §92 IPC (now §30 BNS 2023); assault on modesty: §354 IPC (now §74 BNS 2023).
- ▶ **Child victims** fall under the POCSO Act 2012 (amended 2019); exam under §184 BNSS, by a woman doctor with a trusted adult present.
- ▶ The most common site of a true coital tear, in the lithotomy position, is **6 o'clock**.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Types of hymen:** a labelled clock face for each type — annular (central opening), semilunar (anterior crescent), septate (two openings + septum), cribriform (multiple perforations), fimbriated (fringed edges), imperforate (no opening). Mark 12 o'clock anterior, 6 o'clock posterior.
- ▶ **Fimbriated vs ruptured:** two clock-face panels — Panel A: symmetrical anterior notches short of the base, intact mucosa. Panel B: asymmetrical tears at 6 (and 5/7) o'clock reaching the periphery, torn mucosa.



Salient features of the Medical Termination of Pregnancy (MTP) Act, 1971 with recent amendments

Asked in: Paper III Apr 2025 — RGUHS MD Forensic Medicine

Definition

- ▶ The MTP Act 1971 legalises induced abortion in India when done by a **registered medical practitioner (RMP)**.
- ▶ It applies only under defined conditions, at approved places, and within set gestational limits.
- ▶ The Act's goal is to **reduce maternal deaths from unsafe (criminal) abortion**.
- ▶ It balances the woman's rights against the legal protection of the unborn child.
- ▶ Amended in **2002 and 2003**, then substantially by the **MTP (Amendment) Act, 2021** (in force 25 March 2021).
- ▶ The 2021 amendment raised the upper gestational limit to **24 weeks** for special categories.
- ▶ It extended the contraceptive-failure ground to **any woman and her partner**, not just a married woman.
- ▶ It removed the gestational ceiling for **substantial fetal abnormality** and created **State-level Medical Boards**.

- ▶ An RMP acting in good faith within the Act is protected from the abortion offences under Sections 88–92 BNS 2023 (formerly Sections 312–316 IPC 1860).

Aims, scope and key definitions

- ▶ **Aim:** replace unsafe, criminal abortion with a **safe, legal, regulated** route.
- ▶ "Termination of pregnancy" covers both **medical and surgical** methods.
- ▶ **RMP:** a doctor on the State Medical Register who also has the prescribed **training/experience in obstetrics & gynaecology**.
- ▶ **Minor:** a girl under **18 years** — her guardian's written consent is mandatory.
- ▶ **Section 3(1)** is the core protective clause: an RMP is not guilty of any offence if termination follows the Act.

Indications for MTP — Section 3(2)

The headings below (therapeutic, eugenic, humanitarian, social) are a teaching device, not wording used in the Act itself.

Ground	Section	Basis for termination
Therapeutic	S.3(2)(i)	Risk to the woman's life, or grave injury to her physical/mental health
Eugenic	S.3(2)(ii)	Substantial risk of serious physical or mental fetal abnormality
Humanitarian	S.3(2) Expl. 1	Pregnancy alleged to result from rape
Social	S.3(2) Expl. 2	Contraceptive failure in the woman or her partner

- ▶ For **rape** and **contraceptive failure**, the law itself **presumes** grave mental injury — the doctor need not prove it separately.
- ▶ A woman need not lodge a police complaint before MTP on the rape ground; her own statement suffices.
- ▶ The doctor should still **report the matter to police** and **preserve the products of conception** for DNA profiling.
- ▶ The woman's own statement that she is over 18 years is accepted as proof of age.
- ▶ After 2021, **no upper gestational limit** applies for substantial fetal abnormality, subject to Medical Board approval.

Gestational limits and doctors required

- ▶ **Up to 20 weeks:** opinion of **one RMP** is enough, for any standard ground.
- ▶ **20 to 24 weeks:** needs **two RMPs**, and only for notified **special/vulnerable categories**.
 - Examples: survivors of rape/sexual assault, incest victims, **minors**, mentally ill women.

- Also: change of marital status during pregnancy (widowhood/divorce), physical disability, major fetal malformation, humanitarian settings/disasters.
- ▶ **Beyond 24 weeks:** only the **State Medical Board** may permit termination, and only for **substantial fetal abnormality** — no gestational ceiling here.
- ▶ Before 2021 the upper limit was **20 weeks** (one RMP up to 12 weeks; two RMPs for 12–20 weeks).
- ▶ **Emergency exception (Section 5):** to save the woman's life, a **single RMP** may terminate the pregnancy at **any place, at any gestational age** — the two-doctor rule and place-approval rule do not apply.

Who may perform MTP, and where

- ▶ **Operator qualification:** a PG degree/diploma in O&G, OR a 6-month house job in O&G, OR ≥ 1 year O&G experience, OR having assisted in 25 MTPs (≥ 5 independently) — this level of experience allows termination **only up to 12 weeks**.
- ▶ **Early medical abortion** (up to **9 weeks**, medical method only): needs ≥ 3 months O&G training, or 10 supervised medical MTPs in a Government-approved facility.
- ▶ **Approved places:** a Government hospital, or a place approved by Government or the **District Level Committee (DLC)**.
- ▶ **Category A** private place (up to 12 weeks): gynaecological table, resuscitation, sterilisation, shock-treatment, transport facilities.
- ▶ **Category B** private place (up to 20 weeks): adds an operation table, surgical instruments, anaesthetic and emergency-fluid facilities.

Consent, confidentiality and records

- ▶ **Consent:** the woman's own **written consent** is sufficient if she is ≥ 18 years and of sound mind.
- ▶ For a **minor**, or a **mentally ill woman of any age**, the **guardian's** written consent is required instead.
- ▶ **Husband's or family's consent is never legally required** — abortion cannot proceed on the husband's wish alone if the woman is unwilling.
- ▶ Courts have held that repeated MTP without informing the husband may amount to *cruelty*, a divorce ground (*Suman Kapur v. Sudhir Kapur*, 2009).
- ▶ **Privacy clause (Section 5A):** no RMP may reveal the woman's identity except to a person authorised by law; breach is punishable.
- ▶ The institution keeps a **secret Admission Register** — the woman is given only a serial number and is never named in any other case sheet or theatre register.
- ▶ Records must be kept for **5 years** from the end of the relevant calendar year.
- ▶ **Mandatory forms:** **Form C** (consent), **Form I** (RMP's opinion), **Form II** (monthly report to the CMO/Director of Health Services), **Form III** (Admission Register).
- ▶ All four forms apply to both surgical and medical methods.

Recent advances

- ▶ The MTP (Amendment) Act, 2021 came into force on 25 March 2021; the MTP (Amendment) Rules, 2021 followed.
- ▶ The upper limit was raised 20 → 24 weeks for special categories.
- ▶ No upper limit applies where a Medical Board diagnoses substantial fetal abnormality.
- ▶ The contraceptive-failure clause was widened from "married woman and her husband" to "any woman and her partner" — now covering unmarried women.
- ▶ A new State-level Medical Board was created — a gynaecologist, a radiologist/sonologist, a paediatrician, and other notified members — to decide terminations beyond 24 weeks for fetal abnormality.
- ▶ The privacy/confidentiality protection for the woman's identity was strengthened.
- ▶ Landmark case: *X v. Principal Secretary, Health & Family Welfare Dept, NCT of Delhi* (Supreme Court, 2022) — all women, married or unmarried, are entitled to safe legal abortion of a 20–24-week pregnancy from a consensual relationship.
- ▶ The same judgment recognised that marital rape can qualify as "rape" for the MTP Act, entitling the wife to MTP.
- ▶ MTP is distinct from the PCPNDT Act, 1994: MTP legalises termination on medical grounds; the PCPNDT Act prohibits sex selection/determination to prevent female feticide.
- ▶ Performing MTP after illegal sex determination is punishable under the PCPNDT Act, separately from the MTP Act.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ Flowchart — MTP decision by gestational age: Pregnant woman → confirm gestational age by ultrasound, branching to:
 - Up to 20 weeks → one RMP opinion → standard grounds.
 - 20–24 weeks → two RMP opinions → special category only.
 - Beyond 24 weeks → State Medical Board → fetal abnormality only.
 - Side branch: life-saving emergency (Section 5) → one RMP, any place, any gestation.
- ▶ Box diagram — mandatory documentation: Form C (consent) → Form I (RMP opinion) → Form II (monthly report to CMO/DHS) → Form III (Admission Register, secret, kept 5 years).

Medico-legal significance

- ▶ Acting strictly within the Act gives the RMP statutory immunity under Section 3(1).
- ▶ Any deviation removes this protection and exposes the doctor to prosecution under Sections 88–92 BNS 2023 (formerly Sections 312–316 IPC 1860).
- ▶ An abortion that does not comply with the Act — whether by a qualified or unqualified person — is a criminal abortion.
- ▶ MTP performed by a non-RMP, or at an unapproved place, carries rigorous imprisonment of 2 to 7 years.

- ▶ In suspected criminal abortion or abortion death, the doctor should look for signs of recent abortion.
 - **In the living:** relaxed dilated vagina, open cervical os with injuries, enlarged uterus.
 - **In the dead:** genital lacerations/perforation, a retained abortion stick, raw placental site, haemorrhage, sepsis, vagal inhibition (sudden reflex cardiac arrest from vagus-nerve stimulation), or air/amniotic-fluid embolism.
- ▶ The doctor must preserve viscera and products of conception and report the case to police.
- ▶ Breach of Admission Register secrecy, or disclosure of the woman's identity, is itself an offence.
- ▶ MTP must be read together with the **PCPNDT Act 1994** (no MTP after illegal sex determination) and, for minors, **POCSO 2012** mandatory-reporting duties.
- ▶ Landmark case to remember: *Dr Aleck Bourne* (1938, UK) — the original "grave mental injury" rationale that underlies the rape ground.

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Forensic toxicology

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Antidotes

Asked in: Paper III Apr 2021 — RGUHS MD Forensic Medicine

Definition / Introduction

- ▶ An **antidote** is a substance used to counteract or neutralise the toxic action of a poison (IPCS definition).
- ▶ Antidote administration is the **third step** in managing a poisoning case.
- ▶ It comes after resuscitation and removal of unabsorbed poison.
- ▶ It comes before enhanced elimination and symptomatic care.
- ▶ **Most poisons have no specific antidote.**
- ▶ Supportive care — the ABCD of resuscitation (Airway, Breathing, Circulation, Disability) — is the real mainstay of treatment.
- ▶ A specific antidote, where one exists, is a powerful adjunct but never a substitute for good supportive care.

Classification by mechanism of action

- ▶ **Toxic-effect bypass:** does not interact with the poison, simply bypasses its effect.
 - Example: 100% oxygen in carbon monoxide or cyanide poisoning.
- ▶ **Inert complex formation:** binds the poison into a harmless, excretable complex.
 - Example: chelating agents for heavy metals, sodium thiosulfate for cyanide, Prussian blue for thallium.
- ▶ **Accelerated detoxification:** speeds up the body's own detoxifying pathway.
 - Example: N-acetylcysteine for paracetamol.

- ▶ **Reduced toxic conversion:** blocks conversion of the poison to a more toxic metabolite.
 - Example: ethanol or fomepizole for methanol and ethylene glycol.
- ▶ **Receptor-site blockade:** blocks the receptor the poison acts on.
 - Example: atropine at muscarinic receptors in organophosphate poisoning.
- ▶ **Receptor-site competition:** displaces the poison from its receptor.
 - Example: naloxone for opioids, flumazenil for benzodiazepines.

Classification by site of action

This is the classic forensic classification and the form most often asked in the exam.

- ▶ **Mechanical / physical antidotes** act within the gastrointestinal tract.
 - **Adsorbents:** adsorb the poison onto their surface, e.g. activated charcoal (the single most useful antidote), fuller's earth for paraquat.
 - **Demulcents:** coat the gastric mucosa, e.g. milk, egg-white, starch.
 - **Diluents:** dilute the poison, e.g. plain water, boiled rice.
 - Diluents help only in irritant/corrosive poisoning, not in drug overdose, where they may speed absorption.
- ▶ **Chemical antidotes** neutralise the poison by a reaction inside the gut.
 - Weak acids neutralise alkalis, and weak alkalis neutralise acids.
 - Egg albumin is used in mercuric chloride poisoning.
 - Potassium permanganate (Condy's lotion) acts as an oxidiser.
- ▶ **Chelating agents** form soluble, non-toxic complexes with heavy metals for renal excretion.
- ▶ **Serological antidotes** are antibody-based, e.g. antsnake venom, digoxin-specific Fab fragments, botulinum antitoxin.
- ▶ **Physiological / pharmacological antidotes** act at the target cell, producing effects opposite to the poison.
 - Their action is partial and their use is somewhat risky.
 - They are given only after the poison has already been absorbed.
 - Classic pair: atropine and physostigmine, which reverse each other's effects.
 - Other examples: amyl nitrite for cyanide, naloxone for opioids, flumazenil for benzodiazepines.

Activated charcoal — the universal mechanical antidote

- ▶ A fine, black, odourless powder made by destructive distillation of organic material such as wood or coconut shell.
- ▶ Activation gives it an enormous surface area, about **1000 m² per gram**.
- ▶ **Dose:** 50–100 g in adults (1 g/kg in children), given as a slurry after gastric lavage.
- ▶ Adsorbs strychnine, morphine, atropine, barbiturates, salicylates, theophylline, and paracetamol.
- ▶ **Not adsorbed — mnemonic CLIME:** Corrosives/Cyanide, Lithium, Iron, Metals/Methanol, Ethanol/Ethylene glycol.

- ▶ **Multiple-dose activated charcoal:** repeated doses (every 4–6 hours) create a gradient that pulls poison from blood back into the gut lumen — "gut dialysis."
- ▶ This is useful for drugs with enterohepatic circulation and slow-release preparations, such as aspirin, theophylline, and carbamazepine.
- ▶ The old "universal antidote" (charcoal, magnesium oxide, and tannic acid) is **no longer recommended** — it is ineffective, and tannic acid is hepatotoxic.

Chelating agents for heavy-metal poisoning

- ▶ **BAL (dimercaprol):** for mercury, arsenic, and lead; given by deep intramuscular injection (oily).
 - Avoid in iron poisoning, organic-mercury poisoning, and G6PD (glucose-6-phosphate dehydrogenase) deficiency, where it causes haemolysis.
- ▶ **DMSA (succimer):** oral BAL analogue for mercury, arsenic, and lead.
 - Safer than EDTA in lead poisoning — does not redistribute lead to the brain; also safe in G6PD deficiency.
- ▶ **DMPS (unithiol):** a similar oral chelator for mercury, lead, and arsenic.
- ▶ **Calcium disodium EDTA:** the chief chelator for lead, given by intravenous infusion; raises urinary lead excretion 20–50-fold.
 - Must use the calcium disodium salt — plain sodium EDTA causes fatal hypocalcaemia.
- ▶ **D-penicillamine:** oral chelator mainly for copper (also lead and mercury); also used in Wilson's disease.
- ▶ **Desferrioxamine:** the chelator for acute iron poisoning; turns the urine a "vin-rosé" red.
- ▶ **Prussian blue:** an oral antidote for thallium that interrupts its enterohepatic recycling.

Specific antidotes for common poisons

Poison	Antidote
Organophosphates / carbamates	Atropine + pralidoxime (oximes not used in carbamate poisoning)
Opioids	Naloxone
Benzodiazepines	Flumazenil
Paracetamol	N-acetylcysteine
Methanol / ethylene glycol	Ethanol or fomepizole
Cyanide	Amyl nitrite, sodium nitrite, sodium thiosulfate
Carbon monoxide	100% or hyperbaric oxygen
Methaemoglobinaemia	Methylene blue
Digoxin	Digoxin-specific Fab antibodies
Atropine / belladonna	Physostigmine
Iron	Desferrioxamine

Poison	Antidote
Heparin	Protamine
Warfarin	Vitamin K ₁
Isoniazid	Pyridoxine (vitamin B ₆)
Snake venom	Polyvalent antsnake venom
β-blockers / calcium-channel blockers	Glucagon, calcium, IV lipid emulsion

- ▶ **Coma cocktail:** dextrose, thiamine, and naloxone, given IV to any comatose poisoned patient of unknown cause; harmless even if not needed.
- ▶ **Obsolete antidotes** (still asked in exams): analeptics for barbiturates, copper sulphate for phosphorus, and burnt toast — all abandoned as ineffective or harmful.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Flow chart — "Classification of antidotes by site of action."**
 - Central box: ANTIDOTES.
 - Branches to five boxes: Mechanical/physical, Chemical, Chelating agents, Serological, Physiological/pharmacological.
 - Label each branch with its site of action: GIT, blood, or target cell.
- ▶ **Schematic — mechanism of pralidoxime (2-PAM) in organophosphate poisoning.**
 - Labels: AChE (acetylcholinesterase), esteratic site, anionic site, OP–enzyme complex, 2-PAM, reactivated AChE, "ageing."

Medico-legal significance

- ▶ Knowing and using the correct antidote is a treating doctor's duty; failure to use one that is available and indicated may amount to negligence.
- ▶ An "ideal homicidal poison" is one against which no antidote is available (also colourless, odourless, tasteless, highly toxic, and undetectable — e.g. arsenic, thallium).
- ▶ Antidote availability is therefore a classic distinguishing point in the homicidal-versus-suicidal-poison comparison.
- ▶ The doctor must preserve stomach wash, vomitus, viscera, and any unused poison or antidote for chemical analysis before treatment destroys them.
- ▶ A suspected unnatural or poisoning death triggers a police inquest under **Section 174 CrPC 1973 (now Section 194 BNSS 2023)** and a magistrate's inquest under **Section 176 CrPC 1973 (now Section 196 BNSS 2023)**.
- ▶ Causing death with intention to kill, intention to cause a bodily injury likely to cause death, or knowledge that the act is likely to cause death, is culpable homicide under **Section 299 IPC 1860 (now Section 100 BNS 2023)**.
- ▶ Homicide by poisoning is punishable as murder, not as negligence, under **Section 300 IPC 1860 (now Section 101 BNS 2023)** and **Section 302 IPC 1860 (now Section 103 BNS 2023)**.



Biological weapons

Asked in: Paper III Oct 2025 — RGUHS MD Forensic Medicine

Definition

- ▶ A **biological weapon (BW)** is the deliberate use of **living micro-organisms or the toxins derived from them** to cause disease, death, or incapacitation.
- ▶ The target can be humans, livestock, or crops.
- ▶ Use in a declared war is called **biological warfare**.
- ▶ Use in a terrorist act or threat is called **bioterrorism**.
- ▶ BW is one of the four classes of **weapons of mass destruction (WMD)**, grouped under the acronym **CBRN** (Chemical, Biological, Radiological, Nuclear).
- ▶ For the forensic physician this is a **medico-legal and public-health emergency**, not a battlefield problem.
- ▶ The doctor may be the **first to recognise** a covert release, from an unusual cluster of illness.
- ▶ The doctor must conduct or assist a **high-risk biosafety autopsy** and preserve evidence for criminal attribution.
- ▶ Classic real examples: the **2001 anthrax letters** and the **ricin letters**, both mailed in the United States.

Where it fits among weapons of mass destruction

- ▶ **Chemical warfare:** vesicants (mustard gas, *lewisite*), choking gases (phosgene), tear gases (CAP, BBC, KSK, CS, CR), sternutators, and nerve agents (tabun, sarin, soman, VX).
 - The French were the first to use a chemical weapon (tear gas), in World War I.
- ▶ **Biological warfare:** micro-organisms and toxins — this topic.
- ▶ **Radiological warfare:** "dirty bombs" that disperse radioactive material.
- ▶ **Nuclear warfare:** fission or fusion devices.

What makes an agent a "good" biological weapon

- ▶ **High infectivity and virulence.**
- ▶ **Easy mass production**, with a long shelf-life.
- ▶ **Stable on storage.**
- ▶ **Efficient dispersal** as an invisible aerosol, or by contaminating food or water.
- ▶ **Odourless, tasteless, and invisible** — escapes routine diagnostic detection.
- ▶ **Silent incubation period** — the perpetrator escapes long before the first patient falls ill.
- ▶ **Resistant** to environmental conditions and to treatment.
- ▶ **Overwhelms emergency health services** and causes panic out of proportion to the actual casualties.
- ▶ These same features explain why an attack is usually recognised only in retrospect, from the pattern of disease it produces.

CDC categories of biological agents

Category	Key agents	Key feature
A (highest priority)	Anthrax, plague, smallpox, tularaemia, botulinum toxin, viral haemorrhagic fevers (Ebola, Marburg)	Easily spread, high mortality, can cause public panic
B (second priority)	Q-fever, brucellosis, <i>C. perfringens</i> epsilon toxin, glanders, melioidosis, typhus, psittacosis, staphylococcal enterotoxin-B, ricin, abrin	Moderately easy to spread, lower mortality
C (emerging)	Nipah virus, Hanta virus, SARS coronavirus, pandemic influenza (H1N1)	Could be engineered for mass spread; available and easy to produce

- ▶ Botulinum toxin is the most toxic substance known.

Recognising a covert biological attack

- ▶ **Unusual disease cluster:** a rare, eradicated, or geographically alien disease appears (e.g. inhalational anthrax, smallpox).
- ▶ **High attack rate:** many severe cases or deaths appear in a short time.
- ▶ **Wrong pattern:** the disease turns up in the wrong season, or clusters by a shared location or ventilation system rather than a shared food source.
- ▶ **Sentinel deaths:** dead animals appear before the human cases do.
- ▶ **Unusual strain:** the organism cultured is antibiotic-resistant or genetically uniform.
- ▶ **Modern syndromic surveillance** (computerised monitoring of symptom clusters) is designed to flag these patterns early.

Medico-legal autopsy and biosafety

- ▶ A death from a suspected biological agent is an **unnatural death**, requiring an inquest and a **high-risk (biosafety) autopsy**.
- ▶ **Personal protection:** BSL-3/BSL-4 precautions — fluid-impervious gowns, double gloves, N95 or PAPR respiratory protection, eye protection.
- ▶ Staff numbers are kept to a minimum.
- ▶ Aerosol-generating steps, such as an oscillating saw, are restricted.
- ▶ **Sample collection:** blood, body fluids, and tissue (lung, lymph node, spleen, liver) for culture, PCR, immunoassay, and electron microscopy.
- ▶ Environmental and clothing samples are collected too.
- ▶ Every sample is labelled, sealed, and handed over against signature, with an unbroken chain of custody.
- ▶ These specimens are simultaneously clinical, public-health, and criminal evidence.
- ▶ **Notification:** the treating doctor must notify the public-health authority immediately — a covert release is both a notifiable epidemic and a crime scene.

Attribution: microbial forensics

- ▶ **Microbial forensics** links an organism to its source, for legal attribution.
- ▶ **Genomic fingerprinting** (whole-genome sequencing and SNP typing) can trace an organism to a specific laboratory stock or strain.
- ▶ A cultured organism carries the chemical and isotopic signature of the medium and environment it was grown in.
- ▶ This signature can help identify where the agent was actually produced.
- ▶ Attribution evidence supports prosecution under the **Weapons of Mass Destruction Act 2005** and the **Unlawful Activities (Prevention) Act 1967**.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **CDC category pyramid:** three descending tiers — Category A at the top, then Category B, then Category C — annotated with transmissibility and mortality on the axis.
- ▶ **Response flowchart:** disease cluster noticed → clinical suspicion → notify public-health authority and police → isolation/quarantine → laboratory confirmation (culture/PCR/electron microscopy) → biosafety autopsy with chain-of-custody sampling → microbial-forensic attribution.

Medico-legal significance

- ▶ **Recognition role:** the physician is often the **sentinel** who first detects a covert attack, from the pattern of disease.
- ▶ Early recognition saves lives and preserves evidence.
- ▶ **Dual nature:** every suspected release is simultaneously a **notifiable public-health emergency** and a **crime scene**.
- ▶ **Autopsy hazard:** BW deaths are high-risk autopsies, and secondary infection of mortuary staff is a real danger.
- ▶ For some agents (anthrax spores, viral haemorrhagic fevers), a full autopsy is restricted or avoided in favour of minimally invasive sampling.
- ▶ **Spreading infection is itself an offence:**
 - A negligent act likely to spread a dangerous infection: **Section 269 IPC 1860 (now Section 271 BNS 2023)**.
 - A malignant (deliberate) act to the same effect: **Section 270 IPC 1860 (now Section 272 BNS 2023)**.
 - Knowingly disobeying a quarantine rule: **Section 271 IPC 1860 (now Section 273 BNS 2023)**.
- ▶ **Causing hurt by poison** (administering poison, or a stupefying/noxious substance, with intent to cause hurt): **Section 328 IPC 1860 (now Section 123 BNS 2023)** — imprisonment up to ten years, plus fine.
- ▶ **Terrorist act** using a biological agent: **Unlawful Activities (Prevention) Act 1967 (now also Section 113 BNS 2023)**.

- ▶ India's dedicated statute against biological, chemical, and nuclear weapons is the **Weapons of Mass Destruction Act 2005**.
- ▶ The **Epidemic Diseases Act 1897** (strengthened by the 2020 amendment) empowers special measures during a dangerous epidemic and protects healthcare personnel.
- ▶ The **Disaster Management Act 2005** provides the command structure (NDMA/NDRF) for CBRN mass-casualty response.
- ▶ India ratified the **Biological and Toxin Weapons Convention 1972** in 1974; it bans developing, producing, or stockpiling biological agents or toxins for hostile purposes.
- ▶ **Differentiation:** the forensic expert helps decide whether an outbreak is natural or a deliberate release — a determination with grave legal and national-security consequences.



Body Packer Syndrome

Asked in: Paper III Oct 2016 — RGUHS MD Forensic Medicine

- ▶ **Body packer:** a person ("mule", "courier" or "swallow") who smuggles illicit drugs across borders.
- ▶ They swallow, or insert into a body cavity, multiple drug-filled packets and retrieve them after clearing customs.
- ▶ **Body packer syndrome:** the acute poisoning and/or bowel obstruction that follows when a concealed packet ruptures, leaks, or gets stuck in the gut.
- ▶ It is a classic medico-legal toxicological emergency, spanning toxicology, narcotics law, and forensic autopsy practice.

Terminology and classification

- ▶ **Body packer:** swallows carefully made packets.
 - The drug is usually high-quality.
 - Rupture is comparatively rare because packaging is meticulous.
- ▶ **Body pusher:** inserts packets into a body cavity instead of swallowing.
 - Common sites: ear, rectum/anus, vagina, under the foreskin, or strapped under the breasts.
 - Cavity-inserted packets are larger — roughly 5 cm long by 3 cm wide.
- ▶ **Body stuffer:** a local peddler or user, not an international smuggler.
 - Swallows unpackaged drug hastily when police approach, to destroy evidence.
 - There is no time for proper packing, so the drug is poor-quality or adulterated.
 - Acute poisoning is very common in this group.
- ▶ **Drugs typically concealed:** cocaine and heroin are the most common; also cannabis/hashish, morphine, and opium.

Method used by the smuggler

- ▶ **Packet preparation:** the drug is wrapped in latex/condoms, balloons, rubber-glove fingers, foil, or heat-sealed plastic, in multiple layers.

- A typical packet is spherical, about 2 cm across, holding around 10 g of drug.
- The packet is coated in glycerine to make it easier to swallow.
- ▶ **Load carried:** usually about 100 packets, roughly 10 g each, totalling near 1 kg; more than 200 packets have occasionally been recorded.
- ▶ Packets are swallowed without water, because water can trigger the defecation reflex and cause premature passage.
- ▶ **In transit:** antidiarrhoeal/antipropulsive drugs (loperamide, diphenoxylate) and antiemetics are used to keep the packets retained.
- ▶ **On arrival:** a laxative or enema clears the bowel; the smuggler retrieves the packets from the stool and hands them to the dealer.
- ▶ An unusual variant: a packet tied by thread to a tooth, allowing easy withdrawal at the destination.

How it comes to clinical attention

- ▶ **Packet rupture or leakage** is the principal danger.
 - A burst packet floods the body with concentrated drug, causing severe or fatal poisoning suddenly, even in flight.
 - **Cocaine:** produces a sympathomimetic crisis — agitation, hyperthermia, seizures, fast abnormal heart rhythms, hypertensive emergency, and myocardial ischaemia.
 - Fatal dose is about 1 g given intravenously; toxic effects begin around 200 mg.
 - Death can follow within minutes to a few hours of rupture.
 - **Heroin/opioids:** the classic triad of pinpoint pupils, respiratory depression, and coma, reversible with naloxone.
- ▶ **Osmotic seepage:** even an intact packet slowly leaks drug across the latex, so urine tests and X-ray can still flag a suspect.
- ▶ **Mechanical complications:** acute intestinal obstruction, and rarely bowel perforation from an impacted packet.

Investigation and diagnosis

- ▶ **Physical examination:** a gentle rectal or vaginal examination may reveal an inserted packet.
- ▶ **Plain abdominal X-ray** is the first-line confirmatory test.
 - **Double-condom sign:** a well-defined oval density with a translucent rim of air trapped between the two condom layers.
 - **Rosette sign:** a translucent rosette at one end, from air trapped in the knot of the tied condom.
 - **Tic-tac sign:** multiple uniform oblong packets resembling Tic-Tac mints.
 - **Parallelism:** the rigid packets line up parallel to each other in the bowel.
 - **Density clue:** hashish looks denser than stool; cocaine looks similar to stool; heroin shows a gas-like lucency.
- ▶ **CT scan** is the most sensitive supporting investigation; ultrasound, MRI, and barium studies are supportive only, not primary.

- ▶ **Laboratory:** blood and urine immunoassays confirm the drug.

Management

- ▶ **Asymptomatic, packets intact — conservative:**
 - Nil by mouth while packets remain in the gut.
 - **Whole-bowel irrigation** with polyethylene glycol–electrolyte lavage solution (PEG-ELS) via nasogastric tube is the mainstay, continued until rectal effluent runs clear.
 - Caution: PEG can occasionally dissolve or rupture a packet.
 - Metoclopramide speeds gastric emptying; bisacodyl suppository or enemas help clear the rectum.
 - Activated charcoal binds any drug that has already leaked.
- ▶ **Symptomatic, ruptured, or obstructed — emergency:**
 - Give the drug-specific treatment: naloxone for opioids; benzodiazepines, active cooling, and vasodilators for cocaine.
 - Avoid beta-blockers and succinylcholine in cocaine toxicity — blocking only the beta-receptors leaves the vessel-constricting alpha-effect unopposed, worsening hypertension.
 - Endoscopic or surgical removal (laparotomy) is needed if medical treatment fails, a packet ruptures, or there is obstruction/perforation.
- ▶ Whole-bowel irrigation is avoided in perforation, obstruction, significant GI bleeding, ileus, an unprotected airway, or haemodynamic instability.

Medico-legal significance

- ▶ Manner of death is almost always accidental, following packet failure; death is certified only after natural disease is excluded.
- ▶ Trafficking, possession, and import/export of narcotics are governed by the **Narcotic Drugs and Psychotropic Substances Act, 1985 (NDPS Act)** — a special law left untouched by the 2023 criminal-code overhaul.
- ▶ **Autopsy findings:** ruptured and/or intact packets in the stomach and intestines; congestion of gastric and intestinal mucosa; congestion and oedema of the lungs and brain; plus drug-specific signs such as pinpoint pupils with opioids.
- ▶ Every recovered packet must be counted, labelled, and preserved for chemical analysis, with a documented chain of custody to the Forensic Science Laboratory.
- ▶ A suspect can be medically examined at police request only with valid authority — **Section 53 CrPC 1973 (now Section 51 BNSS 2023)**.
- ▶ If the smuggler dies, the death is unnatural/suspicious and needs a police inquest — **Section 174 CrPC 1973 (now Section 194 BNSS 2023)** — with a magistrate's inquest where indicated under **Section 176 CrPC 1973 (now Section 196 BNSS 2023)**.
- ▶ The autopsy/toxicology report is admissible as expert evidence — **Section 45 Indian Evidence Act 1872 (now Section 39 BSA 2023)**.
- ▶ Body packing increased after 9/11, as tighter border security made conventional smuggling routes harder to use.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Plain abdominal X-ray of a body packer:** multiple oval/oblong packets in the bowel lumen; double-condom sign; rosette sign; complete gas halo around each packet; parallelism; ascending colon; stomach.
- ▶ **Single drug packet, cross-section:** central drug core; inner condom/latex layer; outer condom/balloon layer; trapped air between the layers; knot/ligature end; glycerine lubricant coat.

**Botulism**

Asked in: Paper III Oct 2016 — RGUHS MD Forensic Medicine

Definition

- ▶ **Botulism** (also called *allantiasis*) is a severe, often fatal form of food poisoning.
- ▶ It is caused by the preformed exotoxin of *Clostridium botulinum*, an anaerobic, gram-positive, spore-forming bacillus.
- ▶ It is the third and most dangerous type of bacterial food poisoning.
- ▶ Unlike other food poisonings, it produces a **symmetrical, descending flaccid paralysis** rather than diarrhoea and vomiting.
- ▶ Botulinum toxin is the **most poisonous biological substance known**.
- ▶ It is colourless, odourless and tasteless, so it gives no warning in food.
- ▶ This lethality and stealth give botulism major medico-legal and bioterrorism importance.

The organism and toxin

- ▶ **Organism:** *Clostridium botulinum* — an anaerobic, gram-positive, spore-forming rod.
- ▶ Heat-resistant spores survive in soil and improperly processed food.
- ▶ Under anaerobic conditions (canning, bottling, vacuum-packing) the spores germinate and produce toxin.
- ▶ **Toxin types:** seven immunologically distinct neurotoxins exist, labelled A to G.
- ▶ **Human disease:** caused mainly by types A, B and E (some sources add F).
- ▶ **Type E** is characteristically linked to seafood and fish products.
- ▶ **Heat lability:** the toxin (not the spores) is destroyed by heat — at 80°C for 30 minutes, or 100°C for 10 minutes.
- ▶ So foodborne botulism occurs only when food is not heated thoroughly before eating; cooking destroys the toxin but not the spores.

Mechanism of action

- ▶ Botulinum toxin acts at the neuromuscular junction and cholinergic autonomic synapses.
- ▶ It irreversibly blocks release of acetylcholine from the presynaptic nerve terminal.
- ▶ Loss of acetylcholine release causes **flaccid paralysis** — loss of muscle tone.

- ▶ The paralysis is symmetrical and descending: it starts in cranial-nerve muscles (eyes, face, throat) and spreads to trunk, limbs and respiratory muscles.
- ▶ This is the mechanistic opposite of tetanus toxin, which causes spastic, rigid paralysis.
- ▶ The same acetylcholine-blocking action is used therapeutically and cosmetically as *Botox*.

SOURCE & COVERAGE

- ▶ **Implicated foods:** improperly preserved canned or tinned foods, bottled vegetables, and sausages.
- ▶ Commonest sources are low-acid vegetables — beans, peppers, carrots and corn.
- ▶ Seafood is the classic source of type E botulism.
- ▶ **Incubation period:** symptoms usually appear 12–48 hours after ingestion.
- ▶ **Fatal dose:** extremely small — around 1 nanogram/kg body weight (some sources quote about 60 ng, i.e. 0.005 mg).
- ▶ **Fatal period:** approximately 1–2 days.

Clinical features

- ▶ The patient is **afebrile with a clear sensorium** — this helps distinguish botulism from septic food poisoning.
- ▶ **Early gastrointestinal phase:** nausea, vomiting, diarrhoea, abdominal pain and distension, later constipation.
- ▶ **Later neurological phase** results from cholinergic blockade.
- ▶ The four commonest neurological symptoms are visual disturbance, dry mouth, dysarthria (slurred speech) and dysphagia (difficulty swallowing).
- ▶ **Ocular features:** ptosis, diplopia, fixed dilated pupils, blurred vision.
- ▶ **Bulbar features:** dysphonia, dysphagia, dysarthria, dry mouth.
- ▶ Flaccid paralysis then descends through the limbs and trunk.
- ▶ **Respiratory muscle weakness** causes respiratory failure — the usual cause of death.
- ▶ Severe terminal cases show delirium and coma.

Special forms of botulism

Form	Setting	Key features
Foodborne	Preformed toxin (A, B, E) in preserved food	Descending paralysis after 12–48 h
Infant	Spores colonise infant gut, toxin made <i>in vivo</i> (linked to honey)	Feeding difficulty, feeble cry, floppy infant; Tensilon test unreliable
Wound	Toxin made in an anaerobic wound; seen in intravenous heroin abusers	Same neurological picture, no food source

Form	Setting	Key features
Bioterrorism	Deliberate dissemination of toxin	Among the most feared biological weapons

Diagnosis

- ▶ **Clinical:** afebrile patient, clear sensorium, symmetrical descending flaccid paralysis after eating preserved food.
- ▶ **Laboratory:** culture of the suspected food, food containers, vomit and stool; toxin detection by the FSL.
- ▶ **Confirmatory test:** mouse/guinea-pig bioassay — injecting the leftover food into the animal reproduces the disease.
- ▶ **Tensilon (edrophonium) test** may help, except in infant botulism.
- ▶ **EMG / nerve-conduction studies** support the diagnosis.
- ▶ **Main differential:** Guillain–Barré syndrome.
- ▶ Also consider hypokalaemic periodic paralysis, myasthenia gravis, and thallium or arsenic neuropathy.

Treatment

- ▶ **Specific antidote:** trivalent (types A, B, E) botulinum antitoxin — one vial by slow intravenous infusion plus one vial intramuscularly, repeated as needed.
- ▶ **Supportive care is the mainstay:** endotracheal intubation and mechanical ventilation for respiratory paralysis, with intensive nursing.
- ▶ With modern intensive care, mortality has fallen from about 60% to around 5%.

Prevention

- ▶ Heat/cook preserved food adequately before eating — the toxin is heat-labile.
- ▶ Refrigerate food carefully; discard bulging tins or bottles, or those with an unusual smell.
- ▶ Type E gives no warning smell, so this rule is not fail-safe for seafood.
- ▶ Do not feed honey to newborns or infants, to prevent infant botulism.
- ▶ Meat inspection at slaughterhouses and control of food-handler carriers.

Medico-legal significance

- ▶ **Manner of poisoning:** accidental botulism (faulty home canning) is commonest; homicidal and bioterrorist use are recognised because the toxin is undetectable by taste, smell or colour.
- ▶ Botulinum toxin is listed among the most toxic biological-weapon agents; deliberate use to paralyse troops is documented.
- ▶ Deliberate use as a biological weapon would attract **Section 15(1)(a) of the Unlawful Activities (Prevention) Act 1967**, which defines a terrorist act as one intended to strike terror using, among other things, biological or other hazardous substances to cause death or injury.
- ▶ Causing death this way is prosecuted as **murder under Section 302 IPC 1860 (now Section 103 BNS 2023)**, murder being defined under **Section 300 IPC (now Section 101 BNS 2023)**.

- ▶ An unsuccessful attempt attracts **Section 307 IPC (now Section 109 BNS 2023)**.
- ▶ Administering a poisonous substance to cause hurt is punishable under **Section 328 IPC (now Section 123 BNS 2023)**.
- ▶ Death from suspected food poisoning is an unnatural/suspicious death requiring police inquest under **Section 174 CrPC 1973 (now Section 194 BNSS 2023)**.
- ▶ The treating doctor's report and any toxin analysis are admissible expert evidence under **Section 45 of the Indian Evidence Act 1872 (now Section 39 of the Bharatiya Sakshya Adhiniyam 2023)**.
- ▶ **Cosmetic/therapeutic use:** botulinum toxin type A treats facial wrinkles, spasmodic torticollis, strabismus, blepharospasm and facial muscle pain — raising issues of consent and adverse events.
- ▶ **Autopsy:** non-specific — congestion of organs, with a congested/swollen stomach and intestinal mucosa; diagnosis is essentially toxicological.
- ▶ Preserve stomach contents, the suspected food and its container, vomit and stool for FSL analysis.
- ▶ **Doctor's duties:** treat and stabilise (airway, ventilation, antitoxin), preserve samples with chain of custody, and report the death to police for inquest; an outbreak is also a notifiable public-health event.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Neuromuscular junction — site of botulinum action.** Label the presynaptic nerve terminal, synaptic vesicles containing acetylcholine, the SNARE docking complex, the site of toxin block, the synaptic cleft, and the postsynaptic muscle membrane with its receptors. Annotate: "No ACh release → flaccid paralysis."
- ▶ **Descending paralysis schematic.** On a human figure, mark cranial-nerve features first (ptosis, diplopia, fixed pupils; dysphagia, dysarthria, dry mouth), then neck and trunk, then limbs, then respiratory muscles as the cause of death, with a downward arrow showing the descending sequence.



Briefly describe laboratory tests for qualitative and quantitative analysis of poison

Asked in: Paper III Oct 2025 — RGUHS MD Forensic Medicine

Definition / Introduction

- ▶ **Qualitative analysis** detects and identifies which poison is present; **quantitative analysis** measures how much of it is present.
- ▶ Proving a poisoning death "beyond reasonable doubt" needs three experts: the police officer, the autopsy surgeon, and the **chemical examiner**.
- ▶ The **chemical examiner's report is the most important evidence**, since it proves the poison both qualitatively and quantitatively.

- ▶ The workup has three steps: **separation/extraction** of the poison from tissue, **purification**, then **detection and quantitation**.
- ▶ Testing moves from cheap, sensitive, non-specific **screening (presumptive) tests** to expensive, definitive **confirmatory tests**.

Specimen choice and general principles

- ▶ **Blood** is the specimen of choice for detection — it best reflects the amount acting on the body at death.
- ▶ **Urine** suits quick spot tests (no protein binding to hinder extraction), but its level does not reflect the dose ingested.
- ▶ **Stomach contents** best show the quantity ingested in an acute overdose and confirm recent ingestion.
- ▶ **No method except GC-MS is totally specific** — a screening-test result must always be confirmed.
- ▶ **Pitfalls to exclude:**
 - **Postmortem redistribution:** poison passively diffuses from stomach/intestine into nearby organs, mainly the **left lobe of liver**, giving falsely high levels there — avoid it by taking blood from a **peripheral vessel** (femoral, iliac, or subclavian).
 - **Putrefaction** can generate substances (ethyl alcohol, cyanide, neurin, muscarine) that mimic poisons.
 - A poison may be missed if it was excreted, detoxified, decomposed, or the wrong specimen was sent.

Separation of poisons — five groups

- ▶ **Group I — Gases** (e.g., carbon monoxide): separated from blood/lung by **aeration**.
- ▶ **Group II — Steam-volatile poisons** (alcohols, phenol, chlorinated hydrocarbons, amphetamines, yellow phosphorus): separated by **steam distillation**.
- ▶ **Group III — Metallic poisons** (arsenic, antimony, mercury, lead): separated by **dry ashing** (450°C muffle furnace — but arsenic, antimony, mercury are lost at this heat) or **wet ashing** (nitric + sulphuric + perchloric acid digestion).
- ▶ **Group IV — Non-volatile organic poisons** (barbiturates, cocaine, quinine, strychnine, morphine, imipramine): separated by **solvent extraction** with chloroform/ether, then identified by TLC, GC, and GC-MS.
- ▶ **Group V — Biological toxins and venoms:** these are proteins, so cannot be extracted by the above methods; detected instead by **immunoassay** (ELISA or radioimmunoassay).

Qualitative tests — screening / presumptive

- ▶ **Colour (spot) tests** are quick, cheap, and sensitive, but non-specific; performed on stomach contents, urine, or scene residue.
 - **Marquis reagent:** opium/morphine — colour turns purple, then violet, then blue; amphetamine instead gives yellow-orange.
 - **Fujiwara test:** cyanide — gives a blue colour.

- **Reinsch test** (clean copper foil + concentrated HCl, heated): detects heavy metals by the stain colour.
- **Black** = antimony; **dull black** = arsenic.
- **Shiny black** = bismuth; **silver** = mercury.
- **Trinder's test**: salicylate — gives a violet colour.
- **Duquenois–Levine test**: cannabis — gives a violet layer.
- ▶ **Marsh's and Reinsch's tests for arsenic are now obsolete** — modern detection uses **atomic absorption spectroscopy (AAS)**.
- ▶ **Thin-layer chromatography (TLC)**: the sample migrates through a **stationary phase** (silica gel plate) carried by a **mobile phase** (solvent) rising by capillary action.
- ▶ Identity is judged by the ***R_f* value** — distance moved by spot ÷ distance moved by solvent front.
- ▶ TLC is **10–100 times more sensitive** than simple chemical spot tests, but has **low specificity** — a positive result alone is not admissible and needs confirmation.

Quantitative and confirmatory tests

- ▶ Once a poison is presumptively identified, a **fresh weighed sample** is taken and a specific, confirmatory method applied.
- ▶ **Gas chromatography (GC)**: the vaporised sample partitions between a carrier gas and a stationary liquid phase in a column — the commonest method in forensic toxicology.
- ▶ **High-performance liquid chromatography (HPLC)**: used for drugs too heat-labile for GC — tricyclic antidepressants, benzodiazepines, heroin, LSD.
- ▶ **Mass spectrometry (MS)**: the sample is ionised and fragmented, and the mass-to-charge pattern gives a unique fingerprint.
- ▶ ***GC-MS combines GC separation with MS identification — the gold standard***, 100–1000 times more sensitive and specific than TLC; no other method is totally specific.
- ▶ **Atomic absorption spectroscopy (AAS)**: quantifies heavy metals (arsenic, lead) in blood, hair, nails, and bone.
- ▶ **Immunoassays (ELISA, RIA)**: detect protein toxins, snake venom, drugs of abuse, and insulin.
- ▶ Other quantitative methods include **gravimetric, titrimetric, photometric, and enzymatic** assays.
- ▶ **Interpreting a quantitative result** must weigh age, weight, disease, tolerance, and hypersensitivity — a **lethal blood level does not by itself prove cause of death**, and a non-lethal level may still be the true cause in a treated patient.

Preservation that makes analysis valid

- ▶ **Routine viscera saved in every fatal poisoning**: stomach + contents, ~30 cm upper small intestine + contents, liver 200–300 g, half of each kidney, blood 30 mL (min 10 mL), urine 30 mL.
- ▶ Stomach and intestine go into one bottle, liver and kidney into a second; blood and urine are kept separate.

- ▶ The ligatured stomach must always be opened before bottling, and each bottle is filled only **two-thirds full** (for decomposition gases).
- ▶ **Saturated common salt (NaCl) solution** preserves most viscera — except corrosive acids, alkalis, corrosive sublimate, and aconite; **but phenol IS preserved in it**.
- ▶ **Rectified spirit** is the alternative, except for alcohol, kerosene, chloroform/ether, chloral hydrate, formaldehyde, phenol, and phosphorus.
- ▶ **Blood is preserved with sodium or potassium fluoride** (stops glycolysis, prevents postmortem alcohol formation) **plus potassium oxalate** (anticoagulant).
- ▶ **Formaldehyde must never be used** (blocks extraction of non-volatile organics); **heparin and EDTA must also be avoided** (interfere with detection, e.g. of methanol).
- ▶ A separate sample of the preservative is sent, to rule out contamination.

Medico-legal significance

- ▶ The chemical examiner's report, read with the autopsy and circumstantial evidence, establishes the **cause and manner of death** in suspected poisoning.
- ▶ The autopsy surgeon should **keep the opinion reserved until the chemical examiner's report arrives**.
- ▶ **Chain of custody is essential**: sealed, labelled bottles go in a locked, sealed viscera box, with the seal, key, and postmortem report sent separately.
- ▶ Narrowing the search (history, symptoms, suspect container, medications) — rather than asking for a vague "general unknown poison" — greatly improves the yield.
- ▶ **Section 293 CrPC 1973 (now Section 329 BNSS 2023)** makes the chemical examiner's report admissible without the examiner appearing in person.
- ▶ **Section 45 Indian Evidence Act 1872 (now Section 39 Bharatiya Sakshya Adhiniyam (BSA) 2023)** makes an expert's opinion a relevant fact.
- ▶ A government medical officer must report every suspected poisoning (accidental, suicidal, or homicidal) to the police — omission to do so falls under **Section 176 IPC 1860 (now Section 211 BNS 2023)**, and giving false information falls under **Section 177 IPC 1860 (now Section 212 BNS 2023)**.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Flow chart of toxicological analysis**: biological sample (blood / urine / viscera) → separation/extraction (aeration, steam distillation, ashing, solvent extraction) → purification → screening tests (colour tests, TLC, immunoassay) → confirmatory/quantitative tests (GC, HPLC, AAS, GC-MS) → chemical examiner's report (qualitative + quantitative).
- ▶ **Labelled TLC plate**: glass plate, silica-gel stationary phase, origin line with sample and standard spots, solvent (mobile phase) in the chamber, ascending solvent front, separated spots, $R_f = \text{distance of spot} \div \text{distance of solvent front}$.



Occupational and environmental toxicology

Asked in: Paper III Dec 2023 — RGUHS MD Forensic Medicine

Definition

- ▶ **Environmental toxicology:** the study of harmful effects of chemical, physical and biological pollutants on living organisms.
- ▶ Pollutants enter the environment through human activity and contaminate air, water and soil.
- ▶ **Occupational toxicology:** the study of toxic effects of chemicals and physical agents on workers in their workplace.
- ▶ Its primary goal is protecting worker health.
- ▶ **Ecotoxicology:** a sub-branch studying toxicant effects on whole populations and ecosystems.
- ▶ *Rachel Carson* (1907–1964), author of *Silent Spring* (1962), exposed indiscriminate use of the pesticide DDT.
- ▶ She is regarded as the **mother of environmental toxicology**.
- ▶ Both branches carry major forensic weight because the resulting diseases and deaths are compensable, notifiable, and often litigated.

Key concepts and terminology

- ▶ **Pollutant:** a substance from human activity that harms living organisms.
- ▶ **Xenobiotic:** any chemical compound foreign to the body — drugs and poisons included.
- ▶ **Bioaccumulation:** a fat-soluble toxicant builds up inside a single organism over time.
- ▶ **Biomagnification:** toxicant concentration rises at each successively higher level of the food chain.
 - This explains why DDT residues reach top predators, and even Arctic wildlife never directly exposed.
- ▶ **Point source:** pollution from one identifiable outlet, such as an industrial effluent pipe.
- ▶ **Non-point source:** diffuse, untraceable pollution, such as particulate matter or plastic leachate.
- ▶ **NOAEL (No Observed Adverse Effect Level):** the highest dose at which no adverse effect is seen.
 - NOAEL underlies permissible occupational exposure limits.

Environmental toxicants and their effects

- ▶ **Heavy metals:**
 - **Arsenic** (groundwater, pesticides, rice/seafood): GI distress, neuropathy, hyperkeratosis, skin/lung/bladder cancer.
 - **Mercury** (fish, dental amalgam): tremor, *erethism* (neuropsychiatric change), gingivostomatitis.
 - **Cadmium** (batteries, smelting): renal tubular damage; *Itai-itai disease*, a painful bone and joint disease.
 - **Lead** (old paint, pipes, batteries): anaemia, neuropathy, encephalopathy in children.
 - Treatment is chelation — dimercaprol (BAL), DMSA, DMPS, calcium-EDTA; cadmium has no effective chelator.

► **Pesticides:**

- **Organophosphates** (malathion, parathion) inhibit acetylcholinesterase and produce a cholinergic crisis.
- Treated with atropine plus an oxime (pralidoxime).
- **Organochlorines** (DDT, lindane) disrupt neuronal sodium channels, causing tremor and seizures.

► **Persistent organic pollutants (dioxins, PCBs, DDT):** lipophilic, bioaccumulate, cause endocrine disruption and cancer.

- PCBs specifically also cause *chloracne* and liver dysfunction.

► **Biotoxins** (aflatoxins, botulinum toxin, cyanobacterial toxins): dermatotoxic, neurotoxic and hepatotoxic.

► **Ionising radiation:** causes DNA damage and acute radiation syndrome.

- Potassium iodide protects the thyroid against radioactive iodine.

► **Combustion/air pollutants:** carbon monoxide binds haemoglobin and causes hypoxia.

- SO₂ and NO_x worsen bronchitis/asthma and, with chronic exposure, cause COPD.

► **E-waste** (lead, cadmium, mercury): neurotoxicity, nephrotoxicity, developmental delay in children.

► **Suspended particulate matter (SPM)** is the key air pollutant.

- PM₁₀ reaches the alveoli; PM_{2.5} is even more dangerous.

► **India's Central Pollution Control Board (CPCB)** computes the Air Quality Index from 8 pollutants: SO₂, NO_x, PM_{2.5}, PM₁₀, ozone, CO, NH₃ and lead.

► **Air pollution** causes acid rain, global warming and ozone-layer depletion.

► **Water pollution** results from industrial effluent and pesticide seepage into groundwater.

► **Soil pollution** results from solid waste and pesticide residues entering crops.

► **Kasaragod endosulfan tragedy (Kerala):** aerial spraying of endosulfan over cashew plantations from 1975 caused mental retardation, cerebral palsy, epilepsy, congenital anomalies and infertility.

- Banned by the Kerala High Court in 2000.
- Listed under the Stockholm Convention in 2011.
- Banned nationwide by the Supreme Court of India on 13 May 2011.

Occupational toxicology — workplace hazards

► **Hazardous material:** any solid, liquid, gaseous, biological or radioactive agent that can harm health by any route of absorption.

► **Inhalation** of dust or fumes is the chief occupational route of exposure.

► **Ingestion** of minute amounts via contaminated hands, food or cigarettes adds a smaller additional dose.

► **Gases:** carbon dioxide, carbon monoxide, hydrogen cyanide, carbon disulphide, ammonia, hydrogen sulphide.

- ▶ **Metals:** arsenic, lead (plumbers, painters, potters), mercury, cadmium, chromium, manganese, beryllium.
- ▶ **Solvents:** benzene, chloroform, carbon disulphide, trichloroethylene.
- ▶ **Other chemicals:** acids, alkalis, pesticides, and phosphorus in matchbox/firecracker factories.
- ▶ **Dusts** below about 5 micrometres penetrate the lungs and cause **pneumoconiosis** (dust-induced lung fibrosis).

Pneumoconioses — dust and disease

Causative dust	Disease
Free silica	Silicosis
Coal dust	Anthracosis
Asbestos	Asbestosis (can progress to mesothelioma)
Iron	Siderosis
Cane fibre	Bagassosis
Cotton dust	Byssinosis
Hay/grain dust	Farmer's lung

- ▶ **Silicosis** is the commonest pneumoconiosis, from free-silica dust in mining, rock-drilling and pottery.
- ▶ First reported in India at the **Kolar Gold Mines in 1947**.
- ▶ Chest X-ray shows a characteristic "**snow-storm**" **appearance** — dense micronodular fibrosis.
- ▶ It has no cure and strongly predisposes to pulmonary tuberculosis.
- ▶ It is a **notifiable disease** under the Factories Act 1948 and Mines Act 1952.
- ▶ **Hierarchy of exposure control**, most to least effective: elimination, substitution, containment, engineering controls, administrative controls, and personal protective equipment last.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Bioaccumulation/biomagnification pyramid:** water/soil → plankton/plants → small fish → large fish → top predator and humans, with toxicant concentration rising at each step.
 - Label DDT residues as the example, and annotate bioaccumulation (within one organism) versus biomagnification (up the chain).
- ▶ **Hierarchy-of-control triangle:** elimination at the top (most effective) down through substitution, containment, engineering controls and administrative controls, to personal protective equipment at the base (least effective).

Medico-legal significance

- ▶ Fouling public water is punishable under **Section 279 BNS 2023 (Section 277 IPC 1860)**.
- ▶ Vitiating the atmosphere so as to make it noxious is punishable under **Section 280 BNS 2023 (Section 278 IPC 1860)**.

- ▶ Negligent conduct with a poisonous substance is punishable under **Section 286 BNS 2023** (**Section 284 IPC 1860**).
- ▶ Occupational poisonings and pneumoconioses are compensable under the **Employees'/Workmen's Compensation Act 1923**.
 - Its **Schedule III** lists notified occupational diseases — arsenic, lead, mercury, cadmium, benzene, asphyxiants and the pneumoconioses.
 - The employer is liable to compensate under **Section 3**.
 - Free medical examination must be offered within 3 days (**Section 11**).
 - The treating doctor must establish work-relatedness, maintain health records, and issue a medical certificate.
- ▶ Notifiable diseases such as silicosis must be reported under the **Factories Act 1948** and **Mines Act 1952**.
- ▶ Environmental pollution is governed by the **Environment (Protection) Act 1986**, **Water Act 1974**, **Air Act 1981** and **National Green Tribunal Act 2010**.
- ▶ **Article 48A** (Directive Principle) and **Article 51A(g)** (Fundamental Duty) of the Constitution require protection of the environment, added after the 1972 Stockholm Conference.
- ▶ The **Montreal Protocol (1987)** phases out ozone-depleting CFCs; the **Stockholm Convention (2011)** banned endosulfan.
- ▶ Chronic occupational/environmental poisoning (lead, arsenic, mercury, asbestos) raises questions of latency and dose reconstruction.
 - A body may occasionally need **exhumation** to settle a compensation claim.
- ▶ The forensic toxicologist contributes to exposure assessment, biological monitoring (e.g. blood lead levels), and certifying cause of death in pollution- or workplace-related fatalities.



Poisons that are themselves used as antidotes for other poisons — mechanism of action, fatal dose and clinical features

Asked in: Paper III Jun 2024 — RGUHS MD Forensic Medicine

Definition

- ▶ A **physiological (pharmacological) antidote** acts at the target cell, after the poison has been absorbed into the blood.
- ▶ It produces effects opposite to the poison — the **principle of antagonism**.
- ▶ A special sub-group of these antidotes are themselves **potent poisons**.
- ▶ Only dose, indication and monitoring separate treatment from fresh poisoning.
- ▶ Classic examples: **atropine**, **physostigmine**, the **nitrites** and **methylene blue**, with the **oximes** as a related reactivator.

Two mutually antidotal axes

- ▶ **Anticholinergic poisons** (atropine, *Datura*, belladonna) versus **anticholinesterase poisons** (physostigmine, organophosphates, carbamates).
- ▶ What raises acetylcholine cures what blocks it, and vice versa.
- ▶ **Cyanide** (a cellular asphyxiant) versus the methaemoglobin-forming **nitrites**.
- ▶ That methaemoglobinaemia is itself reversed by **methylene blue**.

1. Atropine — deliriant poison, antidote for anticholinesterases

- ▶ **Antidotal role:** treats **organophosphate (OP) and carbamate poisoning** as a competitive **muscarinic receptor antagonist** — dries secretions, relieves bradycardia and bronchorrhoea.
- ▶ It has **no effect on nicotinic** effects (fasciculation, weakness).
- ▶ **Mechanism as poison:** the active alkaloid of belladonna and *Datura*; blocks muscarinic receptors throughout the body, causing the **anticholinergic (atropinic) syndrome**.
- ▶ **Fatal dose:**
 - Pure atropine alkaloid: **100–130 mg**; fatal period **within 24 hours**.
 - *Atropa belladonna* root: **80 grains** is enough to kill; fatal period **3–6 hours**.
 - *Datura* seeds: **50–125 crushed seeds**; fatal period **1–2 days** if untreated.
- ▶ **Clinical features — anticholinergic toxidrome:**
 - "Hot as a hare" — hyperthermia.
 - "Blind as a bat" — mydriasis (dilated pupils), blurred vision.
 - "Red as a beet" — flushed skin.
 - "Dry as a bone" — dry mouth and skin.
 - "Mad as a hatter" — delirium.
 - Also tachycardia, urinary retention and dense amnesia for the episode.
- ▶ **Atropinisation caution:** titrate to **drying of secretions, not pupil size**.
 - Average requirement ~40 mg/day; up to 1,000 mg/day used in severe cases.
 - Tachycardia alone is not a contraindication, but avoid heart rate above 140/min.

2. Physostigmine — anticholinesterase poison, antidote for atropine/*Datura*

- ▶ **Antidotal role:** the mirror image of atropine — treats anticholinergic poisoning from atropine, *Datura* and hyoscyamus.
- ▶ **Mechanism as antidote:** a **reversible acetylcholinesterase inhibitor** that crosses the blood–brain barrier and raises synaptic acetylcholine.
- ▶ **Mechanism as poison:** the same enzyme inhibition, if excessive, lets acetylcholine accumulate uncontrollably — a **cholinergic crisis** resembling organophosphate poisoning.
- ▶ **Dose:** 1–2 mg slow IV, repeated cautiously every five minutes under monitoring until signs resolve.
- ▶ **Clinical features — cholinergic (SLUDGE) toxidrome:**
 - Salivation, Lacrimation, Urination, Defecation, Gastrointestinal distress, Emesis.

- Also miosis, bronchorrhoea, bradycardia, hypotension.
 - Nicotinic effects: muscle fasciculation, weakness, paralysis.
 - Central effects: seizures, respiratory depression.
 - Death is from **bradyasystole**, seizures or respiratory failure.
- **Important caution: contraindicated in organophosphate poisoning** — adding a cholinesterase inhibitor to a patient already cholinesterase-inhibited can be fatal.

3. Nitrites — methaemoglobin-forming poisons, antidote for cyanide

- **Antidotal role:** the first two steps of the 3-step cyanide antidote kit — inhaled amyl nitrite, then IV sodium nitrite, then sodium thiosulphate.
- **Mechanism as antidote:** nitrites induce **methaemoglobinaemia**; the ferric iron (Fe^{3+}) of methaemoglobin pulls cyanide off cytochrome oxidase, forming **cyanmethaemoglobin**.
- Sodium thiosulphate then lets the liver enzyme **rhodanese** convert the freed cyanide to non-toxic **thiocyanate**.
- **Mechanism as poison:** methaemoglobin cannot carry oxygen — an overdose turns the rescue into fresh tissue hypoxia.
- **Dose:**
- Amyl nitrite: one 0.2 mL perle inhaled for ~30 seconds, repeated each minute.
 - Sodium nitrite 3%: adult 10 mL (300 mg) slow IV; paediatric 0.33 mL/kg up to 10 mL.
- **Clinical features of overdose:** cyanosis unresponsive to oxygen, chocolate-brown blood, headache, hypotension, tachycardia, breathlessness; at high levels, seizures, coma and death.

4. Methylene blue — antidote that completes the circle

- **Antidotal role:** treats **methaemoglobinaemia**, including that caused by the nitrites themselves and by other oxidising agents (benzocaine, sulfonamides, lidocaine/prilocaine).
- **Mechanism as antidote:** an artificial electron carrier that, via NADPH-methaemoglobin reductase, reduces ferric (Fe^{3+}) methaemoglobin back to functional ferrous (Fe^{2+}) haemoglobin.
- **Dose:** 1–2 mg/kg IV (0.1–0.2 mL/kg of a 1% solution) over 5 minutes, repeatable every 4 hours.
- **As a poison:** in excess, methylene blue itself causes methaemoglobinaemia and haemolysis, particularly in **G6PD deficiency**.

Oximes — a related reactivator

- **Pralidoxime (2-PAM)**, obidoxime and DAM are **cholinesterase reactivators** — they compete for the phosphate group on the OP molecule and free the enzyme.
- Adult dose 1–2 g IV, not exceeding 12 g in 24 hours; given together with atropine (synergistic).
- Oximes are **contraindicated in carbamate poisoning** and carry their own toxicity in excess — tachycardia, hypertension, neuromuscular block.

Summary table

Agent	Antagonises	Mechanism as antidote	Danger as a poison
Atropine	OP / carbamates	Muscarinic-receptor blockade	Delirium; fatal dose 100–130 mg
Physostigmine	Atropine / <i>Datura</i>	Reversible AChE inhibitor	Cholinergic crisis, bradycardia
Nitrites	Cyanide	Forms methaemoglobin, strips cyanide off cytochrome oxidase	Fatal methaemoglobinaemia
Methylene blue	Methaemoglobinaemia	Reduces Fe ³⁺ met-Hb to Fe ²⁺ Hb	Methaemoglobinaemia/haemolysis (G6PD)
Oximes	Organophosphates	Reactivates cholinesterase	Toxic in excess; harmful in carbamates

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Two mutually antidotal axes.** Axis 1: box "Anticholinergic poisons — atropine/*Datura*/belladonna" ↔ box "Anticholinesterase poisons — physostigmine/OP/carbamates", each labelled the antidote of the other. Axis 2: "Cyanide → blocks cytochrome oxidase" → "Nitrites → form methaemoglobin (binds CN⁻)" → "Methylene blue → reduces methaemoglobin back to haemoglobin".
- ▶ **Atropine vs physostigmine mirror.** Two columns: "Atropine toxidrome — mydriasis, dry hot flushed skin, tachycardia, delirium" vs "Cholinergic toxidrome — miosis, salivation, bradycardia, fasciculations, SLUDGE".

Medico-legal significance

- ▶ Death from an antidote is a recognised **therapeutic mishap** — fatal methaemoglobinaemia from sodium nitrite, atropinic delirium/asystole from over-atropinisation, or cholinergic arrest from physostigmine.
- ▶ The autopsy surgeon must distinguish this from the original poisoning and from negligence; dose, timing and monitoring records are central evidence.
- ▶ Giving **physostigmine in OP poisoning**, or **oximes in carbamate poisoning**, can be lethal and may found a negligence allegation.
- ▶ A response to atropine supports anticholinesterase poisoning; a response to physostigmine supports anticholinergic poisoning — useful while chemical analysis is pending.
- ▶ Preserve blood, stomach contents, liver, kidney, brain and (for cyanide) spleen; send RBC cholinesterase for suspected OP cases (< 50% of normal indicates poisoning).
- ▶ Death following poisoning, by the original agent or an antidote, is an **unnatural/suspicious death** requiring inquest under **Section 174 CrPC 1973 (now Section 194 BNSS 2023)**.

- ▶ Expert toxicological opinion is admissible under Section 45 IEA 1872 (now Section 39 BSA 2023).
- ▶ Homicidal use of *Datura* for robbery or rape engages the Indian Penal Code 1860 (now Bharatiya Nyaya Sanhita 2023).

High-yield exam pointers

- ▶ Physiological antidotes act by **antagonism at the target cell**; several are themselves poisons — dose alone separates cure from harm.
- ▶ Atropine and physostigmine are mutually antidotal.
- ▶ Physostigmine is contraindicated in OP poisoning; oximes in carbamate poisoning; nitrites/thiosulphate must not be used for isocyanates.
- ▶ Atropine fatal dose: 100–130 mg, fatal period < 24 h.
- ▶ Toxidrome mnemonics: "hot/blind/red/dry/mad" (anticholinergic) vs SLUDGE (cholinergic).
- ▶ Nitrites rescue cyanide by forming methaemoglobin; overdose causes fatal methaemoglobinaemia.
- ▶ Methylene blue reverses methaemoglobinaemia but in excess causes it too, especially in G6PD deficiency.
- ▶ Always atropinise to drying of secretions, not pupil size.



Carbon monoxide poisoning

Asked in: Paper III Apr 2020 — RGUHS MD Forensic Medicine

Definition

- ▶ Carbon monoxide (CO) is a colourless, odourless, tasteless gas.
- ▶ It is non-irritant, lighter than air, and inflammable (burns with a blue flame).
- ▶ It forms from incomplete combustion of carbon-containing fuels.
- ▶ CO is a **systemic (chemical) asphyxiant**, not a simple one.
- ▶ It binds haemoglobin to form **carboxyhaemoglobin (COHb)**, causing severe tissue hypoxia.
- ▶ It is one of the commonest causes of fatal accidental gas poisoning worldwide.

SOURCE & COVERAGE

- ▶ **Common sources:** incomplete combustion of wood, charcoal, coal, kerosene, or gas.
- ▶ Automobile and generator exhaust.
- ▶ Smoke from fires and defective heating appliances.
- ▶ Sleeping in a closed room with a burning brazier (*angeethi*) in winter.
- ▶ Tobacco smoke and prolonged hookah/shisha smoking.
- ▶ Methylene chloride (a paint remover) is metabolised in the body to CO.
- ▶ **Endogenous CO:** normally produced by breakdown of haeme (via haeme oxygenase).
- ▶ Normal COHb is 1–5% in non-smokers and 7–8% in smokers.
- ▶ COHb may rise to about 8% in haemolytic anaemia, from increased haeme turnover.
- ▶ Domestic LPG and natural gas contain almost no CO, unlike the old coal gas.
- ▶ CO is absorbed rapidly by the lungs.
- ▶ It binds haemoglobin (about 85%) and myoglobin (about 15%).
- ▶ CO is not metabolised and leaves the body only through the lungs.
- ▶ Half-life is 4–5 hours on room air, about 40 minutes on 100% oxygen, and shorter still on hyperbaric oxygen.

Mechanism of toxicity

- ▶ **High affinity for haemoglobin:** CO binds haemoglobin roughly 200–270 times more avidly than oxygen.
- ▶ So even a normal oxygen tension cannot compete, and arterial oxygen content falls sharply.
- ▶ **Leftward shift of the dissociation curve:** COHb also blocks release of the remaining oxygen to the tissues.
- ▶ **Histotoxic effect:** CO binds mitochondrial cytochrome oxidase and blocks cellular respiration.
- ▶ CO also binds myoglobin, impairing heart-muscle function.
- ▶ **Vascular injury:** CO displaces nitric oxide from platelets, causing vasodilatation and profound hypotension.
- ▶ Free-radical injury (lipid peroxidation) causes demyelination of white matter and basal-ganglia damage.
- ▶ Net effect: combined anaemic and histotoxic anoxia, hitting the brain and heart hardest.

Fatal level and clinical features

- ▶ CO toxicity is graded by blood COHb level, not by any ingested dose.
- ▶ Symptoms are usually absent below about 10% COHb.
- ▶ Visible cherry-red skin colour needs COHb above 40% — already a near-lethal level.
- ▶ A COHb level above 60% is generally fatal.

COHb level	Clinical features
10–20%	Mild headache, breathlessness on exertion

COHb level	Clinical features
20–40%	Headache, irritability, poor judgement, nausea, dizziness
40–50%	Cherry-red skin appears, confusion, hallucinations, syncope
50–70%	Coma with convulsions, hypotension, arrhythmias
>70%	Profound coma, respiratory arrest, death

- ▶ **Vulnerable groups:** the elderly, the anaemic, those with heart or lung disease, and the intoxicated.
- ▶ The fetus is especially vulnerable because fetal haemoglobin binds CO even more avidly.
- ▶ **Delayed CO encephalopathy** appears 2–40 days after apparent recovery.
- ▶ It causes amnesia, dementia, psychosis, and personality change.
- ▶ Basal-ganglia damage can leave a residual parkinsonian movement disorder.
- ▶ **Other effects:** retinal haemorrhage, optic-disc oedema, sensorineural hearing loss.

Diagnosis

- ▶ **Carboxyhaemoglobin estimation on a co-oximeter** is the single most useful test.
- ▶ Ordinary pulse oximetry and a routine ABG read falsely normal.
- ▶ They cannot distinguish COHb from oxyhaemoglobin.
- ▶ ABG typically shows a metabolic (lactic) acidosis.
- ▶ **Bedside sodium-hydroxide test:** blood diluted with water and sodium hydroxide turns straw-yellow or pink if COHb is present, and brown if normal.
- ▶ **Classical confirmatory tests:** Hoppe-Seyler, Katayama, Kunkel's tannic-acid, and the spectroscopic test.
- ▶ CT or MRI may show symmetric low-density lesions in the globus pallidus, putamen, and caudate within 12 hours.

Management

- ▶ Remove the victim from the source and secure the airway.
- ▶ Give high-flow 100% oxygen by a tight-fitting mask or endotracheal tube.
- ▶ Continue oxygen until COHb falls to 15–20%.
- ▶ **Hyperbaric oxygen** (100% oxygen at 2–3 atmospheres) is the treatment of choice in severe poisoning.
- ▶ Indications include coma, seizures, a focal neurological deficit, COHb above 25%, and age above 50 years.
- ▶ Correct metabolic acidosis cautiously, control convulsions, and watch for cerebral oedema.
- ▶ Arrange long-term follow-up for delayed neurological sequelae.

Autopsy findings

- ▶ **Cherry-red (pink) colour** of skin, mucous membranes, and lividity, seen above COHb 40%.

- ▶ In dark-skinned bodies, check the inner lips, tongue, palms, and soles.
- ▶ Blood and internal organs look cherry-pink; blood remains fluid and poorly clotted.
- ▶ Skin blisters (bullae) may form over wrists, knees, calves, and buttocks.
- ▶ Lungs are congested, cherry-red, and oedematous; soot in the trachea suggests a fire source.
- ▶ The heart may show pericardial haemorrhages and focal myocardial necrosis.
- ▶ Brain white matter feels firmer than normal.
- ▶ In delayed deaths, look for bilateral necrosis of the globus pallidus and putamen.
- ▶ Always collect a sealed blood sample for quantitative COHb estimation.
- ▶ The cause of death is certified as non-mechanical (toxic/systemic) asphyxia.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Oxyhaemoglobin dissociation curve in CO poisoning:** the normal sigmoid curve plus a curve shifted left in CO poisoning, with a lowered plateau (reduced oxygen-carrying capacity) and a reduced P50 (impaired oxygen off-loading).
- ▶ **Autopsy schematic:** a body showing cherry-red lividity over dependent parts, cherry-pink lips/nail beds/palms/soles, skin blisters over wrists/knees/calves/buttocks, and an inset brain showing bilateral globus pallidus and putamen necrosis.

Medico-legal significance

- ▶ **Manner of death is usually accidental.**
- ▶ The classic Indian pattern is sleeping near a closed-room brazier (*angeethi*) in winter.
- ▶ Other accidental settings are fires and faulty heating or exhaust systems.
- ▶ Suicidal CO poisoning (car exhaust, gas oven) was common in the West with old coal gas.
- ▶ It is now rare, since the switch to natural gas/LPG.
- ▶ Homicidal CO poisoning is very rare.
- ▶ **COHb in the blood is the surest sign the victim was breathing during a fire.**
- ▶ This distinguishes antemortem from post-mortem burns and matters in arson cases.
- ▶ Bruises sustained during CO poisoning appear cherry-red.
- ▶ At the scene, check for a closed space, a lit brazier or fire, or a defective vehicle exhaust.
- ▶ Putrefaction can spuriously raise COHb, so results from a decomposed body need caution.
- ▶ Chronic occupational CO exposure (mine or industrial workers) may attract employer's compensation liability.
- ▶ An unnatural death needs a police inquest under **Section 174 CrPC 1973 (now Section 194 BNSS 2023)**.
- ▶ A custodial or suspicious death needs a magisterial inquest under **Section 176 CrPC 1973 (now Section 196 BNSS 2023)**.
- ▶ A doctor who fails to inform the police in a medico-legal case is liable under **Section 176 IPC 1860 (now Section 211 BNS 2023)**.

- ▶ Preserving blood for COHb estimation is mandatory chemical analysis in every suspected CO death.



Chronic manifestations of alcohol

Asked in: Paper III Oct 2018 — RGUHS MD Forensic Medicine

Definition

- ▶ **Chronic alcoholism** (alcohol addiction, ethanolism) is the state of a person who cannot stop drinking for long periods, or who gets withdrawal symptoms whenever they try.
- ▶ By this stage most organ and brain changes are largely **irreversible**.
- ▶ It rests on two pillars: **tolerance** (the same dose gives a progressively smaller effect) and **physical dependence** (the body now needs alcohol just to function).
- ▶ Best learnt system by system, since several organs carry examinable eponymous syndromes.

Pathophysiological basis

- ▶ **Acetaldehyde toxicity**: alcohol dehydrogenase converts ethanol to acetaldehyde, then aldehyde dehydrogenase to acetic acid.
- ▶ Acetaldehyde and oxidative stress are the main toxins to liver, heart, and pancreas.
- ▶ **Malnutrition**: the addict meets calorie needs from alcohol and eats poorly, causing **thiamine (vitamin B1) deficiency**.
- ▶ Thiamine deficiency is the basis of the Wernicke–Korsakoff syndromes, beriberi heart, and polyneuropathy.
- ▶ **Neuroadaptation**: chronic alcohol potentiates inhibitory **GABA** receptors and up-regulates excitatory **NMDA** receptors.
- ▶ Sudden withdrawal then leaves an unopposed, hyper-excitabile brain — the substrate for withdrawal and delirium tremens.
- ▶ **Barbiturate synergism**: alcohol and barbiturates have additive effects and cross-suppress each other's withdrawal — relevant in combined-overdose deaths.

Jellinek's subtypes of chronic alcoholism

Five Greek-letter subtypes describe the spectrum of chronic drinking behaviour.

Subtype	Core feature
Alpha (α)	Psychological/escape drinking only; no loss of control, able to abstain
Beta (β)	Physical complications (cirrhosis, gastritis, pancreatitis) without clear dependence
Gamma (γ)	Physical dependence, tolerance, withdrawal, and loss of control
Delta (δ)	Strong dependence; cannot abstain even 1–2 days , but quantity is controlled

Subtype	Core feature
Epsilon (ε)	Periodic binges (dipsomania) with long abstinent intervals

Systemic manifestations

- ▶ **Hepatic** — the commonest cause of death: fatty liver (steatosis) → alcoholic hepatitis → cirrhosis.
- ▶ Cirrhosis brings jaundice, portal hypertension, and ascites.
- ▶ A raised **AST:ALT ratio above 2.0** is characteristic.
- ▶ Biopsy shows hepatocyte necrosis, **Mallory bodies**, and neutrophilic infiltration.
- ▶ **Gastrointestinal**: nausea, vomiting, anorexia, and diarrhoea.
- ▶ Chronic gastritis and peptic/gastric ulceration.
- ▶ **Mallory–Weiss syndrome**: longitudinal tears at the gastro-oesophageal junction causing haematemesis.
- ▶ Acute or chronic pancreatitis.
- ▶ **Cardiovascular**: alcoholic (dilated) cardiomyopathy, typically after ~80 g/day for more than 5 years.
- ▶ **Holiday Heart syndrome**: alcohol-associated atrial fibrillation.
- ▶ **Beriberi heart**: thiamine-deficiency heart failure with oedema, but no CNS involvement.
- ▶ **Nutritional/haematological**: anaemia, low blood protein, anasarca; a raised **MCV** marks chronic abuse.
- ▶ **Endocrine**: males get gynaecomastia, feminization, and testicular atrophy; females get amenorrhoea, menorrhagia, and infertility.
- ▶ **Respiratory**: aspiration pneumonia and alcohol-induced asthma.
- ▶ **Café-coronary**: sudden death from food-bolus aspiration during intoxicated eating — high blood alcohol blunts the gag reflex, and death is by reflex vagal inhibition.
- ▶ **Battered alcoholic syndrome**: three or more fractures in different stages of healing, from falls/fights plus toxic and nutritional effects.
- ▶ Old healed thyroid fractures can mimic strangulation — need histological ageing.
- ▶ **Fetal alcohol syndrome**: if the mother drinks in pregnancy — facial dysmorphism, mental retardation, and growth restriction.
- ▶ **Problem-drinker signs**: bloated plethoric face, conjunctival suffusion, red gums that bleed easily, central obesity, and striae.

Neuropsychiatric & withdrawal syndromes

- ▶ **~12–24 h after the last drink**: tremors ("the shakes") with tachycardia, sweating, and agitation.
- ▶ **~24 h (up to 24–72 h)**: withdrawal seizures ("rum fits"), generalised tonic–clonic, with high risk of progressing to delirium tremens.
- ▶ **~48 h**: alcoholic hallucinosis — persistent hallucinations (visual > auditory > tactile), lasting weeks to months.

- ▶ **Delirium tremens (DT):** the most severe withdrawal manifestation, appearing 72–96 h after sudden withdrawal (also precipitated by trauma, infection, or shock).
- ▶ **Features:** disorientation in time, place, and person, with coarse tremors of the face, tongue, and hands.
- ▶ The "**delirium of horrors**" — terrifying visual/tactile hallucinations of insects or snakes on the skin or bed.
- ▶ Autonomic storm: tachycardia, fever, sweating, dilated pupils.
- ▶ Risk of suicide, homicide, assault, or property damage.
- ▶ DT is a medical emergency; mortality is 5–15% (from arrhythmia, hyperpyrexia, or infection).
- ▶ Treatment: **benzodiazepines** (diazepam is the drug of choice), plus thiamine and supportive fluids.
- ▶ **Wernicke's encephalopathy:** an acute thiamine-deficiency emergency — classic triad of confusion, ophthalmoplegia (nystagmus, lateral rectus palsy), and ataxia.
- ▶ Lesions: mammillary bodies, medial thalamus, periventricular brainstem, and superior cerebellar vermis.
- ▶ Treatment: IV thiamine and glucose.
- ▶ **Korsakoff's psychosis:** the chronic, often irreversible sequel to Wernicke's encephalopathy.
- ▶ An amnesic–confabulatory syndrome: amnesia, inability to learn, and **confabulation** (false memories the patient genuinely believes).
- ▶ Together they form the **Wernicke–Korsakoff syndrome** ("cerebral beriberi").
- ▶ **Marchiafava–Bignami disease:** rare necrosis and atrophy of the corpus callosum, causing severe dementia.
- ▶ **Other CNS effects:**
 - Alcoholic dementia and alcoholic epilepsy.
 - **Alcoholic paranoia:** pathological jealousy causing violent quarrels.
 - **Alcoholic polyneuritis:** burning pain and foot drop.
- ▶ **Mania a potu:** senseless violence after small amounts of alcohol, followed by terminal sleep and amnesia.

Laboratory markers & treatment of dependence

- ▶ **GGT (gamma-glutamyl transpeptidase)** is raised in about 80% of alcohol-dependent people, normalising within ~48 h of abstinence.
- ▶ **MCV above 100 fL** is raised in about 60%, but normalises only after several weeks.
- ▶ **Screening tools:** CAGE (Cut down, Annoyed, Guilty, Eye-opener) and MAST (Michigan Alcoholism Screening Test).
- ▶ **Disulfiram (Antabuse)** blocks ethanol oxidation at the acetaldehyde stage, so drinking causes an unpleasant flush reaction.
- ▶ **Anti-craving agents:** naltrexone (opioid antagonist) and acamprosate (NMDA blocker), plus thiamine supplementation.

- ▶ **Withdrawal/DT control:** benzodiazepines (diazepam, chlordiazepoxide), psychotherapy, and Alcoholics Anonymous.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Withdrawal timeline** (arrow, hours after last drink): ~12–24 h tremors → ~24–72 h rum fits → ~48 h hallucinosis → 72–96 h delirium tremens.
- ▶ **Wernicke–Korsakoff axis** (box diagram): thiamine deficiency → Wernicke's encephalopathy (confusion, ophthalmoplegia, ataxia) → Korsakoff's psychosis (amnesia + confabulation).
- ▶ Mark the lesion sites: mammillary bodies, medial thalamus, superior cerebellar vermis.

Medico-legal significance

- ▶ **Drunkenness certification:** on referral, the doctor records findings (plus BAC if needed) and opines on the degree of intoxication.
- ▶ **Diminished responsibility:** a person who commits an unlawful act during delirium tremens is not held responsible, being of unsound mind under **Section 22 BNS 2023 (formerly Section 84 IPC 1860)**.
- ▶ **Death of a patient** under a doctor who has consumed alcohol is a rash and negligent act, punishable under **Section 106 BNS 2023 (formerly Section 304A IPC 1860)**, and is professional misconduct under National Medical Commission ethics.
- ▶ **Drink-driving:** driving with a blood alcohol concentration above **30 mg%** is an offence under **Section 185, Motor Vehicles Act 1988**.
- ▶ First offence: up to 6 months and/or ₹10,000; repeat: up to 2 years and/or ₹15,000.
- ▶ A doctor may examine such an arrested person, using reasonable force if needed, under **Section 51 BNSS 2023 (formerly Section 53 CrPC 1973)**.
- ▶ **Autopsy findings** in a chronic alcoholic: fatty or cirrhotic (contracted, nodular) liver, oesophageal varices, congested/ulcerated gastric mucosa.
- ▶ Also a dilated fatty heart, mammillary-body and cerebellar atrophy, pulmonary infections, and old healed fractures (battered alcoholic).
- ▶ Preserve liver, brain, heart, lung, and kidney for histopathology, and viscera/blood/vitreous for BAC in sodium fluoride preservative.
- ▶ **Trauma and delayed death:** alcohol clears from circulating blood but persists in the clotted blood of an extradural/subdural haematoma — preserve it for analysis.
- ▶ **Hooch tragedies:** chronic drinkers are over-represented among methanol-poisoning victims and catecholamine-triggered sudden death.

♦ ♦ ♦

Classification of pesticides

Asked in: Paper III Oct 2016 — RGUHS MD Forensic Medicine

Definition

- ▶ A **pesticide** is any substance or mixture of substances intended to prevent, destroy, repel, or reduce a pest.
- ▶ Pesticides are the largest subgroup of **agricultural poisons**, which also include fertilizers and grain preservatives.
- ▶ In India, pesticides (mainly organophosphates, aluminium phosphide, and paraquat) form the single commonest group of fatal poisons.
- ▶ Most deaths are suicidal or accidental ingestion in the farming community.
- ▶ A systematic classification helps predict the toxidrome (cluster of toxic effects), fatal dose, and management.

A. Classification by target pest (most asked scheme)

Pesticides are named after the pest they are designed to control.

Class	Target pest	Key examples
Insecticides	Insects	Organophosphates, carbamates, organochlorines, pyrethroids
Herbicides	Weeds	Paraquat, diquat, glyphosate, 2,4-D
Rodenticides	Rats	Aluminium phosphide, zinc phosphide, strychnine, anticoagulants
Fungicides	Fungi	Thiocarbamates, copper compounds
Fumigants	Insects/fungi/rodents, as a gas	Aluminium phosphide, hydrogen cyanide, methyl bromide, phosphine
Acaricides	Mites and ticks	Chlorobenzilate, kelthane
Molluscicides	Snails and slugs	Metaldehyde
Nematicides	Nematodes	Ethylene dibromide

- ▶ Minor functional groups also exist: **avicides** kill birds, plus **algicides**, **aphicides**, **bactericides**, and **virucides**.
- ▶ Some agents only modify behaviour rather than kill outright — bird repellents, insect repellents, growth regulators, and chemosterilants.

B. Classification by toxicity (fatal dose)

- ▶ Toxicity is graded into three qualitative bands.
- ▶ **Virtually harmless**: generally not fatal, e.g. phenoxyacetic-acid herbicides, lime-sulphur fungicides.

- ▶ **Mildly toxic:** fatal dose > 10 g — e.g. DDT, gammexane, methoxychlor, chlordane, aldrin, dieldrin.
- ▶ **Highly toxic:** fatal dose < 10 g — e.g. arsenicals, cyanides, dinitro compounds, organophosphates.
- ▶ **Trap to avoid:** not every organochlorine falls in the ">10 g" band.
- ▶ **Endrin** (5–6 g) and **toxaphene** (2 g) are organochlorines but are actually highly toxic (<10 g).
- ▶ Always check the individual fatal dose, not just the class, before grading toxicity.

C. Classification of insecticides by origin

- ▶ **Vegetable origin:** nicotine, pyrethrins (from *Chrysanthemum*), synthetic pyrethroids (permethrin, deltamethrin, cypermethrin), and rotenone.
- ▶ Pyrethroids prolong sodium-channel opening; human toxicity is low because of rapid metabolism.
- ▶ **Inorganic chemical insecticides:** phosphorus, and compounds of antimony, arsenic, barium, mercury, thallium, zinc, and fluorides.
- ▶ **Synthetic organic insecticides** — three forensically important groups:
 - **Organophosphates (OPs):** esters of phosphoric acid; irreversible cholinesterase inhibitors.
 - **Carbamates:** derivatives of carbamic acid (carbaryl, propoxur, carbofuran).
 - Carbamates reversibly inhibit cholinesterase, so toxicity is milder, shorter-acting, and has little central nervous system involvement.
 - **Organochlorines** fall into four subgroups:
 - DDT and its analogues (methoxychlor).
 - The benzene-hexachloride group (lindane, gammexane).
 - Cyclodienes (aldrin, dieldrin, **endrin**, chlordane, heptachlor, endosulfan).
 - Chlorinated camphenes (toxaphene, strobane).

D. Organophosphates and cholinesterase inhibitors

- ▶ **Alkyl phosphates** have a linear side chain — TEPP, OMPA, malathion, demeton.
- ▶ **Aryl phosphates** have a ringed side chain — parathion, methyl-parathion, diazinon.
- ▶ Aryl organophosphates need liver activation (cytochrome P450) before they become toxic.
- ▶ Cholinesterase inhibitors as a pharmacological class include organophosphates, carbamates, and quaternary amines.
- ▶ Insecticides use only the organophosphate and carbamate groups.

E. Fatal doses to remember

- ▶ TEPP 100 mg orally; OMPA and parathion 175 mg; HETP 350 mg; malathion/diazinon ~1 g.
- ▶ **Carbamates:** 3–6 g.
- ▶ DDT 150 mg/kg body weight; **lindane** 15 g; **toxaphene** 2 g; **endrin** 5–6 g.
- ▶ Endrin is three times more toxic than aldrin/dieldrin and ten times more toxic than DDT, earning it the name "*plant penicillin*."

- ▶ **Paraquat** 5–10 g; death may follow progressive pulmonary fibrosis within about two weeks.
- ▶ **Aluminium phosphide** 1–3 g (1–3 tablets); fatal period typically 6–12 hours, with most deaths within 24 hours.
- ▶ **Zinc phosphide** 2–5 g.
- ▶ **Dinitro compounds** 1–2 g; **fluorides** 5 mg/kg; **chlorates** ~20–30 g.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ A branching classification tree: **Agricultural poisons** splits into Fertilizers, Pesticides, and Grain preservatives.
- ▶ **Pesticides** branches into Insecticides, Herbicides, Rodenticides, Fungicides, Fumigants, Acaricides, Molluscicides, and Nematicides.
- ▶ **Insecticides** splits further into Vegetable origin (nicotine, pyrethrins, rotenone) and Chemical (Organophosphates, Carbamates, Organochlorines).
- ▶ **Organophosphates** sub-splits into Alkyl phosphates and Aryl phosphates.
- ▶ A second diagram — the organophosphate toxidrome: a central "acetylcholine accumulation" box branches to three arms.
- ▶ **Muscarinic arm (SLUDGE)**: salivation, lacrimation, urination, defecation, gastrointestinal distress, emesis; also miosis and bradycardia.
- ▶ **Nicotinic arm**: fasciculations, muscle weakness, tachycardia, mydriasis.
- ▶ **CNS arm**: anxiety, convulsions, coma, respiratory-centre depression.

Medico-legal significance

- ▶ **Manner of death**: suicide is commonest, chiefly with organophosphates and aluminium phosphide.
- ▶ Accidental poisoning occurs during crop-spraying and in children.
- ▶ Homicide is rare; endrin or other organochlorines may be mixed into food or alcohol ("toddy") to mask the solvent smell.
- ▶ **Autopsy — odour clues**:
 - A **kerosene-like odour** of stomach contents suggests organophosphate or organochlorine (e.g. endrin) poisoning.
 - A **garlicky or decaying-fish odour**, blood-stained froth, gastro-oesophageal congestion, and centrilobular liver necrosis suggest **aluminium phosphide** poisoning.
 - Aluminium phosphide does **not** cause cherry-red discolouration.
 - **Zinc phosphide** gives the same garlicky odour but additionally causes cherry-red blood.
 - **Cherry-red lividity or blood is a carbon monoxide or cyanide sign, not a phosphide sign.**
 - **Paraquat** causes corrosive ulceration of the lips, mouth, and oesophagus; delayed deaths show stiff, fibrosed lungs.
- ▶ **Viscera preservation**: preserve stomach contents, blood, and viscera in **saturated sodium chloride**, never formalin or spirit.
- ▶ Send **blood for cholinesterase estimation** in organophosphate or carbamate cases.

- ▶ **Preserve body fat** in suspected organochlorine poisoning, since these agents are lipophilic and accumulate in adipose tissue.
- ▶ Organophosphates and endrin resist putrefaction and can be detected even in decomposed viscera.
- ▶ **Doctor's duty:** inform the police, preserve and label samples, and maintain chain of custody.
- ▶ An unnatural or suspicious poisoning death requires a police inquest under **Section 174 CrPC 1973 (now Section 194 BNSS 2023)**.
- ▶ The doctor's report and testimony are admissible as expert opinion under **Section 45 IEA 1872 (now Section 39 BSA 2023)**.
- ▶ Import, manufacture, sale, and use of these compounds are regulated under **Section 3(e), the Insecticides Act, 1968**.



Classify poisonous snakes in India. Write the fatal dose and fatal period with common poisonous snakes in India and medico-legal aspects

Asked in: Paper III Oct 2025 — RGUHS MD Forensic Medicine

Definition / Introduction

- ▶ **Ophitoxaemia** is poisoning by snake venom, a major rural medico-legal emergency in India.
- ▶ India has about 216 snake species, of which roughly 52 are venomous.
- ▶ Only **five snakes are dangerously poisonous to man**: king cobra, common cobra, common krait, Russell's viper and saw-scaled viper.
- ▶ The last four cause almost all snakebite deaths and are called the **Big Four**.
- ▶ Venom is modified saliva, delivered through fangs, and poisonous only when **injected** — it is harmless if swallowed because intestinal enzymes digest it.

Classification of venomous snakes

- ▶ Venomous snakes fall into **five families**.
 - **Viperidae**: Russell's viper, saw-scaled viper — vasculotoxic (haemotoxic) venom.
 - **Crotalidae (pit vipers)**: rattlesnakes, hump-nosed pit viper — cytotoxic, haemorrhagic venom.
 - **Elapidae**: cobras, kraits, mambas — neurotoxic venom.
 - **Hydrophidae (sea snakes)**: about 20 Indian species, all venomous but rarely bite; myotoxic venom.
 - **Colubridae**: mostly harmless.
- ▶ **Constrictors** (pythons, boas) are non-venomous; they kill by constricting the chest, causing traumatic asphyxia.

The Big Four and the king cobra

- ▶ **Common cobra (Naja naja): long body, a dilatable hood** with a spectacle mark, round pupil, oviparous (egg-laying).
 - The third labial scale touches both the eye and the nasal shield.
 - The hood is not visible once the snake is dead.
- ▶ **King cobra (Ophiophagus hannah):** world's longest venomous snake (up to ~5 m), found in the Western Ghats, injects a very large venom volume; hood lacks the spectacle mark.
- ▶ **Common krait (Bungarus caeruleus):** steel-blue with white cross-bands, nocturnal, the most common venomous snake in India.
 - Bite is almost painless; victims are often bitten asleep on the floor and may die in their sleep.
 - Venom (*beta-bungarotoxin*) is about 10 times as potent as cobra venom, giving the **highest case-fatality rate** of all four.
- ▶ **Russell's viper (Daboia russelii):** stout body, large triangular head, vertical slit pupil, long grooved fangs, viviparous (bears live young); venom is procoagulant.
- ▶ **Saw-scaled viper (Echis carinatus):** smallest of the Big Four (~½ m), wavy white flank line, arrow mark on the head; serrated scales rustle on movement, and the snake is highly excitable.
- ▶ Other venomous snakes: banded krait (East India), green pit viper, hump-nosed pit viper (Western Ghats). The rat snake is non-venomous.

Fatal dose and fatal period

- ▶ Fatal dose is measured as **dried (lyophilised) venom**; a single bite usually delivers several times the fatal dose.

Snake	Fatal dose (dried venom)	Fatal period
Common krait	6 mg	~18 hours
Saw-scaled viper	8 mg	~5 days
Common cobra	12 mg	½–6 hours
Russell's viper	15 mg	1–2 days
King cobra	2.5–6 mg	rapid

- ▶ **Memory aid for ascending fatal dose** ("Kill Snakes by Cutting Rapidly"): krait 6 mg → saw-scaled viper 8 mg → cobra 12 mg → Russell's viper 15 mg.
- ▶ Pythons and boas kill by traumatic asphyxia, not by a venom dose.

Venom composition and mechanism

- ▶ Venom is water- and alcohol-soluble. **Hyaluronidase** (the "spreading factor") is present in every snake venom.
- ▶ **Proteolytic enzymes and haemolysins** are rich in viper venom and cause tissue oedema, blistering, necrosis and haemolysis.
- ▶ **Cholinesterase** is rich in elapid (cobra/krait) venom.

- ▶ **Neurotoxic (elapid) venom** blocks the neuromuscular junction like curare, causing flaccid paralysis and depressing the respiratory and cardiac centres.
- ▶ **Vasculotoxic (viper) venom** causes intravascular haemolysis and coagulopathy.
- ▶ **Sea-snake venom is myotoxic**, causing rhabdomyolysis (muscle breakdown), myoglobinuria and high blood potassium.

Clinical features

- ▶ Fright alone can kill — even a non-venomous bite can cause fatal psychological shock.
- ▶ More than half of venomous bites are "**dry bites**" with inadequate venom injected.
- ▶ Neuroparalysis in an elapid bite follows a fixed order: **ptosis** (drooping eyelid), then **diplopia** (double vision), then **dysarthria** (slurred speech), then **dysphonia** (voice change), then **dyspnoea** (breathlessness), then **dysphagia** (difficulty swallowing).
- ▶ **Cobra bite**: mild local pain, minimal swelling, salivation, ptosis is the earliest sign, death from respiratory failure.
- ▶ **Krait bite**: resembles cobra but with no local swelling or burning pain; intense drowsiness.
- ▶ **Viper bite**: severe local pain, swelling spreading to the trunk, persistent bleeding, blisters, bruising, nosebleed, blood in the urine, dilated non-reactive pupils, prolonged clotting time.
- ▶ **Sea-snake bite**: little local reaction, then muscle pain, lockjaw, ptosis, flaccid paralysis and renal failure from myoglobin blocking the kidney tubules.

Cause of death in viper bite — a genuine textbook conflict

- ▶ One source's autopsy description states acute renal failure is the leading cause of death in viper bite.
- ▶ Other sources — including the same author's own comparison table — give the cause as circulatory/haemorrhagic shock from haemolysis and haemorrhage.
- ▶ Best reconciled by stating both: haemorrhagic shock is the immediate mechanism, acute renal failure the later/leading cause of death.

Management

- ▶ **First aid ("do it R.I.G.H.T.")**: Reassure the patient, Immobilise the limb, Get to hospital fast, let Hospital treat, Tell the doctor of new symptoms.
- ▶ Pressure-immobilisation bandaging suits cobra, krait and sea-snake bites but **not viper bites** (viper venom is locally necrotic).
- ▶ Do not incise, suck, cauterise, apply ice/chemicals, or use a tourniquet.
- ▶ **Definitive treatment is Polyvalent Anti-Snake Venom (PAV)**, raised in horses against the four common snakes, given by the **intravenous route only**.
- ▶ PAV is most effective within 4 hours and of doubtful value after 24 hours.
- ▶ Adjuncts: neostigmine with atropine, the **20-minute whole-blood clotting test** for viper coagulopathy, ventilation, and dialysis.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Bite-mark diagram:** venomous bite = two deep fang punctures; non-venomous bite = a semicircular row of small tooth marks, no fangs.
- ▶ **Cobra vs viper diagram:** cobra = long body, small head, hood with spectacle mark, round pupil; viper = short stout body, large triangular head with small scales, vertical slit pupil.

Medico-legal significance

- ▶ Manner of death is almost always **accidental** — about 98% of bites are on the limbs.
- ▶ **Homicide** is rare but documented, classically by throwing a venomous snake onto a sleeping person's bed; also used for infanticide.
- ▶ **Suicide** is very rare (classically Queen Cleopatra).
- ▶ A death from snakebite is an **unnatural/sudden death**, requiring police inquest under **Section 174 CrPC 1973 (now Section 194 BNSS 2023)**, and magistrate's inquest under **Section 176 CrPC 1973 (now Section 196 BNSS 2023)** where relevant.
- ▶ The treating or autopsy doctor gives **expert opinion under Section 45 IEA 1872 (now Section 39 BSA 2023)**.
- ▶ Negligently keeping a venomous snake that endangers human life is punishable under **Section 291 BNS 2023 (formerly Section 289 IPC 1860)**.
- ▶ **Autopsy** shows local discolouration and haemorrhagic kidneys in viperine death, and a congested brain with minimal local change in elapid death.
- ▶ Venom on bitten skin or clothing is detected by **ELISA**; **radioimmunoassay (RIA)** is the most sensitive test.
- ▶ **Cattle-poisoning fraud:** a cobra is made to bite a banana, and the venom-laden pulp is inserted into an animal's rectum — the meat is safe to eat, but the animal's **blood is fatal if injected**.

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Classify poisons. Write mechanism of action, signs, symptoms and treatment of O.P. poisoning*Asked in: Paper III Apr 2018 — RGUHS MD Forensic Medicine*

- ▶ A **poison** is any substance — solid, liquid or gas — that harms or kills when introduced into or brought into contact with the living body, by local or systemic action, or both.
- ▶ There is no absolute line between a poison and a drug — the dose decides ("*sola dosis facit venenum*", only the dose makes the poison).
- ▶ **Organophosphorus (OP) compounds** are esters of phosphoric acid used as agricultural insecticides — the commonest agents of suicidal and accidental poisoning in India.
- ▶ They **irreversibly inhibit acetylcholinesterase (AChE)**, producing a cholinergic crisis of overwhelming nerve overstimulation.

Classification of poisons

- ▶ Poisons are classified by their chief symptoms (mode of action) into four groups.

- ▶ **I. Corrosives** (local burning/ulceration): strong acids/alkalis, carbolic/oxalic acid, caustic soda, ammonia.
- ▶ **II. Irritants** (inflammation of the gut):
 - Inorganic: phosphorus, arsenic, lead, mercury.
 - Organic: *Abrus precatorius* (ratti), castor (ricin), snake venom.
 - Mechanical: powdered glass.
- ▶ **III. Systemic/neurotoxic** (act on the nervous system):
 - Cerebral: alcohol, opioids, datura, LSD.
 - Spinal/peripheral: strychnine, curare, conium.
 - Cardiovascular: aconite, oleander, digitalis, cyanide.
- ▶ **IV. Miscellaneous:** asphyxiants (carbon monoxide), hydrocarbons (kerosene), **agrochemicals** (organophosphates, carbamates, paraquat, aluminium phosphide), warfare agents.
- ▶ An **expanded eight-group scheme** further splits group III into Neurotoxic and Cardiac, and group IV into Asphyxiants, Pharmaceuticals, **Agrochemicals**, and Miscellaneous.
- ▶ Also grouped by chemical nature, mode of action, or circumstance (suicidal, homicidal, accidental).
- ▶ A **homicidal "ideal" poison** is colourless, tasteless, odourless, cheap, highly toxic in small dose, mimics natural disease, and undetectable at autopsy — classically arsenic and thallium.

OP poisoning — mechanism of action

- ▶ OP compounds are esters of phosphoric acid: **alkyl phosphates** (TEPP, OMPA, malathion) and **aryl phosphates** (parathion, diazinon), dissolved in a solvent that gives the classic **kerosene-like smell** to breath, vomit and stomach contents.
- ▶ Normally acetylcholine (ACh), the neurotransmitter at the myoneural junction and autonomic synapses, is broken down fast by **cholinesterase** (AChE in red cells/muscle; BuChE in plasma/liver).
- ▶ **Mechanism:** OP compounds **phosphorylate the esteratic (serine) site** of cholinesterase, inactivating it **irreversibly**.
- ▶ With AChE blocked, **ACh accumulates** at muscarinic, nicotinic and central receptors — first overstimulation, then paralysis.
- ▶ **"Ageing"**: within hours the phosphorylated enzyme loses an alkyl group and becomes permanently stable, so oximes can no longer reactivate it — effectively irreversible by **24–36 hours**, so oximes must be given **early**.
- ▶ Aryl OPs (e.g. parathion) need **hepatic activation** to their toxic **oxon** form.
- ▶ RBC-AChE and plasma BuChE both fall; plasma cholinesterase falls earlier. RBC cholinesterase below 50% indicates poisoning.

Severity	Cholinesterase remaining	Features
Mild	20–50%	Nausea, malaise, fatigue, mild weakness, cramps without diarrhoea

Severity	Cholinesterase remaining	Features
Moderate	10–20%	SLUDGE, tremors, weakness, fasciculations, confusion
Severe	<10%	SLUDGE, respiratory insufficiency, coma, paralysis, seizures

OP poisoning — signs and symptoms

- ▶ Onset is fastest after inhalation, slowest after skin absorption; with massive ingestion, symptoms begin within 5 minutes–1 hour and peak in 2–8 hours.
- ▶ Acute OP poisoning has **three phases**: acute cholinergic crisis, intermediate syndrome, and delayed neuropathy.
- ▶ **Muscarinic effects** — **SLUDGE**: Salivation, Lacrimation, Urination, Defecation, Gastrointestinal distress, Emesis; plus **miosis (pin-point pupils)** and **bronchorrhoea with pulmonary oedema** — the leading cause of death.
- ▶ **Nicotinic effects** (~10–20% of cases): fasciculations, cramps, weakness progressing to **paralysis**.
- ▶ **CNS effects**: restlessness, tremor, confusion, convulsions, then respiratory/cardiovascular centre depression and coma.
- ▶ **Intermediate syndrome (IMS)** appears 1–4 days later (notably with malathion, parathion), with proximal weakness — cannot lift the head, plus facial, respiratory and limb muscle weakness.
 - No cholinergic features; does **not** respond to atropine or oximes.
 - Treated with ventilation; resolves over days to weeks.
- ▶ **Delayed neuropathy (OPIDN)** appears 1–5 weeks after exposure (parathion, malathion), starting with calf cramps.
 - Progresses to distal weakness, ataxia and toe-drop — a flaccid, ascending paresis resembling Guillain–Barré syndrome.
- ▶ **Fatal dose**:
 - TEPP 50 mg IM / 100 mg oral.
 - Parathion 80 mg IM / 175 mg oral.
 - Malathion/diazinon ~1 g oral.
- ▶ **Fatal period**: usually **24 hours** if untreated.
- ▶ **Cause of death**: respiratory failure — muscle paralysis, respiratory centre depression, or bronchoconstriction.

Treatment of OP poisoning

- ▶ Management is an emergency built on **decontamination + airway support + specific antidotes (atropine, oximes) + supportive care**.
- ▶ **Resuscitation**: remove from source, suction bronchial secretions, intubate, give oxygen — correct hypoxia **before** large atropine doses (avoids ventricular arrhythmias).
- ▶ **Decontamination**: remove clothing, wash skin, irrigate eyes; for ingestion, gastric lavage with 1:5000 potassium permanganate plus **activated charcoal (1 g/kg)**.

- ▶ **Atropine** (mainstay; muscarinic antagonist): 2–5 mg IV every 5–10 minutes, **doubling the dose until atropinisation** appears.
- ▶ **Signs of atropinisation**: clear lungs, heart rate ≥ 80 /min, systolic BP ≥ 80 mmHg, dry axillae, pupil wider than pin-point — **pupillary dilatation alone is NOT the end-point**.
- ▶ Maintain atropinisation for 1–2 days on lower doses; tachycardia is not a contraindication. Atropine has **no effect on nicotinic** paralysis.
- ▶ **Oximes (pralidoxime/2-PAM)**: 1–2 g IV over 15–30 minutes, repeatable hourly, then every 3–8 hours; **maximum 12 g/24 h**.
- ▶ Give oximes **with atropine** and **as early as possible**, before ageing sets in; they are **ineffective in carbamate poisoning**.
- ▶ **Convulsions**: diazepam 5–10 mg IV; add phenobarbital or phenytoin if persistent.
- ▶ **Avoid** physostigmine, edrophonium and succinylcholine.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Cholinergic synapse / OP mechanism**: presynaptic terminal, ACh in vesicles, synaptic cleft, muscarinic and nicotinic receptors, AChE at the cleft, the OP molecule phosphorylating the esteratic (serine) site, accumulated ACh, pralidoxime reactivating the enzyme, atropine blocking the muscarinic receptor.
- ▶ **"SLUDGE / muscarinic–nicotinic–CNS" chart**:
 - Muscarinic: pin-point pupils, bronchorrhoea/pulmonary oedema, bradycardia.
 - Nicotinic: fasciculations progressing to paralysis.
 - CNS: coma and convulsions.

Medico-legal significance

- ▶ OP and aluminium-phosphide poisoning are leading causes of **suicidal** death in rural India; also accidental and occasionally homicidal.
- ▶ **Autopsy**: signs of asphyxia, **kerosene smell** of stomach contents, congested stomach mucosa with petechiae, congested lungs with froth and oedema.
- ▶ **Preserve viscera** (stomach with contents, intestine, liver, kidney, blood) for chemical analysis — OP resists putrefaction and is detectable even when decomposed.
- ▶ Draw blood/serum for **cholinesterase estimation** to confirm the diagnosis.
- ▶ The doctor must inform the police in every suspected poisoning, not decide the manner of death — general duty under **Section 33 BNSS 2023 (formerly Section 39 CrPC 1973)**.
- ▶ Police inquest into an unnatural death — **Section 194 BNSS 2023 (formerly Section 174 CrPC 1973)**; doctor must furnish information — **Section 195 BNSS 2023 (formerly Section 175 CrPC 1973)**.
- ▶ Omission to inform a public servant — **Section 211 BNS 2023 (formerly Section 176 IPC 1860)** — up to 1 month.
- ▶ Furnishing false information — **Section 212 BNS 2023 (formerly Section 177 IPC 1860)** — up to 6 months.

- ▶ Giving or fabricating false evidence — **Section 229 BNS 2023 (formerly Section 193 IPC 1860)** — up to 7 years.
- ▶ Causing evidence to disappear to screen an offender — **Section 238 BNS 2023 (formerly Section 201 IPC 1860)**.
- ▶ Arrested accused may be examined without consent — **Section 51 BNSS 2023 (formerly Section 53 CrPC 1973)**.
- ▶ **Evidence handling:** collect, label, seal and hand over vomitus, gastric-lavage fluid, blood, urine and any poison container to police for FSL analysis; prepare three copies of the MLC report.



Classify rodenticides. Write about aluminium phosphide poisoning

Asked in: Paper III Jun 2024 — RGUHS MD Forensic Medicine

Definition / Introduction

- ▶ **Rodenticides** are pesticides used to kill rats and mice.
- ▶ Given as poisoned baits, pastes, or grain fumigants.
- ▶ A leading cause of **agricultural self-poisoning** in India — cheap and freely available.
- ▶ The most lethal member is **aluminium phosphide (ALP)**, a fumigant that liberates **phosphine gas (PH₃)**.
- ▶ Phosphine is a mitochondrial poison with **no specific antidote**.
- ▶ Case-fatality is very high: 35–100%.

Classification of rodenticides

- ▶ One branch of **agricultural poisons** (alongside insecticides, herbicides, fungicides, other fumigants).
- ▶ Best classified by **chemical nature / mechanism**:

Class	Examples	Key feature
Phosphides	Aluminium, zinc, calcium phosphide	Release phosphine on contact with moisture/acid; most lethal group in India
Anticoagulants	Warfarin; brodifacoum, bromadiolone ("superwarfarins")	Vitamin-K antagonists causing bleeding; have a specific antidote
Inorganic / metallic	Barium carbonate, thallium sulfate, sodium fluoroacetate	Thallium: hair loss, nerve damage; barium: low-potassium paralysis
Yellow phosphorus	Rodine / "rat paste"	Liver-toxic; luminous "smoking" vomit and stool
Botanical	Red squill, strychnine	Squill is cardiotoxic; strychnine causes convulsions

Class	Examples	Key feature
Newer agents	Cholecalciferol, bromethalin	Lower risk of secondary poisoning

- ▶ Commercial Indian "rat paste" often mixes several agents, giving overlapping poisoning patterns.
- ▶ **Key contrast:** anticoagulants have an antidote (vitamin K₁); **phosphides have none** — why ALP is so dangerous.

Aluminium phosphide — sources and composition

- ▶ Solid fumigant used mainly to **preserve stored grain and tobacco**.
- ▶ Indian trade names: **Celphos, Alphos, Quickphos, Phostoxin**; sold as "**rice tablets**."
- ▶ Each tablet weighs **3 g**: **56% pure ALP** plus **44% ammonium carbamate** (inert filler).
- ▶ The carbamate releases CO₂ and ammonia gas, which stop the phosphine from **catching fire spontaneously**.
- ▶ Moisture or gastric acid reacts with the tablet: each 3 g tablet liberates about **1 g of phosphine gas**.
- ▶ Pure phosphine is odourless, but contaminants give a **garlicky / decaying-fish smell** — a key clue at the bedside and autopsy.

Mechanism of action

- ▶ **Mitochondrial poison:** phosphine inhibits **cytochrome-c oxidase**, the final enzyme of the electron-transport chain.
- ▶ Blocking it stops cells using oxygen (similar to **cyanide**), causing **cellular hypoxia** and **metabolic acidosis**.
- ▶ **Oxidative stress:** phosphine generates free radicals and depletes antioxidants, damaging cell membranes.
- ▶ **Systemic poison:** every organ is affected, but the **heart suffers most**.
- ▶ Direct heart toxicity causes refractory hypotension and arrhythmias.
- ▶ **Cardiogenic shock is the commonest cause of death**.
- ▶ Absorbed rapidly from gut and lungs; some ALP reaches the liver, where phosphine is released slowly.
- ▶ This slow liver release explains the **prolonged symptoms** seen in some patients.
- ▶ Excreted mainly in urine and through the lungs.

Fatal dose and fatal period

- ▶ **Fatal dose:** 1–3 tablets (3–9 g), about **1.5–5 g of pure ALP**; survival unlikely beyond ~1.5 g.
- ▶ Inhaled phosphine above 400–600 ppm is **lethal within 30–60 minutes**.
- ▶ **Fatal period:** typically around **24 hours** (range ~1 hour to 4 days).

Clinical features

By ingestion (commonest route):

- ▶ Symptoms begin within about **half an hour**, worse with a fresh tablet.
- ▶ **Gastrointestinal**: metallic taste, thirst, garlicky breath, burning abdominal pain, vomiting, diarrhoea.
- ▶ About **one-third of survivors** develop oesophageal strictures 2–8 weeks later.
- ▶ **Cardiovascular (dominant, decides prognosis)**: profound refractory hypotension and shock, arrhythmias, acute heart failure.
- ▶ **Respiratory**: cough, breathlessness, cyanosis, pulmonary oedema (ARDS), respiratory failure.
- ▶ **Other systems**: hepatitis and jaundice; acute kidney failure; severe metabolic acidosis.
- ▶ Headache, restlessness, convulsions, and coma can occur.

By **inhalation**: graded **mild** (irritation, headache, chest tightness), **moderate** (unsteady gait, weakness), **severe** (ARDS, arrhythmias, convulsions, coma).

Investigations

- ▶ **Bedside silver-nitrate test**: gastric aspirate mixed with water in a flask.
- ▶ Filter paper soaked in silver nitrate covers the flask mouth and is gently heated.
- ▶ The paper **turns black** (silver phosphide) if phosphine is present.
- ▶ **Most specific test**: gas chromatography with a nitrogen–phosphorus detector on viscera.
- ▶ Blood/urine phosphine levels are unreliable (oxidises too quickly).
- ▶ **Supportive tests**: ECG (ST changes, arrhythmias), chest X-ray (pulmonary oedema), arterial blood gas (acidosis), serum magnesium.
- ▶ **Poor prognosis**: low blood pH, low bicarbonate, ECG changes, shock, high blood sugar.

Management

- ▶ **No specific antidote**; treatment is supportive and aggressive.
- ▶ Staff wear masks and gloves — the patient's breath and vomit can poison others; spontaneous ignition can occur.
- ▶ **Gut decontamination**: gastric lavage with potassium permanganate (after securing the airway), which oxidises phosphine to a non-toxic form.
- ▶ Activated charcoal, antacids, and liquid paraffin or coconut oil are also given.
- ▶ **Magnesium sulfate**: stabilises cell membranes and prevents arrhythmias; given IV for several days.
- ▶ **Shock support**: aggressive IV fluids early, vasopressors for refractory hypotension, low-dose dopamine, IV hydrocortisone.
- ▶ **Organ support**: oxygen, ventilation for ARDS, bicarbonate for acidosis, dialysis for kidney failure.
- ▶ **Survivors**: screen for oesophageal strictures (endoscopic dilatation); counselling to prevent repeat attempts.

Autopsy appearances

- ▶ **Garlicky / decaying-fish odour** at the mouth, nose, and on opening the stomach — highly suggestive.

- ▶ Blood-stained froth at the mouth and nostrils.
- ▶ Congestion of the lower oesophagus, stomach, duodenum, lungs, liver, spleen, kidneys, and brain.
- ▶ **Centrilobular haemorrhagic necrosis of the liver** is characteristic.
- ▶ Microscopy shows hypoxic cell injury in the heart, lungs, kidneys, adrenals, and brain.
- ▶ **Viscera preservation:** saturated common-salt solution, in **glass** bottles (never plastic — the poison escapes through it).
- ▶ Send preserved viscera to the Forensic Science Laboratory.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Mechanism flow-chart:** ALP tablet (3 g) → moisture/gastric HCl → phosphine liberated → inhibits cytochrome-c oxidase + free radicals → cellular hypoxia + metabolic acidosis → end-organ boxes for heart (cardiogenic shock), lungs (ARDS), liver/kidney/CNS.
- ▶ **Silver-nitrate test set-up:** flask with gastric aspirate + water; filter paper soaked in silver nitrate over the flask mouth; gentle heating; paper turning black = positive.

Medico-legal significance

- ▶ **Manner:** suicidal is commonest in India, especially among North-Indian farmers; ALP approximates the "**ideal suicidal poison**" — cheap, available, nearly always fatal.
- ▶ Accidental poisoning occurs in children and fumigated grain stores; homicide is rare (bitter, fast-acting).
- ▶ **Occupational hazard:** treating doctors and autopsy staff can be secondarily poisoned by phosphine, so masks are essential.
- ▶ **Doctor's duty:** collect, label, seal, and preserve evidence (vomit, lavage fluid, blood, urine, poison container) and hand it to police against signature.
- ▶ Failing to inform police in a medico-legal case: **Section 176 IPC 1860 (now Section 211 BNS 2023)**.
- ▶ Giving false information to police: **Section 177 IPC 1860 (now Section 212 BNS 2023)**.
- ▶ Giving false evidence (perjury): **Section 191 IPC 1860 (now Section 227 BNS 2023)**; its punishment: **Section 193 IPC 1860 (now Section 229 BNS 2023)**.
- ▶ Intentionally omitting to inform of an offence: **Section 202 IPC 1860 (now Section 239 BNS 2023)**.
- ▶ A suspicious/unnatural death needs a **police inquest** (**Section 174 CrPC 1973, now Section 194 BNSS 2023**) or a **magistrate's inquest** (**Section 176 CrPC 1973, now Section 196 BNSS 2023**).
- ▶ Police have the power to summon witnesses during inquest (**Section 175 CrPC 1973, now Section 195 BNSS 2023**).
- ▶ A suspicious ALP death thus proceeds through inquest, then a medico-legal autopsy with viscera sent to the FSL.

♦ ♦ ♦

Classify substances of abuse. Write on drug dependence

Asked in: Paper III Oct 2025 — RGUHS MD Forensic Medicine

Definition

- ▶ A **substance of abuse** is any psychoactive drug taken in a way that deviates from the accepted medical or social pattern.
- ▶ Psychoactive means it acts on the CNS to alter perception, mood, consciousness, cognition or behaviour.
- ▶ **Drug dependence** is the umbrella term the WHO introduced in 1964 to replace the older terms *addiction* and *habituation* (both first defined by WHO in 1957).
- ▶ It means the user develops a compulsion or strong desire to keep taking the drug, with or without physical dependence.
- ▶ The topic links toxicology, psychiatry and criminal law — the NDPS Act 1985 and the intoxication provisions of the BNS 2023.

Key terms

- ▶ **Habituation**: psychological dependence only — desire to continue, no compulsion, no dose escalation, minimal harm (e.g., caffeine, nicotine).
- ▶ **Addiction**: physical plus psychological dependence — compulsive craving, dose escalation, withdrawal, relapse, harm to self and society.
- ▶ **Drug dependence** covers both habituation and addiction (WHO 1964).
- ▶ **Tolerance**: needing a higher dose for the same effect, or a smaller effect from the same dose.
 - Mechanisms: CNS adaptation, faster drug metabolism, immune-like changes.
 - **Loss of tolerance** during a drug-free spell (hospital, prison), then resuming the old dose, is a classic cause of fatal overdose.
- ▶ **Cross-tolerance**: reduced response to one drug from prior exposure to another (mescaline, psilocybin, LSD cross-tolerate).
- ▶ **Withdrawal syndrome**: symptoms, usually opposite to the drug's acute effects, appearing as its tissue level falls after prolonged heavy use.

Addiction vs habituation

Feature	Addiction	Habituation
Dependence	Physical > psychological	Psychological only
Compulsion	Present; may drive crime	Only a desire
Dose escalation	Present	Absent
Withdrawal	Characteristic	Mild or none
Relapse	Occurs	Absent
Harm	Individual and society	Individual, minimal

Feature	Addiction	Habituatation
Examples	Opiates, cocaine, cannabis, amphetamines, barbiturates, alcohol	Caffeine, nicotine, tea

Classification of substances of abuse

- ▶ **CNS depressants** (reduce CNS activity):
 - Alcohol, GHB, ketamine, inhalants (petrol, glue, toluene).
 - **Opioids** — morphine, codeine, heroin, fentanyl, methadone.
 - Sedative-hypnotics — benzodiazepines (diazepam, alprazolam) and barbiturates.
- ▶ **CNS stimulants** (increase CNS activity):
 - Amphetamines, **cocaine**, caffeine, nicotine.
 - Ecstasy (MDMA), khat (*Catha edulis*).
- ▶ **Hallucinogens/psychedelics** (distort CNS activity):
 - LSD, psilocybin, mescaline.
 - **Cannabis** (marijuana, hashish) — also has a depressant action.
 - Phencyclidine (PCP), datura.
- ▶ **Designer drugs** — synthetic drugs made by modifying a legal drug's structure to dodge drug laws (MDMA, bath salts, Spice, mephedrone).
- ▶ **Combination drugs** — e.g. *speedball* (cocaine plus heroin).
- ▶ **Legal classification (NDPS Act 1985):**
 - **Narcotic drugs:** coca leaf, cannabis, opium, poppy straw, and all manufactured drugs.
 - **Psychotropic substances:** over 110 scheduled substances (LSD, THC, amphetamines, barbiturates, benzodiazepines).
- ▶ **Psychiatric classification:** DSM-5 groups 10 substance classes under "Substance-Related and Addictive Disorders" (ICD-11: "disorders due to substance use").

WHO types of drug dependence

- ▶ **Morphine:** strong psychic and physical dependence, marked tolerance.
- ▶ **Barbiturate-alcohol:** strong dependence; tolerance present but lost fast on withdrawal.
- ▶ **Cocaine:** strong psychic dependence; no physical dependence, sensitisation instead of tolerance.
- ▶ **Cannabis:** moderate-strong psychic dependence; little or no physical dependence or tolerance.
- ▶ **Amphetamine:** variable psychic dependence; no physical dependence; tolerance considerable but uneven.
- ▶ **Khat:** moderate, persistent psychic dependence; no physical dependence or tolerance.
- ▶ **Hallucinogen (LSD):** usually mild psychic dependence; no physical dependence; tolerance develops and disappears fast.

Routes and hazards

- ▶ **Routes:** oral, inhalation (tobacco, charas), snorting (cocaine).

- *Chasing the dragon* — heating heroin on foil and inhaling the fumes.
- Injection: **skin-popping** (subcutaneous), **mainlining** (intravenous), or intramuscular.
- ▶ **Hazards of injection use:**
 - Accidental overdose, mainly by the intravenous route.
 - Toxicity from talc/quinine adulterants — pulmonary granulomas.
 - Blood-borne infection — hepatitis B, HIV, thrombophlebitis, right-sided endocarditis.
 - Gangrene and anaphylaxis.
- ▶ **Body packing/pushing:** smuggling drugs by swallowing or inserting packets — risk of fatal packet rupture and intestinal obstruction.

Clinical features and withdrawal

- ▶ **Signs of ongoing use:** weight loss, unsteady gait, tremor, red puffy eyes, slurred speech, poor memory, mood change, sweating.
 - Drug paraphernalia at the scene and theft to fund the habit are supportive clues.
- ▶ **Opioid withdrawal (prototype):** starts 6–8 hours after stopping, peaks around 72 hours, settles in 7–10 days.
 - **Early (up to 12 h):** craving, lacrimation, yawning, sweating, tachycardia.
 - **Intermediate (12–24 h):** dilated pupils, gooseflesh, tremor, rapid breathing — together with the early stage, this is called "**cold turkey**."
 - **Late (24 h–10 days):** deep sleep, then symptoms recur with abdominal cramps, leg pain, vomiting, diarrhoea.
- ▶ **Withdrawal severity by class:** marked with alcohol/opioids/sedative-hypnotics, weak with amphetamine/cannabis/cocaine/nicotine, absent with hallucinogens/PCP.
- ▶ A newborn of a dependent mother can develop withdrawal — hyperactivity, twitching, convulsions — needing treatment.

Management

- ▶ **Acute care:** institutional admission, close supervision to block secret drug access, supportive treatment; benzodiazepines help many withdrawal states.
- ▶ **Detoxification:** gradual dose tapering, sedatives, or opioid substitution with methadone or buprenorphine/naloxone.
- ▶ **Long-term:** psychotherapy, occupational therapy, general health rebuilding, and **rehabilitation** with strong family/social support.
- ▶ Some jurisdictions run **drug courts** that treat rather than punish.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Diagram 1 — Classification flow-chart, "Substances of abuse."** Top box: *Substances of abuse*. Four branches: *CNS depressants*, *CNS stimulants*, *Hallucinogens/psychedelics*, *Special groups* (designer + combination drugs) — each branch labelled with 3–4 example drugs. Side note: legal split under the NDPS Act — narcotic drugs vs psychotropic substances.
- ▶ **Diagram 2 — Venn diagram, "Drug dependence."** A large circle *Drug dependence* (WHO 1964) containing two overlapping circles: *Addiction* (physical + psychological) and *Habituation* (psychological only). Label the addiction circle with arrows to *Tolerance*, *Compulsion/craving*, *Withdrawal syndrome*, *Relapse*.

Medico-legal significance

- ▶ **Involuntary intoxication** (given without consent or knowledge) negates criminal responsibility — **Section 23 BNS 2023 (Section 85 IPC 1860)**.
- ▶ **Voluntary intoxication** presumes knowledge, but specific intent must still be proved — **Section 24 BNS 2023 (Section 86 IPC 1860)**.
- ▶ **Unsoundness of mind** (the M'Naughten rule) — **Section 22 BNS 2023 (Section 84 IPC 1860)**.
- ▶ **Consent given while intoxicated**, and unable to understand its nature, is invalid — **Section 28 BNS 2023 (Section 90 IPC 1860)**.
- ▶ **NDPS Act 1985 penalties:**
 - Consumption — **Section 27**: 1 year plus fine for cocaine/morphine/heroin, 6 months for others.
 - Trafficking (embezzlement S.19, dealing S.24, financing/harboursing S.27A) — 10–20 years' rigorous imprisonment with fine.
 - **Section 31A** — death penalty for certain repeat commercial-quantity offences.
 - Cultivation of coca, opium or cannabis is banned except for medical/scientific use — **Section 8**.
- ▶ **Driving under drug influence** — an offence under **Section 185(b), Motor Vehicles Act 1988**.
- ▶ Giving a stupefying agent to cause hurt or facilitate a crime (including drug-facilitated sexual assault) is punishable under **Section 123 BNS 2023 (Section 328 IPC 1860)**; urine (within 72 h) and hair are the preferred specimens.
- ▶ **Autopsy pointers:**
 - Emaciated body with scars, tattoos, and **injection (track) marks** with perivenous fibrosis.
 - **Perforated nasal septum** in cocaine/heroin snorters, hepatic lymphadenopathy, froth at the mouth or nostrils.
 - Talc/starch adherent to the gut mucosa, seen under polarised light.
 - Preserve injection-site tissue (with a contralateral control), blood and urine, for chemical analysis.
- ▶ **Body packers/stuffers** are detected by X-ray, ultrasonography or CT; whole-bowel irrigation (polyethylene glycol) recovers the packets.



Collection and preservation of viscera in poisoning deaths

Asked in: Paper III Apr 2021 — RGUHS MD Forensic Medicine

Definition / introduction

- ▶ In a suspected poisoning death, the autopsy surgeon preserves the viscera and sends them to the Forensic Science Laboratory (FSL) for chemical analysis.
- ▶ Viscera means the soft internal organs — mainly stomach, intestine, liver, kidney — plus body fluids.
- ▶ Cause of death stays reserved until the chemical examiner's report arrives.
- ▶ Correct organs, correct preservative, and an unbroken chain of custody give the result its evidentiary value.
- ▶ A flawless autopsy is worthless if the viscera are wrongly preserved or the seal is broken.

Indications — when viscera must be preserved

- ▶ Suspected poisoning — flagged by police (e.g., a drug sachet/bottle at the scene) or by the doctor (unusual smell/colour in stomach contents).
- ▶ History of intoxication or drug abuse.
- ▶ Cause of death not found even after a complete autopsy.
- ▶ Advanced decomposition, obscuring gross findings.
- ▶ Death due to burns (checks carbon monoxide and cyanide).
- ▶ Anaphylactic or drug-induced death, and surgical/anaesthetic deaths.
- ▶ Road-traffic accident involving the driver, or a machine operator.
- ▶ Criminal abortion — uterus and appendages preserved separately.

Routine viscera — the five bottles

Five bottles are sent in every fatal poisoning case:

Bottle	Contents	Quantity
1 (1 L)	Stomach + contents; upper 30 cm small intestine	Whole stomach; 30 cm gut
2 (1 L)	Liver + kidney	200–300 g liver; ½ each kidney
3 (50 mL)	Blood	30 mL (min 10 mL)
4 (50 mL)	Urine	30 mL
5 (50 mL)	Preservative sample	25 mL spirit or 25 g salt

- ▶ Bottle 1 matters — most poisons are swallowed, so it shows how much was taken.
- ▶ Bottle 2 matters — the liver detoxifies poison and the kidney excretes it.
- ▶ Bottle 5 is a control against contamination from the preservative itself.

- ▶ Stomach/intestine are ligated at both ends, removed, and slit open so contents stay with the wall; if empty, the wall itself is kept.
- ▶ Liver and kidney are sliced thin (0.5–1 cm) so the preservative penetrates fully.
- ▶ Blood is drawn from inside a vein (femoral preferred), not pooled from a cavity — less postmortem diffusion.
- ▶ In a putrefied body, blood is unreliable, since putrefaction generates cyanide and alcohol; use vitreous humour or CSF instead.
- ▶ Keep gut contents (Bottle 1) separate from solid organs (Bottle 2): comparing levels shows time since ingestion.

Additional / special-case viscera

- ▶ **Brain (100 g):** alkaloids, organophosphates, opiates, carbon monoxide, cyanide, strychnine, barbiturates, anaesthetics, volatile poisons.
- ▶ **Heart:** strychnine, digitalis, yellow oleander.
- ▶ **Spinal cord:** strychnine, gelsemium.
- ▶ **Bile / gall bladder:** morphine, cocaine, methadone, barbiturates.
- ▶ **Vitreous humour:** alcohol, chloroform, cocaine, morphine, tricyclics, urea/creatinine, sugar, electrolytes — resists putrefaction.
- ▶ **Lung (whole, nylon bag):** inhaled and volatile poisons.
- ▶ **Fat (abdominal wall, ~10 g):** pesticides and insecticides.
- ▶ **Skeletal muscle (50–100 g):** badly putrefied organs or an embalmed body.
- ▶ **Bone, hair, nails:** chronic heavy metals (arsenic, thallium), radioactive poisons.
- ▶ **Uterus + appendages + upper vagina:** criminal abortion.
- ▶ **Spleen (half):** carbon monoxide and cyanide.

Preservatives — choice and contraindications

- ▶ **Saturated common salt solution** — routine viscera (stomach, intestine, liver, kidney); quantity $\geq$ the viscera volume.
 - Contraindicated in: corrosive acids/alkalis, mercuric chloride, aconite.
- ▶ **Rectified spirit (~95% alcohol)** — alternative when salt is contraindicated.
 - Contraindicated in: alcohol, kerosene, chloroform, ether, chloral hydrate, formic acid, formaldehyde, acetic acid, phenol, phosphorus, paraldehyde.
- ▶ **Sodium/potassium fluoride 10 mg/mL + potassium oxalate ~3 mg/mL** — for blood, urine, CSF, vitreous; fluoride stops glycolysis and bacterial growth, oxalate is the anticoagulant.
 - Essential for estimating alcohol, cocaine, cyanide, or carbon monoxide.
- ▶ **Sodium citrate (~30 mg per 10 mL blood)** — instead of oxalate, for oxalic acid, ethylene glycol, or carbon monoxide poisoning.
- ▶ **Refrigeration (~4°C)** — for volatile poisons, if analysed within 24 hours.
- ▶ **Formalin is never used** for chemical analysis, since it cross-links tissue; it is only used for the histopathology sample.

- ▶ **No preservative needed** if analysed within 24 hours, refrigerated, or the sample is bone, hair, nail, or lung.
- ▶ Fill bottles only two-thirds full; use **glass** (or nylon for volatiles), never plastic.

Labelling, sealing, dispatch, and chain of custody

- ▶ Use clean, wide-mouthed glass bottles with tight stoppers, sealed quickly to prevent loss of volatiles.
- ▶ Label each bottle in triplicate: name/age/sex, PM number, police station + crime number, organ + preservative, date/place, signature.
- ▶ Add a biohazard warning if infectious (HIV, hepatitis B, tuberculosis) or radioactive.
- ▶ Seal each stopper with cloth, string, and red sealing wax bearing the doctor's personal or departmental seal.
- ▶ Lock the bottles inside a box and seal the lock too — an unsealed box invites allegations of tampering.
- ▶ Send the box to the FSL through the Investigating Officer with: a forwarding letter, the sealed box, an envelope with the box key and a sample seal, the postmortem report, and clinical information.
- ▶ The doctor takes a receipt and logs the despatch in a register.
- ▶ If despatch is delayed, refrigerate the viscera at $\sim 4^{\circ}\text{C}$; destroy only with the Magistrate's permission or once police close the case.
- ▶ Tell the laboratory the symptoms, suspected poison and its access, and the postmortem interval — never a vague "general unknown poison" search.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Five labelled bottles:**
 - Bottle 1 (1 L) — stomach + contents + upper 30 cm intestine.
 - Bottle 2 (1 L) — sliced liver + half of each kidney.
 - Bottle 3 (50 mL) — blood (fluoride + oxalate).
 - Bottle 4 (50 mL) — urine.
 - Bottle 5 (50 mL) — preservative sample.
- ▶ Label each with name/age/sex, PM number, police station + crime number, contents, preservative, date, signature.
- ▶ **Chain of custody:** autopsy table → sealed bottles → locked, sealed box → Investigating Officer (letter + box + key envelope + PM report) → FSL → report to IO → final opinion.

Medico-legal significance

- ▶ Cause of death stays reserved until the chemical examiner's report arrives; a preliminary report states "opinion pending chemical analysis," then a supplementary report follows.
- ▶ An unnatural or suspicious death requires a police inquest — **Section 174 CrPC 1973 (now Section 194 BNSS 2023)**.

- ▶ The investigating officer can summon inquest witnesses, who must attend and answer truthfully — **Section 175 CrPC 1973 (now Section 195 BNSS 2023)**.
- ▶ Every person's duty to inform police of a cognisable offence (no warrant needed for arrest) — **Section 39 CrPC 1973 (now Section 33 BNSS 2023)**.
- ▶ The doctor must also prepare an MLC record, take consent, and collect, preserve, and seal evidence against signature.
- ▶ Omission to inform police, by someone legally bound to, is punishable — **Section 176 IPC 1860 (now Section 211 BNS 2023)**.
- ▶ Furnishing false information to police — **Section 177 IPC 1860 (now Section 212 BNS 2023)**.
- ▶ Giving or fabricating false evidence in a judicial proceeding — **Section 193 IPC 1860 (now Section 229 BNS 2023)**.
- ▶ Causing evidence of an offence to disappear, or screening the offender — **Section 201 IPC 1860 (now Section 238 BNS 2023)**.
- ▶ Intentional omission to give information of an offence — **Section 202 IPC 1860 (now Section 239 BNS 2023)**.



Cyanide poisoning

Asked in: Paper III Oct 2017 — RGUHS MD Forensic Medicine

- ▶ Cyanide is one of the fastest-acting poisons known — a **systemic (chemical) asphyxiant**.
- ▶ It kills by blocking the cell's ability to use oxygen, not by starving the blood of oxygen.
- ▶ Forensically it appears as the gas **hydrogen cyanide (HCN)**, the liquid **hydrocyanic acid (Prussic acid)**, or crystalline **salts (KCN, NaCN)**.
- ▶ It is a classic agent for suicide, judicial execution, and the spy's quick-acting "L-pill".

Physical forms and sources

- ▶ **Smell:** characteristic **bitter-almond odour**.
- ▶ **20–40% of people cannot smell it** (inherited, sex-linked recessive trait) — the autopsy surgeon may then miss this clue.
- ▶ **Plant sources:** cyanogenic glycosides such as **amygdalin** (bitter almonds, apricot/peach/plum kernels) release HCN on hydrolysis by gut bacteria — about **40 times more toxic orally than intravenously**.
- ▶ **Fire deaths:** burning plastics, wool and silk release HCN — the main reason cyanide turns up in smoke-inhalation deaths.

Toxicokinetics and mechanism

- ▶ **Absorption:** very rapid through the lungs and mucous membranes.
- ▶ Swallowed cyanide salts react with stomach hydrochloric acid to release HCN, which is then absorbed.
- ▶ **Distribution:** reaches all tissues; red cells carry **2–3 times** the cyanide level of plasma.

- ▶ **Mechanism — histotoxic anoxia:** cyanide binds the ferric (Fe^{3+}) iron of cytochrome oxidase in the mitochondria, blocking the last step of **oxidative phosphorylation**.
- ▶ Cells cannot use oxygen even though the blood is fully oxygenated.
- ▶ **ATP production collapses**, and cells switch to anaerobic glycolysis.
- ▶ Pyruvate is converted to lactate, causing a severe **anion-gap (lactic) metabolic acidosis**.
- ▶ **Detoxification:** the enzyme **rhodanese** converts cyanide to non-toxic **thiocyanate**, excreted in urine.

Fatal dose and fatal period

Form of cyanide	Usual fatal dose
Hydrocyanic acid (liquid)	~50 mg
KCN / NaCN salts	~200–250 mg
HCN gas	1 part in 2,000 kills almost instantly
Bitter almonds	~50–125 nuts

- ▶ **Fatal period:** seconds to a few minutes after inhaling HCN gas; within an hour after swallowing the liquid acid.
- ▶ About **30 minutes** after swallowing KCN/NaCN salts, because stomach acid first needs time to release HCN.
- ▶ Death is due to **central respiratory arrest**.
- ▶ Despite the popular myth of instant death, death from salts is often delayed by minutes to hours.

Clinical features

- ▶ **Onset:** fastest by inhalation (near-immediate coma); slower by ingestion, because the liver breaks down part of the dose first.
- ▶ **CNS:** headache, anxiety, confusion, convulsions, coma; pupils dilated and sluggish.
- ▶ **Cardiovascular:** early hypertension with reflex bradycardia, later hypotension with tachycardia and dysrhythmias.
- ▶ **Respiratory:** early fast breathing, then slow breathing and respiratory depression.
- ▶ **Cyanosis is a late sign**, because the blood is still carrying oxygen.
- ▶ **Skin:** classic bright **cherry-pink / brick-red** colour.
- ▶ **Eyes:** retinal arteries and veins are equally red on fundoscopy.
- ▶ **Acid-base:** anion-gap lactic acidosis, with serum lactate above 7–10 mmol/L.
- ▶ **Chronic poisoning** (smokers, cassava-dependent populations): tropical ataxic neuropathy and spastic paraparesis (**Konzo**); acute survivors may develop delayed **Parkinsonian** features.

Diagnosis and chemical tests

- ▶ **Bitter-almond odour** at the scene or on opening the body.
- ▶ ***Lee-Jones test*** — a screening test on gastric aspirate.
- ▶ Add ferrous sulphate crystals and sodium hydroxide, boil and cool, then add hydrochloric acid.

- ▶ A **greenish-blue colour confirms cyanide**; a purplish colour instead suggests salicylates.
- ▶ **Blood cyanide level** is the definitive test.
- ▶ Above **0.2 µg/mL** is toxic; above **1 µg/mL** is fatal.

Treatment

- ▶ **Speed is everything** — the fatal period is very short, so give **100% oxygen, antidote, then gastric lavage**, with antidotes started even before lavage.
- ▶ **Stabilisation**: remove from the source, secure airway-breathing-circulation, give 100% oxygen, get IV access, monitor the heart, correct acidosis.
- ▶ **Classic 3-step antidote kit**:
 - **Step 1** — **Amyl nitrite**: inhaled from a crushed perle until IV access is ready.
 - **Step 2** — **Sodium nitrite (3%)**: 10 mL (300 mg) slow IV.
 - **Step 3** — **Sodium thiosulphate (25%)**: 50 mL (12.5 g) slow IV.
- ▶ **How nitrites work**: convert haemoglobin to **methaemoglobin**, which pulls cyanide off cytochrome oxidase and frees the enzyme.
- ▶ Methaemoglobin must be kept below 25%, or it can itself become fatal.
- ▶ **How thiosulphate works**: it donates sulphur so rhodanese can convert cyanide to thiocyanate for excretion.
- ▶ **Newer antidotes**: **hydroxocobalamin** (binds cyanide, safe in smoke inhalation) and **dicobalt edetate** (chelates cyanide, reserved for confirmed poisoning).
- ▶ **Decontamination**: gastric lavage with sodium thiosulphate or potassium permanganate; **emesis is contraindicated** because seizures and coma can develop rapidly.

Autopsy findings

- ▶ **External**: bright cherry-red lividity and mucosae, froth at the mouth and nostrils, dilated pupils.
- ▶ **Open the cranium first** — the bitter-almond odour is best preserved in the brain and can be masked once other cavities are opened.
- ▶ **Stomach**: bitter-almond odour, said to be specific for cyanide; mucosa bright red to brown from cyanhemochromogen.
- ▶ **Viscera**: generalised congestion, pulmonary and cerebral oedema, scattered petechial haemorrhages.
- ▶ **Best sample for analysis**: the **spleen**, because it holds the highest cyanide concentration.
- ▶ Preserve blood in **fluoride**; send the lung intact in a **nylon bag**, never plastic.
- ▶ Cyanide can also form after death from microbial action, confusing interpretation.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Mechanism of toxicity (flowchart):** CN^- binds Fe^{3+} of cytochrome oxidase → blocks the electron-transport chain → no ATP → anaerobic glycolysis → lactate → lactic acidosis.
- ▶ Side branches: rhodanese + thiosulphate → thiocyanate (excreted); nitrites → methaemoglobin → cyanmethaemoglobin (frees the enzyme).
- ▶ **Three-step antidote diagram:** three linked boxes — amyl nitrite (inhaled), sodium nitrite IV, sodium thiosulphate IV.

Medico-legal significance

- ▶ **Manner of death is most often accidental** — fires, laboratory handling, jewellers using a KCN gold-stripping solution, or eating bitter almonds.
- ▶ **Suicide** is common among those with easy access — chemists, photographers, jewellers, laboratory workers.
- ▶ **Homicide is rare** — the odour and rapid action tend to betray the poisoner.
- ▶ **Judicial execution** (some US states): the gas-chamber method drops sodium cyanide into sulfuric acid to generate HCN gas.
- ▶ **Secondary poisoning risk:** vomitus from a salt-poisoned victim can release HCN gas, so autopsy and rescue personnel must wear protective equipment.
- ▶ An unnatural or suspicious poisoning death needs a **police inquest under Section 174 CrPC 1973 (now Section 194 BNSS 2023)**, or a **magistrate's inquest under Section 176 CrPC 1973 (now Section 196 BNSS 2023)**.
- ▶ Causing hurt by poison with criminal intent is punishable under **Section 328 IPC 1860 (now Section 123(g) BNS 2023)**.
- ▶ If death results, it becomes **culpable homicide or murder under Section 299/300 IPC 1860 (now Section 100/101 BNS 2023)**, punishable under **Section 304/302 IPC 1860 (now Section 105/103 BNS 2023)**.
- ▶ Negligent handling of a poisonous substance is punishable under **Section 284 IPC 1860 (now Section 286 BNS 2023)**.
- ▶ Sale of noxious food or drink is punishable under **Section 274 IPC 1860 (now Section 275 BNS 2023)**.
- ▶ **Doctor's duty:** resuscitate the patient first, then collect, preserve and seal evidence (vomitus, blood, urine, viscera, any suspect container).
- ▶ Hand the evidence to police against a signed receipt and maintain the **chain of custody**.
- ▶ Preserve viscera in **saturated common-salt solution**, never rectified spirit or formalin, because these destroy or already contain cyanide.
- ▶ Give the final opinion only after the Forensic Science Laboratory toxicology report.

♦ ♦ ♦

Decontamination of ingested poisons

Asked in: Paper III Oct 2017 — RGUHS MD Forensic Medicine

Definition and concept

- ▶ **Gastrointestinal (GI) decontamination** means removing an ingested poison from the gut, or reducing its absorption, before it reaches the bloodstream.
- ▶ It is the second of the **four pillars of poisoning management**: supportive care, decontamination, antidotes, enhanced elimination.
- ▶ Methods: induced emesis, gastric lavage, activated charcoal, cathartics, whole-bowel irrigation, gut antidotes, rarely endoscopic/surgical removal.
- ▶ Decontamination is **no longer routine** — used only when the patient presents early, the ingestion is serious, and benefit outweighs risk.
- ▶ **Most poisoned patients recover with supportive care alone** (the *Scandinavian method*, from severe barbiturate poisoning in the late 1940s).

General principles before decontaminating

- ▶ **Stabilise first** using ABCD: Airway, Breathing, Circulation, and correction of central nervous system Depression.
- ▶ Put a depressed patient in the **recovery position** so the tongue does not block the airway.
- ▶ **Decontamination must never delay resuscitation.**
- ▶ Take a focused history: what, how much, when, and the manner of poisoning.
- ▶ **Timing is the single most important factor** — after about **1 hour** most soluble poison is already absorbed, so benefit is small.
- ▶ Match the method to the poison — corrosives, hydrocarbons, and convulsants each rule out one or more methods.

1. Induced emesis

- ▶ Provokes vomiting to expel stomach contents.
- ▶ **Now virtually obsolete** — used only where no other facility exists, in a fully conscious patient lying on the side, head dependent.
- ▶ **Agent: Syrup of ipecac**, 30 mL in adults (lower doses in children).
 - Gives vomiting in **90–95% within 20–30 minutes**.
 - May repeat once if no vomiting after half an hour.
- ▶ **Obsolete and dangerous**: apomorphine, copper sulphate, zinc sulphate, saturated salt solution — salt water can cause fatal hypernatraemia.
- ▶ **Contraindications**: corrosives, hydrocarbons, falling consciousness, convulsant poisons, severe heart/lung disease, advanced pregnancy, very young or elderly patients.
- ▶ **Complications**: aspiration, *Mallory–Weiss tear*, *Boerhaave syndrome*, coma, seizures.

2. Gastric lavage (stomach wash)

- ▶ Washing out stomach contents through a tube; better for liquids than intact tablets, and now rarely routine.
- ▶ **Indications:** early presentation (within ~1 hour), very large or dangerous ingestions, and medico-legal cases needing contents for chemical analysis.
- ▶ **Apparatus:** the *Ewald/Boas tube* — a rubber tube ~1 cm × 1.5 m with a funnel and side-holed tip — is still common in India; the *Edlich* and *Lavacuator* are modern, less traumatic alternatives.
- ▶ **Procedure:**
 - Position the patient left-side or prone, head down (**Trendelenburg position**), so fluid cannot enter the airway.
 - Pass the lubricated tube to the 50-cm mark and confirm placement.
 - Preserve the first aspirate (~250 mL) for chemical analysis.
 - Instil warm water and siphon it out in 250-mL cycles until it returns clear.
- ▶ **Common lavage fluids:** warm water/saline (any poison), potassium permanganate (alkaloids, salicylates), sodium thiosulphate (cyanide), desferrioxamine (iron), castor oil (carbolic acid).
- ▶ **Late lavage stays useful, up to 12–18 hours**, for poisons that delay gastric emptying — salicylates, phenothiazines, tricyclics, barbiturates, morphine.
- ▶ It also helps in poisons with **enterohepatic circulation** (e.g. morphine, heroin), which re-enter the gut via bile even after parenteral poisoning.
- ▶ **Only absolute contraindication:** corrosive poisoning, except carbolic acid, due to perforation risk.
- ▶ **Relative contraindications:** convulsant poisons, coma, volatile poisons, oesophageal varices, hypothermia, bleeding disorders.
- ▶ **Complications:** aspiration pneumonitis (most dangerous), laryngeal spasm, perforation, arrhythmias, electrolyte disturbance.

3. Activated charcoal

- ▶ A fine black powder made by heating organic material without air, giving an enormous surface area (~1000 m²/g).
- ▶ **The single most useful GI decontaminant.**
- ▶ **Mechanism:** adsorbs poison onto its surface, drawing more poison from blood back into the gut (gut dialysis), and interrupts enterohepatic recycling.
- ▶ **Dose:** 50–100 g in adults (1 g/kg in children) as a slurry, given after gastric lavage.
- ▶ **MDAC (multiple-dose):** 50 g every 6 hours, for enterohepatic-recycling poisons — salicylates, phenobarbitone, theophylline, carbamazepine, phenothiazines, quinine.
- ▶ Use cautiously with drugs that slow gut movement (opioids, amitriptyline) — hardened charcoal masses can obstruct the bowel.
- ▶ **Not adsorbed — CLIME:** Corrosives/Cyanide, Lithium, Iron, Methanol/Metals, Ethanol/Ethylene glycol.

- ▶ **Not helpful** — **PHIALS**: Pesticides, Hydrocarbons/Heavy metals, Ileus, Acids/Alkalis/Altered consciousness, Lack of gag reflex, Seizures.
- ▶ Still given in **cyanide** (50 g binds >10 lethal doses) and **methanol** poisoning (binds co-ingested toxins).
- ▶ **Adverse effects**: black stools, constipation, vomiting, aspiration pneumonitis, intestinal obstruction.

4. Cathartics and whole-bowel irrigation

- ▶ **Cathartics are no longer routine** — they add nothing if charcoal already adsorbs the poison; if not, whole-bowel irrigation is preferred.
- ▶ Sorbitol or magnesium citrate may substitute when irrigation is unavailable. **Magnesium sulphate is avoided** — may cause CNS depression in renal failure.
- ▶ **Whole-bowel irrigation (WBI)** flushes the gut in 4–6 hours with a polyethylene-glycol electrolyte solution (PEG-ELS) via nasogastric tube, 0.5–2 L/hour, until effluent runs clear.
- ▶ **Indications**: poisons not adsorbed by charcoal (iron, lithium, heavy metals), sustained-release drugs, body packers carrying cocaine or heroin.
- ▶ **Contraindications**: bowel obstruction/perforation, ileus, GI bleeding, unprotected airway, intractable vomiting.

5. GI antidotes (mechanical and chemical)

- ▶ **Adsorbents**: activated charcoal; fuller's earth (Multani mitti) for paraquat.
- ▶ **Demulcents** coat the mucosa (milk, egg-white, aluminium hydroxide gel) — avoid fats/oils for organophosphates and phenol, which they help absorb.
- ▶ **Diluents** (water, milk) suit only corrosives/irritants, never drug tablets, where dilution speeds absorption.
- ▶ **Chemical antidotes** neutralise poison in the gut.
 - Weak alkalis (magnesium hydroxide, lime water) for acids; weak acids (vinegar, lemon juice) for alkalis — never swap the two.
 - Avoid bicarbonate — its CO₂ can rupture a weakened stomach.
 - Egg-white for mercuric chloride and copper.
 - Common salt for silver nitrate.
 - Lugol's iodine precipitates alkaloids, metals, quinine, and strychnine.
 - Potassium permanganate oxidises atropine, barbiturates, opium, and cyanides.
- ▶ The old "universal antidote" (charcoal + magnesium oxide + tannic acid) is **no longer recommended**.

6. Endoscopic / surgical removal

- ▶ Reserved for button batteries, body-packer drug packets, massive iron overdose (iron bezoars), retained metallic foreign bodies, and mechanical obstruction — gastroscopy/gastrotomy when other measures fail.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Gastric-lavage set-up:** funnel, rubber tube (1 cm × 1.5 m), 50-cm mark, side-holed distal tip, mouth gag, patient in left-lateral Trendelenburg position, siphon direction of flow.
- ▶ **Decision flowchart:** poison ingested → stabilise ABCD → corrosive/hydrocarbon? if yes, avoid lavage/emesis, dilute, supportive care → if no and seen early/serious, gastric lavage plus charcoal → not charcoal-adsorbable or sustained-release/body-packer? → whole-bowel irrigation → specific antidote plus enhanced elimination.

Medico-legal significance

- ▶ Preserve and hand over the **first lavage sample or vomitus** to the police in every poisoning case — suicidal, homicidal, or accidental — as primary evidence for the forensic toxicology laboratory.
- ▶ Seal and sign it on the medico-legal case (MLC) record, with the police officer's countersignature.
- ▶ A doctor is **legally bound to report** a suspected poisoning case; failure attracts **Section 211(b) BNS 2023** (formerly §176 IPC 1860) — up to six months' imprisonment, or ₹10,000 fine, or both.
- ▶ Destroying evidence attracts **Section 238 BNS 2023** (formerly §201 IPC 1860).
- ▶ Intentionally omitting to inform of an offence attracts **Section 239 BNS 2023** (formerly §202 IPC 1860) — six months' imprisonment or ₹5,000 fine, or both.
- ▶ If the patient dies, **do not issue a death certificate** — refer the body for medico-legal autopsy/inquest under **Section 174/176 CrPC 1973, now Section 194/196 BNSS 2023**.
- ▶ If seriously ill, record a **dying declaration** under **Section 32 IEA 1872, now Section 26 BSA 2023**.
- ▶ Decontamination is defensible only if **documented** — timing, consent/refusal, contraindications respected, and an unbroken chain of custody for samples.

♦ ♦ ♦

Define Vitriolage. What are the causative agents? Describe one of them*Asked in: Paper III Oct 2019 — RGUHS MD Forensic Medicine***Definition**

- ▶ **Vitriolage** is throwing a corrosive substance over a person's body, usually the face.
- ▶ Also called **vitriol throwing, acid throwing, or an acid attack**.
- ▶ The intent is to **disfigure or injure**, not to kill.
- ▶ The motive is usually jealousy, hatred, or revenge.
- ▶ The name comes from *vitriol*, the old name for concentrated sulphuric acid.
- ▶ *Vitriolage* literally means "throwing the oil of vitriol."
- ▶ It is medico-legally a form of **grievous hurt**.
- ▶ It is also a specific statutory offence under **Section 124 BNS 2023** (earlier Sections 326A and 326B IPC 1860).

Salient features

- ▶ **Agent:** usually a strong mineral acid, classically concentrated sulphuric acid (H_2SO_4).
- ▶ **Target site:** the face is the classic target.
- ▶ Eyes, neck, chest, hands, and forearms are also hit, since victims raise their arms to ward off the splash.
- ▶ **Intent:** to disfigure/maim, not kill — this makes vitriolage a homicidal/assaultive corrosive exposure.
- ▶ This differs from corrosive poisoning, which is usually suicidal or accidental.
- ▶ **Typical perpetrator:** a rejected suitor acting against the woman who refused him.
- ▶ Enmity, rivalry, rioting, and revenge are other motives.
- ▶ **Method:** the corrosive is filled into an empty light bulb and thrown, or sprayed from a *pichkari* (spray gun).
- ▶ The assailant often escapes on a moving motorcycle.
- ▶ **Outcome:** permanent facial disfigurement.
- ▶ Complications include blindness, a melted nose with closed nostrils, shrivelled ears, and joint contractures.
- ▶ Death can follow from shock, toxæmia, or secondary septicaemia.

Causative (corrosive) agents

A corrosive destroys tissue by extracting water, coagulating proteins, and converting haemoglobin to haematin.

Group	Examples
Strong mineral acids	Sulphuric acid (commonest), nitric acid, hydrochloric acid
Strong alkalis	Caustic soda, caustic potash, ammonia
Corrosive salts	Corrosive sublimate (mercuric chloride)
Irritant plant juices	Marking-nut juice, calotropis (madar)

- ▶ Nitric acid leaves characteristic **yellow** staining on tissue, teeth, and clothing.
- ▶ Alkalis cause deeper **liquefactive necrosis**, so they penetrate further than acids.
- ▶ **Concentrated sulphuric acid is by far the commonest agent** used in vitriolage.

Sulphuric acid — the classic agent

- ▶ **Appearance:** pure acid is colourless; the commercial form is brown/dark from impurities.
- ▶ It is acrid-smelling, oily, non-fuming, and hygroscopic.
- ▶ It is about twice as dense as water (specific gravity ≈ 1.84 for 95% acid).
- ▶ It chars organic matter on contact.
- ▶ It is also called *Babcock acid*.
- ▶ **Battery acid** is a dilute (30–35%) form that is cheap and commonly used in attacks.

- ▶ **Mechanism:** contact with moist tissue triggers an exothermic reaction.
- ▶ Heat plus corrosion produces **coagulative necrosis**.
- ▶ A hard crust (**eschar**) forms and limits deeper penetration.
- ▶ Hydrogen ions are neutralised quickly, so the injury stays largely superficial (unlike alkalis).
- ▶ Superficial burns appear within about 1 second; full-thickness burns within about 30 seconds.
- ▶ Absorbed acid can still cause systemic metabolic acidosis and haemolysis.
- ▶ **If swallowed:** pharyngeal pain, dysphagia, salivation, and epigastric pain occur.
- ▶ Vomit looks brownish-black, like coffee grounds (acid haematin).
- ▶ Brown/black streaks run from the corners of the mouth to the chin and neck (acid run-off).
- ▶ The teeth turn chalky-white.
- ▶ The mind stays clear until death.
- ▶ **Fatal dose:** 5–10 mL (Reddy) or 10–15 mL (Aggrawal) of concentrated acid.
- ▶ **Fatal period:** 12–24 hours.
- ▶ **Causes of death (immediate):** circulatory collapse, glottic oedema/spasm causing asphyxia, and collapse from gastric perforation.
- ▶ Perforation is commonest with sulphuric acid among the corrosives.
- ▶ **Causes of death (delayed):** hypostatic pneumonia, renal failure, secondary infection, and starvation from oesophageal stricture.
- ▶ **On skin:** intense burning pain and immediate corrosion.
- ▶ Burns penetrate deeply and heal with contracting scars.
- ▶ **On eyes:** corneal oedema/ulceration, iridocyclitis, and necrotising keratitis, which can cause blindness.
- ▶ **Postmortem (oral ingestion):** lips, chin, mouth angles, and hands show corrosion.
- ▶ Necrotic areas are first greyish-white, then turn brown/black and leathery.
- ▶ The stomach is worst affected along the lesser curvature (*magenstrasse*) and pyloric region.
- ▶ It can become a soft, spongy, black mass that disintegrates on touch.
- ▶ **First aid — skin:** remove contaminated clothing/jewellery and wash copiously with cool running water.
- ▶ Then apply magnesium oxide/carbonate paste (milk is no longer advised, since souring makes it acidic).
- ▶ **First aid — eyes:** wash and irrigate with dilute (1%) sodium bicarbonate, then instil castor/olive oil.
- ▶ Antibiotics are given for corneal ulcers.
- ▶ **First aid — ingestion:** supportive ICU care and demulcents.
- ▶ Early flexible endoscopy (within 12 hours, not after 24 hours) grades the injury.
- ▶ Oral carbonates/bicarbonates are avoided, since the CO₂ they release can rupture the stomach.
- ▶ **Chemical identification:** turns blue litmus red.
- ▶ Gives a white precipitate (barium sulphate) with barium chloride/nitrate.

- ▶ Chars organic matter such as cotton.
- ▶ Stomach contents are the best autopsy sample, since free acid may not persist beyond about 2 days.
- ▶ Clothing and plain-water skin swabs are also sent to the Forensic Science Laboratory (FSL).

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Face of an acid-attack victim** — label the site of impact, brown/black run-off streaks from the mouth angles to the chin and neck, destroyed/closed eyes, melted nose with closed nostrils, shrivelled ears, and a contracting neck scar.
- ▶ **Stomach in sulphuric-acid poisoning** — label the soft, spongy, blackened wall, maximal damage along the lesser curvature (*magenstrasse*) and pylorus, the relatively spared oesophagus, and a perforation site (source of chemical peritonitis).

Medico-legal significance

- ▶ Vitriolage is a **medico-legal case (MLC)**: the police must be informed.
- ▶ The medico-legal report is prepared only after obtaining the victim's consent.
- ▶ The size, site, and pattern of burns must be documented and photographed.
- ▶ **Evidence for the FSL**: the victim's clothing and plain-water swabs of affected skin.
- ▶ At the scene: spilt corrosive on the ground/walls/vehicle, and broken glass from the thrown bulb (its residue should match the corrosive found on the victim).
- ▶ The perpetrator can sometimes be traced by tell-tale tear-drop acid burns on his own neck or forearm.
- ▶ Vitriolage amounts to **grievous hurt** under **Section 116 BNS 2023 (Section 320 IPC 1860)** — e.g. permanent loss of sight or facial disfigurement.
- ▶ Causing such injury is a specific offence under **Section 124(1) BNS 2023 (Section 326A IPC)** — punishable with 10 years to life imprisonment plus a fine payable to the victim for treatment.
- ▶ Throwing or attempting to throw acid is punishable under **Section 124(2) BNS 2023 (Section 326B IPC)** — 5 to 7 years plus fine.
- ▶ Under **Section 397 BNSS 2023 (Section 357C CrPC 1973)**, every hospital, government or private, must give free first-aid/treatment to acid-attack (and rape) victims and inform the police.
- ▶ A doctor who refuses such treatment is punishable under **Section 200 BNS 2023 (Section 166B IPC 1860)**.
- ▶ Following the *Laxmi Agarwal* petition, the **Supreme Court (2013)** restricted over-the-counter acid sale — no sale to persons under 18, and photo-ID plus a logbook are required.
- ▶ Acid-attack survivors are also protected under the **Rights of Persons with Disabilities Act, 2016**.

♦ ♦ ♦

Describe a) Laughing gas and b) Tear gases and give Medico Legal aspects of them

Asked in: Paper III Apr 2022 — RGUHS MD Forensic Medicine

Definition

- ▶ **Laughing gas** is the common name for **nitrous oxide** (N_2O).
- ▶ It is a colourless, non-flammable, sweet-smelling gas.
- ▶ It is used as an inhalational anaesthetic/analgesic in surgery and dentistry.
- ▶ It is also abused recreationally for its euphoriant and dissociative effects.
- ▶ **Tear gases (lachrymators)** are non-lethal chemicals that irritate the corneal nerves.
- ▶ They cause tearing, pain, forced eyelid closure and mucous-membrane irritation.
- ▶ They form one class of **war gases / riot-control agents** — the main agents are CN, CS, CR and OC (pepper spray).

A) Laughing gas (Nitrous oxide, N_2O)

- ▶ **Nature:** colourless, non-flammable gas with a faintly sweet smell and taste.
- ▶ Called *laughing gas* for its euphoriant effect; old nickname "*sweet air*".
- ▶ Used in surgery/dentistry as an anaesthetic-analgesic, and recreationally as a dissociative agent.
- ▶ **Pharmacokinetics:** N_2O is about **35 times more soluble in blood than nitrogen**.
- ▶ This lets it diffuse rapidly into any gas-filled body cavity.
- ▶ It **expands compliant air spaces** (e.g. bowel distension).
- ▶ It **raises pressure in non-compliant spaces** (e.g. rupturing the eardrum).
- ▶ It can make an existing **pneumothorax expand rapidly**.

Toxic dose and clinical features

- ▶ **40% N_2O** in inspired air causes sedation and confusion.
- ▶ **80% N_2O** causes loss of consciousness.
- ▶ **CNS effects:** sedation, confusion, seizures, increased muscle tone, dilated pupils.
- ▶ **Respiratory effects:** hypoventilation and respiratory depression.
- ▶ **Cardiovascular effects:** hypertension that can progress to collapse.
- ▶ **Fatal mechanism:** simple (anoxic) asphyxia, when N_2O displaces oxygen in a closed space or a faulty breathing circuit.
- ▶ It is also classed as a cause of **pericellular histotoxic anoxia** — cell-membrane permeability falls and blocks oxygen uptake.
- ▶ **Chronic abuse** inactivates **vitamin B₁₂**, blocking the enzyme methionine synthase.
- ▶ This produces **subacute combined degeneration / myeloneuropathy** (a demyelinating nerve disorder) and megaloblastic marrow changes.

Treatment

- ▶ Remove immediately from the source of exposure.
- ▶ Give **oxygen** for hypoxia.

- ▶ Treat raised intracranial pressure if present (head elevation, mannitol).
- ▶ Give **vitamin B₁₂ and folic acid** for the neurological complications.
- ▶ Support with anticonvulsants for seizures and continuous ECG/haemodynamic monitoring.

B) Tear gases (Lachrymators)

- ▶ A **lachrymator** is a non-lethal chemical that stimulates the corneal nerves.
- ▶ It causes tearing, pain, temporary blindness and irritation of other mucous membranes.
- ▶ **War gases are classified two ways:**
 - **By persistence:** *non-persistent* agents dissipate quickly and make good riot-control agents.
 - *Persistent* agents (e.g. mustard gas, lewisite) linger and are poor riot-control agents.
 - **By physiological action** (mnemonic VALSHoN):
 - Vesicants — blistering agents
 - Asphyxiants — lung irritants
 - Lachrymators — tear gases
 - Sternutators — nasal irritants
 - Nerve gases
- ▶ The French were the first to use tear gas as a chemical weapon, in World War I.

Clinical features

- ▶ Burning sensation in the eyes, nose and throat.
- ▶ Immediate, forceful, involuntary closure of the eyes (**blepharospasm**).
- ▶ Profuse **lacrimation** (streaming tears).
- ▶ **Coughing** and copious **rhinorrhoea**.
- ▶ Effects are usually transient and settle on reaching fresh air.

Key tear-gas agents

- ▶ **CN** (chloroacetophenone, sold as "*Mace*"):
 - Supplied to police in a small pressurised aerosol can.
 - Can cause syncope, disorientation and allergic dermatitis.
 - At high concentration: corneal damage and chemosis (conjunctival swelling).
 - Rarely causes **death from pulmonary injury**.
 - Largely replaced by CS and pepper spray because of its higher toxicity.
- ▶ **CS** (*ortho*-chlorobenzylidene malononitrile):
 - First made in **1928** by Corson and Stoughton — hence the name "CS".
 - The **most popular** tear gas: strong effect, low toxicity.
 - Metabolised to **cyanide**; rarely linked to miscarriage or chromosomal change.
 - Treat skin exposure by washing with **5% sodium bisulfite**.
- ▶ **CR** (dibenzoxazepine):
 - Developed by the British Ministry of Defence in the late 1950s–early 1960s.
 - About 6–8 times more potent than CS.

- ▶ **OC** (oleoresin capsicum, "pepper spray"):
 - Active ingredient is **capsaicin**.
 - Generally non-lethal, but rarely can be fatal.
- ▶ **Wartime lachrymators** (WWI/WWII): acrolein, benzyl bromide, bromoacetone, bromobenzyl cyanide (BBC) and ethyl iodoacetate (KSK).

Treatment of tear-gas exposure

- ▶ Remove to fresh air.
- ▶ **Irrigate the eyes copiously** with water or normal saline.
- ▶ Boric-acid eyewash for irritant exposure.
- ▶ Remove and wash contaminated clothing.
- ▶ For CS specifically, wash the skin with 5% **sodium bisulfite**.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Classification chart (VALSHoN)**: root box "War gases / Riot-control agents" branching by persistence (non-persistent / persistent) and by physiological action into five boxes — Vesicants, Asphyxiants, Lachrymators (CN, CS, CR, OC), Sternutators, Nerve gases. Add a side-box for nitrous oxide labelled "asphyxiant / anaesthetic".
- ▶ **Labelled eye diagram**: cornea, conjunctiva, lacrimal gland and nasolacrimal duct, with arrows showing corneal-nerve stimulation leading to lacrimation, blepharospasm, conjunctival injection and rhinorrhoea.

Medico-legal significance

- ▶ **Nitrous oxide deaths**:
 - Rare, but can follow an overdose, a hypoxic gas mixture, or contamination with nitric oxide.
 - The term "anaesthetic death" is best avoided since it pre-judges the anaesthetist.
 - The **death certificate must not be issued** in such cases.
 - The surgeon must inform the police, and an autopsy is mandatory.
 - At autopsy, all devices — airway tubes, chest tubes, catheters, cannulae, drains — must be left **in situ**, not removed, so the pathologist can trace them.
 - The gas apparatus and gas-mixing settings should be checked, ideally with an **independent anaesthetist and surgeon** from another hospital on the team.
 - Abuse can cause fatal anoxic asphyxia in enclosed spaces, or chronic myeloneuropathy from vitamin B₁₂ loss.
- ▶ **Tear-gas deaths**:
 - Riot/crowd-control use is legitimate non-lethal force, but excessive or confined-space use causes serious morbidity and occasional death.
 - Custodial or crowd-control deaths raise allegations of excessive force.
 - CN can rarely kill via pulmonary injury.
 - CS releases cyanide on metabolism, relevant in confined-space deaths.

- Use as a weapon of war engages international law and needs FSL identification of the agent.
- **Inquest and reporting duties (apply to both):**
 - Unnatural or operative deaths need a **police inquest** — Section 174 CrPC 1973 (now Section 194 BNSS 2023).
 - Or a **magistrate inquest** — Section 176 CrPC 1973 (now Section 196 BNSS 2023).
 - Under BNSS, the police inquest report (panchnama) must reach the District/Sub-Divisional Magistrate within 24 hours.
 - A doctor who fails to inform the police in a medico-legal case is liable under **Section 176 IPC 1860 (now Section 211 BNS 2023)** — omission to give information to a public servant.
 - Issuing a **false medical or death certificate** is an offence under **Section 197 IPC 1860 (now Section 234 BNS 2023)**.
 - Chemical-weapon use is barred by the **Chemical Weapons Convention (CWC) 1993**, in force from 29 April 1997.
 - India implements the CWC through the **Chemical Weapons Convention Act, 2000**.



Describe clinical features, treatment, Post Mortem appearance and Medico Legal aspects of ENDRINE poisoning

Asked in: Paper III Oct 2019 — RGUHS MD Forensic Medicine

Introduction

- Endrin is an **organochlorine (chlorinated-hydrocarbon)** insecticide of the cyclodiene group.
- It is the **stereoisomer** of dieldrin.
- It is the **most toxic** of the polychlorinated hydrocarbons — about 3 times as toxic as aldrin/dieldrin.
- It is roughly **10 times more toxic** than DDT when ingested.
- Its very broad insecticidal action earned it the name "**plant penicillin**."
- It is a **CNS stimulant** that produces convulsions and death.
- It is a common **suicidal and accidental agricultural poison** in India.
- It is now **banned in India** and several other countries.

Physico-chemical nature and mechanism

- A colourless-to-off-white solid with a **bitter taste**; melting point 245°C.
- **Insoluble in water**; soluble in aromatic hydrocarbons and ketones.
- **Highly lipid-soluble** — it accumulates in body fat, which matters for sample collection later.
- Sold under brand names such as **Endrex, Tafdrin, Endrin-We-16**, mixed with petroleum hydrocarbons.
- This mixing gives products a characteristic **kerosene-like odour** — a key clinical and autopsy clue.

- ▶ Absorbed by **ingestion, inhalation, and through skin/mucous membranes**; skin absorption rises when mixed with oil.
- ▶ Unlike DDT or dieldrin, **endrin is rapidly metabolised and does not persist for long in body fat**.
- ▶ **Mechanism**: it binds open **sodium (Na^+) channels** and slows their inactivation.
- ▶ This causes sustained sodium influx, **neuronal depolarisation, and repetitive firing**.
- ▶ The result is **CNS hyperexcitability** — tremors and convulsions.

Clinical features

- ▶ **Onset**: symptoms begin within **1–6 hours** of exposure.
- ▶ On an empty stomach, seizures can appear within **1–2 hours**.
- ▶ A **generalised seizure may be the first sign**, with no warning prodrome.
- ▶ **Gastrointestinal**: salivation, nausea, vomiting, abdominal pain.
- ▶ **Respiratory**: hoarseness, coughing, **froth at the mouth and nose**, breathlessness.
- ▶ **Neurological (dominant feature)**: headache, giddiness, restlessness, **dilated pupils**.
- ▶ Also incoordination, **ataxia**, mental confusion, and **tremors**.
- ▶ These progress to **tonic-clonic convulsions**, then **status epilepticus** (repeated seizures without recovery in between).
- ▶ This can end in **coma and death from respiratory failure**.
- ▶ **Hyperthermia** may occur from increased muscle activity or aspiration pneumonitis.
- ▶ **Prognosis**: most survivors recover within **24 hours**.
- ▶ Survivors of the acute phase may go on to develop **liver and kidney damage**.
- ▶ **Chronic (occupational) poisoning**: weight loss, weakness, ataxia, tremors, and mental changes.
- ▶ Also **oligospermia** (reduced sperm count).
- ▶ Long-term exposure raises the risk of **leukaemia, purpura, aplastic anaemia, and liver cancer**.

Treatment

- ▶ There is **no specific antidote**.
- ▶ Management rests on decontamination, supportive care, enhanced elimination, and seizure control.
- ▶ **Protect the rescuer**: staff wear apron and gloves before handling the patient; move the patient to fresh air.
- ▶ **Skin decontamination**: remove all clothing and leather articles (leather retains the pesticide).
- ▶ Wash the whole body head-to-toe with copious water and soap.
- ▶ **Gut decontamination**: gastric lavage, preferably with **2% potassium permanganate**.
- ▶ Also give emetics/cathartics and **activated charcoal**.
- ▶ **Enhanced elimination**: **cholestyramine 4 g four times a day (16 g/day) for about 2 weeks**.
- ▶ Cholestyramine binds bile acids and raises faecal excretion of the organochlorine.
- ▶ **Supportive care**: maintain airway, breathing, and circulation; give oxygen or ventilate as needed.

- ▶ **Convulsions:** control with **diazepam** (thiopentone sodium is an alternative); calcium gluconate is also used.
- ▶ **Hyperthermia:** active cooling measures.
- ▶ **Altered sensorium:** give the coma cocktail — **dextrose, naloxone, and thiamine**.
- ▶ **Avoid adrenaline** — it increases myocardial irritability and can provoke ventricular arrhythmias.
- ▶ **Avoid atropine and oil-based cathartics** (the latter increase absorption).
- ▶ **Haemodialysis and haemoperfusion are ineffective.**

Post-mortem appearance

- ▶ **Mouth and stomach contents smell of kerosene** — the hallmark finding.
- ▶ **Blood-stained frothy fluid** at the mouth and nose.
- ▶ **Signs of asphyxia:** congestion, cyanosis, and petechial (pinpoint) haemorrhages.
- ▶ **Pupils dilated.**
- ▶ **Stomach** congested with a kerosene smell.
- ▶ **Lungs congested and oedematous;** other internal organs also congested.
- ▶ **Liver shows centrilobular hepatic necrosis** — death of liver cells around the central vein of each lobule.
- ▶ **Endrin resists putrefaction** and can be detected in the viscera long after death, even in decomposed bodies.
- ▶ Because it is lipophilic, **preserve fat** (abdominal wall/perinephric) along with viscera for chemical analysis.
- ▶ Alcohol ("toddy") is sometimes used to mask the kerosene smell, so **preserve viscera in saturated sodium chloride solution**, not rectified spirit.

Medico-legal significance

- ▶ **Suicide is very common** — endrin is cheap and easily available on farms.
- ▶ **Accidental deaths occur during spraying** (occupational exposure) and from food contamination.
- ▶ **Homicide is rare**, owing to the strong kerosene smell and bitter taste, but it has occurred when mixed into food, sweets, or alcohol/toddy.
- ▶ **The 1967 Qatar–Saudi Arabia outbreak** — bread made from endrin-contaminated flour — caused 874 hospitalisations and 26 deaths.
- ▶ Any suspected poisoning **must be reported to the police**; the treating doctor is not competent to decide the manner of death.
- ▶ Police inquest into an unnatural/suspicious death: **Section 174 CrPC 1973 (now Section 194 BNSS 2023)**.
- ▶ Magistrate's inquest: **Section 176 CrPC 1973 (now Section 196 BNSS 2023)**.
- ▶ Duty of the public/doctor to give information of the offence: **Section 39 CrPC 1973 (now Section 33 BNSS 2023)**.
- ▶ Failure to inform is punishable under **Section 176 IPC (now Section 211 BNS 2023)**.

- ▶ Giving false information is punishable under **Section 177 IPC (now Section 212 BNS 2023)**.
- ▶ Concealing information of an offence is punishable under **Section 202 IPC (now Section 239 BNS 2023)**.
- ▶ Prepare a **medico-legal case (MLC) report** in three copies (police, patient, hospital); mark "MLC" boldly on the case file.
- ▶ Obtain consent for examination; **Section 53 CrPC (now Section 51 BNSS 2023)** allows examining an arrested accused even without consent.
- ▶ **Collect, seal, and label** vomitus, gastric-lavage fluid, blood, urine, stomach contents, and the container; hand these to police against signature.
- ▶ Arrange a **dying declaration** before a Magistrate once the patient is certified *compos mentis* (mentally fit).
- ▶ Dying declaration is admissible under **Section 32 Indian Evidence Act 1872 (now Section 26 Bharatiya Sakshya Adhiniyam 2023)**.
- ▶ The doctor's/chemical examiner's expert opinion is admissible under **Section 45 Indian Evidence Act 1872 (now Section 39 Bharatiya Sakshya Adhiniyam 2023)**.
- ▶ If the patient dies or is brought dead, **do not issue a death certificate**; send the body for medico-legal autopsy.
- ▶ Viscera are preserved and sent to the **Forensic Science Laboratory (FSL)**; the cause/manner opinion is given only after the chemical report.
- ▶ Medico-legal records are kept for **10 years** or until the court case is disposed of.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Mechanism flow diagram:** show endrin binding the open Na^+ channel and slowing its inactivation, causing sustained sodium influx, then neuronal depolarisation and repetitive firing, then CNS stimulation progressing through tremors, tonic-clonic convulsions, status epilepticus, and respiratory failure ending in death.
- ▶ **Annotated autopsy schematic:** a body/torso outline labelled with kerosene smell at the mouth and stomach, blood-stained froth at the mouth and nose, dilated pupils, signs of asphyxia, congested oedematous lungs, centrilobular hepatic necrosis in the liver, congested internal organs, and a note to preserve fat and viscera in saturated NaCl.

♦ ♦ ♦

Describe clinical features, treatment, post mortem appearance and Medico Legal aspects of HCN poisoning

Asked in: Paper III Apr 2022 — RGUHS MD Forensic Medicine

Definition

- ▶ Hydrogen cyanide (HCN) and its salts are **systemic (chemical) asphyxiants**.
- ▶ They let oxygen reach the tissues but block the tissues from using it — called **histotoxic anoxia**.
- ▶ Cyanide exists in three forms: the gas **hydrogen cyanide (HCN)**, the liquid **hydrocyanic acid (prussic acid)**, and solid salts (**NaCN, KCN** and others).

- ▶ HCN is one of the **fastest-acting poisons known**, capable of killing within minutes.

Physical properties and sources

- ▶ **Odour:** a characteristic *bitter-almond* smell.
- ▶ **20–40% of people (mostly males) cannot smell it** — an inherited trait, so a doctor may miss the clue.
- ▶ **Plant sources:** cyanogenic glycosides release cyanide on breakdown — *amygdalin* (bitter almonds, apricot, peach, cherry kernels), *dhuririn* (sorghum), *linamarin* (cassava).
- ▶ **Industrial sources:** electroplating, gold/silver extraction, photography, pesticide manufacture.
- ▶ **Combustion sources:** burning wool, nylon and plastics in building fires.
- ▶ **Absorption** is very rapid through the lungs, gut and even intact skin.
- ▶ Ingested salts react with stomach acid to release HCN, so **act more slowly than inhaled gas**.
- ▶ Cyanide is detoxified by the enzyme **rhodanese** (liver and kidney) into non-toxic **thiocyanate**, excreted in urine.

Mechanism of action

- ▶ Cyanide binds the **ferric (Fe^{3+}) ion of cytochrome oxidase**, the terminal enzyme of the mitochondrial electron transport chain.
- ▶ This blocks **oxidative phosphorylation**, so cells cannot generate ATP aerobically.
- ▶ Cells switch to anaerobic glycolysis, producing **lactic acid** and a severe **anion-gap metabolic acidosis**.
- ▶ Oxygen is delivered but not consumed, so **venous blood stays bright red** — the basis of the bright-red skin and retinal veins seen in poisoning.
- ▶ Cyanide also inhibits other Fe^{3+} enzymes and injures neurons via lipid peroxidation.

Clinical features

- ▶ Speed depends on the route: **inhaled gas acts almost instantly; ingested salts act more slowly**.
- ▶ **Severe inhalation:** throat/chest constriction, giddiness, instant loss of consciousness, convulsions, death within seconds to minutes.
- ▶ **Ingestion, CNS effects:** anxiety, headache, confusion, then stupor, convulsions, coma.
- ▶ **Cardiovascular:** early hypertension with reflex bradycardia; later hypotension, tachycardia and collapse.
- ▶ **Respiratory:** early tachypnoea and dyspnoea; late respiratory depression.
- ▶ **Cyanosis appears only very late**, just before death.
- ▶ **Eyes:** pupils dilated and unreactive; retinal arteries and veins equally bright red.
- ▶ **Skin:** characteristic bright (brick) red skin and mucous membranes.
- ▶ After an intermediate dose, the victim may briefly perform **voluntary acts** (corking the bottle, walking a few steps) before collapsing — this can wrongly suggest homicide.
- ▶ **Massive doses** cause sudden collapse with no voluntary act, and prompt death.
- ▶ **Blood cyanide levels:** below 0.5 $\mu\text{g/mL}$ causes no symptoms; above 3 $\mu\text{g/mL}$ is usually fatal.

- ▶ **Chronic exposure** (smokers, cassava eaters) can cause optic neuropathy and **spastic paraparesis (Konzo)**; acute survivors may later develop delayed **Parkinsonian features**.

Fatal dose and fatal period

Form	Fatal dose	Fatal period
Hydrocyanic acid (liquid)	50–60 mg	2–10 minutes
Sodium/potassium cyanide (salt)	200–300 mg	~30 minutes
HCN gas (inhaled, 1:2000 conc.)	—	Seconds to minutes

Treatment

- ▶ Treatment must begin **immediately** — priorities are **100% oxygen, antidotes, then decontamination**.
- ▶ Staff must protect themselves (gown, gloves, eyewear) — the patient and vomitus can emit HCN (**secondary poisoning**).
- ▶ **Mouth-to-mouth resuscitation must never be attempted.**
- ▶ **Stabilisation:** clear the airway, give 100% humidified oxygen, secure IV access, correct acidosis with bicarbonate, and give diazepam for seizures.
- ▶ **Antidote kit (Lilly cyanide kit) — three sequential steps:**
 - **Amyl nitrite:** a crushed perle inhaled, as a temporising measure until IV access is ready.
 - **Sodium nitrite:** 10 mL of 3% solution given IV slowly over 5–10 minutes.
 - **Sodium thiosulphate:** 50 mL of 25% solution given IV slowly over about 15 minutes.
- ▶ **How the antidotes work:**
 - Nitrites convert haemoglobin to **methaemoglobin**, which binds cyanide and frees cytochrome oxidase.
 - Methaemoglobin must be kept **below 25%** — too much nitrite is itself lethal.
 - Thiosulphate donates sulphur so rhodanese can convert cyanide into harmless thiocyanate.
- ▶ **Alternative / direct-binding antidotes:**
 - **Hydroxocobalamin** binds cyanide directly and is relatively safe.
 - **Dicobalt edetate** chelates cyanide directly but is reserved for confirmed poisoning (risk of severe allergic-type reactions).
- ▶ **Decontamination (after antidotes):** remove clothing, wash the skin, gastric lavage, and activated charcoal.
- ▶ **Induced vomiting is contraindicated** — it risks sudden seizures or coma.

Post-mortem appearance

- ▶ **Precautions:** autopsy staff wear masks and work in the open or under an exhaust, to avoid secondary poisoning.
- ▶ **Open the cranial cavity first** — the bitter-almond odour is best appreciated in the brain before it dissipates.

► **External findings:**

- Bitter-almond odour from the body.
- **Post-mortem lividity is bright (cherry/brick) red**, because the blood stays oxygenated.
- Eyes prominent and glistening, pupils dilated.
- Jaws firmly closed; blood-stained froth at the mouth and nostrils.

► **Internal findings:**

- **Stomach:** mucosa congested and haemorrhagic (crimson to brown); may contain cherry or almond kernels.
- **Lungs, brain, blood:** oedema and petechial (pinpoint) haemorrhages, generalised visceral congestion; blood stays bright oxygenated red throughout.

► **Specimens:** blood (preserved with **sodium fluoride**), stomach contents, and viscera — liver, kidney, brain, lung sealed in a nylon bag.

► **Spleen is the best specimen** — it has the highest cyanide concentration.

► HCN is **volatile**, so specimens must be sealed and analysed promptly, or the cyanide is lost.

► The **Lee–Jones test** on gastric aspirate can screen for cyanide — a positive test turns greenish-blue.

Medico-legal significance

► Poisoning is mostly **accidental** — building fires, bitter-almond ingestion, laboratory mishandling, and gold-stripping by **jewellers** using KCN.

► **Suicide** is common — a classic "quick" agent for chemists, photographers and lab workers with access.

► **Homicide is rare**, because of the strong odour and rapid action.

► The **Rasputin** case illustrates *achlorhydria*: KCN-laced cakes failed to kill him because chronic alcoholism had abolished his gastric acid.

► **Pitfalls for the doctor:**

- The brief voluntary-act phase after ingestion may wrongly suggest homicide.
- The odour is missed by 20–40% of examiners.
- Fire victims may show cyanide from burnt clothing, not foul play.
- Cyanide may be generated after death by microbial action.

► **Embalming with formaldehyde destroys cyanide**, so autopsy must precede embalming.

► An unnatural or suspicious poisoning death requires a police or magistrate inquest under **Section 174/176 CrPC 1973 (now Section 194/196 BNSS 2023)**.

► Administering poison with intent to cause hurt is punishable under **Section 328 Indian Penal Code 1860 (now Section 123 Bharatiya Nyaya Sanhita 2023)**.

► The autopsy report and testimony are expert evidence under **Section 45 Indian Evidence Act 1872 (now Section 39 Bharatiya Sakshya Adhiniyam 2023)**.

► **Doctor's duties:** resuscitate first, preserve viscera correctly, record the odour and lividity, and report the death for inquest.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Mechanism diagram:** mitochondrial electron transport chain with a CN^- ion blocking cytochrome oxidase (Fe^{3+}). Labels: oxidative phosphorylation halted, anaerobic glycolysis, lactic acidosis, histotoxic anoxia, venous blood staying bright red.
- ▶ **Antidote flow diagram:** three boxes in sequence — amyl nitrite (inhaled) → sodium nitrite (IV, generates methaemoglobin that pulls CN^- off cytochrome oxidase, forming cyanmethaemoglobin) → sodium thiosulphate (IV, where rhodanese converts CN^- to thiocyanate, excreted in urine). Side label: keep methaemoglobin < 25%.

**Describe Duties of doctor in dealing with a poisoning case**

Asked in: Paper III Oct 2019 — RGUHS MD Forensic Medicine

- ▶ A poisoning case is a medico-legal emergency.
- ▶ The doctor carries a **double duty**: a **medical duty** to save the patient's life, and a **legal duty** to help the State determine the manner of poisoning — accidental, suicidal, or homicidal.
- ▶ The doctor is **not** the authority to decide the manner; his job is to preserve evidence so police and court can decide.
- ▶ Failure in either duty can mean negligence, criminal liability for non-reporting, or disciplinary action.

A. Suspicion and diagnosis — the first duty

- ▶ **When to suspect poisoning:**
 - Symptoms appear suddenly in a previously healthy person.
 - Symptoms are uniform and increase rapidly, ending in recovery or death.
 - Symptoms begin soon after food or drink.
 - Several persons fall ill together (points to a common source).
- ▶ **History at once:** poison/drug taken, route, quantity, time since ingestion, nature of vomitus, alleged reason. In a comatose patient, use relatives, attendants, or any container brought along.
- ▶ **Toxidrome clues (symptom cluster → poison):**
 - **Anticholinergic:** dry hot skin, dilated pupils, delirium (*Datura*, atropine).
 - **Cholinergic:** salivation, pin-point pupils, twitching, slow pulse (organophosphates).
 - **Opioid:** pin-point pupils, slow breathing, coma.
- ▶ **Pupils:** miosis — mnemonic **COOBA** (carbolic acid, opioids, organophosphates, barbiturates, antipsychotics); mydriasis — mnemonic **DAAM** (deliriants, asphyxiants, anticholinergics, miscellaneous).
- ▶ **Odours:** bitter almond (cyanide), garlic (organophosphates), fishy (aluminium phosphide).
- ▶ **Investigations:** chemical analysis of gastric contents/vomit/blood/urine, ECG.

B. Medical (therapeutic) duties — saving life

Therapeutic duty comes first. Most poisoned patients recover with supportive care alone.

- ▶ **Stabilise — ABCD:** Airway clear/intubate; Breathing — oxygen/ventilate; Circulation — IV access, fluids, monitor, be ready for CPR; Disability — correct coma/CNS depression (dextrose, thiamine, naloxone).
- ▶ **Manage complications:** respiratory failure, arrhythmias, convulsions, abnormal temperature.
- ▶ **Remove unabsorbed poison:**
 - *Inhaled:* fresh air, oxygen.
 - *Injected:* proximal ligature (loosen 1 min every 10 min), excise/suck site, local adrenaline.
 - *Ingested:* gastric lavage (useful up to 2–3 hours), emesis only if fully conscious, activated charcoal, whole-bowel irrigation for body-packers.
 - **Only absolute contraindication to stomach wash is corrosive poisoning**, except carbolic acid.
 - Relative contraindications: convulsant poisons, unsecured airway, volatile poisons, oesophageal varices.
- ▶ **Remove absorbed poison:** urine alkalinisation, haemodialysis, haemoperfusion, plasmapheresis.
- ▶ **Antidotes:** activated charcoal — universal adsorbent, **initial adult dose 60–100 g** (15–30 g in children), **repeat 50 g every 4 hours**; atropine + oximes for organophosphates; naloxone for opioids; N-acetylcysteine for paracetamol; ethanol/fomepizole for methanol; BAL/DMSA/EDTA/D-penicillamine for heavy metals; desferrioxamine for iron.
- ▶ **Supportive care** until recovery.

C. Legal / medico-legal duties — assisting the State

This is the limb examiners weight most heavily.

- ▶ **Note particulars:** age, sex, address, time of arrival, two identification marks, thumb impression.
- ▶ **Confirm suspicion before opining.** In suspected homicidal poisoning, check route/quantity/time and symptoms against food eaten, and note whether others were also affected.
- ▶ Consult a senior colleague in confidence before giving any opinion; do not allow a suspected person to remain with the patient.
- ▶ **Inform the police.** Every doctor, government or private, must report all suspected poisoning — accidental, suicidal, or homicidal.
- ▶ Reporting matters because the doctor is not the authority to decide the manner, and it protects the doctor from later liability.
- ▶ **Obtain consent.** A competent adult, or a child over 12, can consent themselves; a guardian consents for a younger child or a mentally ill patient.
- ▶ If the dose is likely fatal or the patient is comatose with no attendant, the doctor may treat in good faith.
- ▶ An arrested accused may be examined at police request without consent under **Section 51 BNSS 2023** (formerly Section 53 CrPC 1973).

- ▶ **Prepare the MLC record.** Write "MLC" in bold on the case sheet; record history, findings, treatment, and nursing notes; prepare **three copies** — police, patient, hospital.
- ▶ **Collect, preserve, and seal evidence** — vomitus, gastric-lavage fluid, blood, urine, faeces, soiled clothing, any poison container — for the FSL.
- ▶ Hand sealed material to the police against a signed receipt — this maintains the **chain of custody**.
- ▶ **Arrange a dying declaration** if death is likely: call a Magistrate; certify the patient is conscious and mentally fit (*compos mentis*); if no Magistrate is available, the doctor may record it himself before two witnesses.
- ▶ **If the patient dies, do not issue a death certificate** — inform the police and send the body for medico-legal autopsy.
- ▶ **Defer the final opinion** on cause/manner until the FSL report arrives.
- ▶ **In food poisoning**, also notify public-health authorities and preserve the suspected food.
- ▶ **Records:** MLC records have **no prescribed retention limit**; ordinary hospital records need be kept only ~3 years, digitised records indefinitely. The "10 years" figure belongs to ART records, not MLC.

D. Autopsy / dispatch of viscera (when death occurs)

- ▶ **Viscera to preserve:** stomach + contents (or wall, if empty); upper ~30 cm small intestine + contents, in the same bottle as the stomach; liver 200–300 g; half of each kidney; blood 30 mL (minimum 10 mL); urine 30 mL.
- ▶ **Containers:** glass only, never plastic — volatile poisons diffuse through plastic. Preserve with saturated sodium chloride or rectified spirit; blood with sodium fluoride + potassium oxalate.
- ▶ **Dispatch under seal:** forwarding letter, sealed viscera box, a separate envelope with lock-key and specimen seal, and a copy of the post-mortem report — preserving the chain of custody.

Medico-legal significance

- ▶ Every poisoning case is medico-legal because the doctor both treats and assists the investigation, preserving the *corpus delicti* for the court.
- ▶ **Chain of custody is the legal spine of the case** — any break invites an allegation of tampering and can make evidence inadmissible.
- ▶ Inquest into an unnatural death runs under **Section 194 BNSS 2023** (formerly Section 174 CrPC 1973) by police, or **Section 196 BNSS 2023** (formerly Section 176 CrPC 1973) by a magistrate.
- ▶ Missing an indicated gastric lavage may amount to negligence; intentional non-reporting or false information attracts **Section 212 BNS 2023** (formerly Section 177 IPC 1860).
- ▶ A lethal blood level alone does not establish cause of death — it must correlate with clinical and autopsy findings, and the final opinion waits for the FSL report.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ Flowchart — "Duties of the doctor in a poisoning case": top box Poisoning case arrives branching into two columns.
- ▶ **Medical column:** Suspect & diagnose → ABCD → Decontaminate → Remove absorbed poison → Antidotes → Supportive care.
- ▶ **Legal column:** Note particulars + consent → Confirm suspicion, consult senior → Inform police → Prepare MLC → Collect/seal/hand over evidence with receipt → Dying declaration → If death: no certificate, autopsy → Final opinion after FSL report. Side box: **Food poisoning** → **notify public health**.
- ▶ **Stomach-wash (Ewald/Boas) tube:** funnel at proximal end, 50 cm mark, suction bulb mid-tube, mouth gag, rounded distal end with lateral openings.

High-yield exam pointers

- ▶ Duty is two-fold — **MEDICAL** (treat) + **LEGAL** (assist police) — doctor never decides accidental/suicidal/homicidal.
- ▶ Priority order: ABCD → **decontamination** → **removal of absorbed poison** → **antidotes** → **supportive care**.
- ▶ Stomach wash absolute contraindication = **corrosive poisoning** (except carbolic acid).
- ▶ Activated charcoal: **60–100 g** initial adult dose (15–30 g child), **50 g every 4 hours** repeat.
- ▶ Write "MLC"; **3 copies**; hand over sealed samples against police receipt (chain of custody).
- ▶ Dying declaration: Magistrate certifies *compos mentis*; **Section 26 BSA 2023** (S.32 IEA 1872).
- ▶ MLC records: **no retention limit** — "10 years" is for ART records, not MLC.

♦ ♦ ♦

Describe Medico Legal aspects of poisoning

Asked in: Paper III Oct 2021 — RGUHS MD Forensic Medicine

Definition and introduction

- ▶ A **poison** is any substance that produces ill-health or death when introduced into, or in contact with, the living body.
- ▶ **Forensic toxicology** covers the medico-legal aspects of harmful chemicals in humans.
- ▶ The topic spans: laws on poisons, manner of poisoning, the doctor's duties to a living patient, autopsy/viscera preservation, and court evidence.
- ▶ **Pesticides** are India's commonest poison overall; **organophosphates** form the largest bulk.
- ▶ **Aluminium phosphide** has been the commonest *intentional* poison in northern India since 1985.

Manner of poisoning (medico-legal types)

The **manner** decides whether an act is an offence, so establishing it is the key exercise.

- ▶ **Suicidal** — commonest in adults: organophosphates, aluminium phosphide, oleander, datura, barbiturates. *Morphine* is ideal — death is painless.
- ▶ **Homicidal** — given with intent to kill, in food/drink/medicine. Arsenic and aconite are classical Indian agents; *aconite* and *thallium* are "ideal".
- ▶ **Accidental** — commonest in children: household poisons, quack/over-dose medicines, snake bite, occupational exposure.
- ▶ **Stupefying** — facilitates robbery, rape or kidnapping: datura, *Cannabis indica*, chloral hydrate.

Ideal homicidal poison (high-yield):

- ▶ Cheap, easily available.
- ▶ Colourless, odourless, tasteless.
- ▶ Mixes into food/drink undetected.
- ▶ Highly toxic in small doses.
- ▶ Mimics natural disease, or is delayed.
- ▶ No antidote.
- ▶ No characteristic postmortem change.
- ▶ Escapes routine chemical tests.
- ▶ Rapidly destroyed or made undetectable in the body.
- ▶ *Fluorine compounds and thallium fit best.* Arsenic and aconite are the ones actually used.

Laws on poisons in India

Two strands of law apply — **regulatory statutes** controlling availability, and **penal provisions** punishing criminal use.

- ▶ **Poisons Act, 1919** — import, possession, sale of poisons.
- ▶ **Drugs and Cosmetics Act, 1940/1945** — quality/sale of drugs. Schedule H = prescription-only; Schedule X = sedatives/hypnotics, extra control.
- ▶ **Insecticides Act, 1968** — regulates agricultural poisons.
- ▶ **NDPS Act, 1985** — narcotic/psychotropic law.
 - Defines "small" and "commercial" quantity.
 - **Death penalty for certain repeat offenders (Section 31A).**

Penal provisions (new code, legacy code in brackets):

- ▶ **Hurt by poison** with criminal intent — **S.123 BNS 2023** (up to 10y + fine), formerly S.328 IPC.
- ▶ **Negligent conduct** with poison — **S.286 BNS 2023**, formerly S.284 IPC.
- ▶ **Adulteration of food, drink or drugs** — **S.274–277 BNS 2023**, formerly S.273–276 IPC.
- ▶ **Murder** (poisoning proving intent) — **S.101 BNS** (definition), **S.103 BNS** (punishment), formerly S.300/302 IPC.
- ▶ **Intoxication:** involuntary = no offence, voluntary = offence — **S.23/24 BNS 2023**, formerly S.85/86 IPC.
- ▶ **Attempt to suicide** — largely repealed; survives only to coerce a public servant, under **S.226 BNS 2023** (formerly S.309 IPC, now decriminalised via S.115, Mental Healthcare Act 2017).

Doctor's duties in a living poisoning case

The doctor has a **dual duty** — medical (resuscitate, decontaminate, antidote) and legal (help establish the manner).

- ▶ **Record particulars first** — age, sex, address, date/time, two identification marks, thumb impression; mark "MLC" in bold; make three copies (police, patient, hospital).
- ▶ **Inform the police in every case**, whatever the manner — the doctor cannot decide manner, and history given may be biased.
 - Failure to inform: **S.211(b) BNS** (formerly S.176 IPC).
 - False information: **S.212(b) BNS 2023** (formerly S.177 IPC).
 - Concealing an offence: **S.239 BNS** (formerly S.202 IPC).
 - At inquest (**S.194 BNSS 2023**, formerly S.174 CrPC), must give all information (**S.195 BNSS**).
- ▶ **Consent** — a child above 12 years can consent; otherwise the guardian.
 - Arrested accused: **S.51 BNSS 2023** (formerly S.53 CrPC), reasonable force allowed.
 - Comatose patient: attendant's consent, or good-faith treatment under **S.30 BNS** (formerly S.92 IPC).
- ▶ **Preserve evidence** — vomitus, lavage fluid, blood, urine, faeces, clothing, poison container — sealed, handed to police against signature on the MLC, for **chain of custody**.
- ▶ **Record the dying declaration** if death is likely — Magistrate present, patient certified *compos mentis*; if no Magistrate, the doctor records and signs it himself (value: **S.26 BSA 2023**, formerly S.32 Evidence Act).
- ▶ **Reserve the opinion** until the Chemical Examiner's report; notify public health in food poisoning.
- ▶ **If the patient dies** — no death certificate; inform police, send the body for autopsy.
- ▶ **Records kept 10 years**, or till the court case ends.

Autopsy and viscera preservation (the dead)

The autopsy must prove death was due to poison, identify it, and supply material for chemical analysis.

- ▶ **Smell clues:**
 - Bitter-almond → **cyanide**.
 - Garlicky → **organophosphate, arsenic, phosphorus or aluminium phosphide**.
 - Kerosene-like → **organophosphate or carbamate**.
 - Rotten-egg → **hydrogen sulphide**.
- ▶ **Staining clues:**
 - Cherry-red → **carbon monoxide**.
 - Chocolate-brown → **methaemoglobin-formers** (nitrites, nitrobenzene).
- ▶ Also note corrosive stains, injection marks, and chronic signs (arsenical hyperkeratosis).
- ▶ **Open the skull first**, to catch brain odours before other cavities mask them.

- ▶ **Open the stomach along the greater curvature** — corrosives track the lesser curvature, the *Magenstrasse* ("stomach street"), pooling and ulcerating deepest near the pylorus.

Viscera preserved in every fatal case:

Bottle	Contents
1	Stomach + contents, plus upper ~30 cm small intestine + contents
2	Liver 200–300 g + half of each kidney
3	Blood ~30 mL (min 10 mL)
4	Urine ~30 mL
5	Sample of the preservative (control)

- ▶ **Liver** proves absorption; **kidney** proves excretion.
- ▶ **Preservative:** saturated **sodium chloride** is routine.
 - Exception: corrosive-acid (except phenol), alkali, corrosive-sublimate, aconite — use **rectified spirit** instead.
 - Spirit itself is contraindicated in alcohol, kerosene, chloroform, formaldehyde, phenol, phosphorus or paraldehyde poisoning.
- ▶ **Blood:** fluoride 10 mg/mL (anti-glycolytic) plus potassium oxalate; also added to urine/CSF/vitreous for alcohol, cocaine, cyanide, CO.
- ▶ **Never formaldehyde** (blocks extraction) or **plastic** (volatiles diffuse) — use glass, or nylon for volatiles.
- ▶ Fill bottles only **two-thirds full** (decomposition gases); refrigerate at ~4°C if dispatch is delayed.
- ▶ **Dispatch:** label, seal and lock the box; send it via the investigating officer.
 - Enclose: forwarding letter to the Chemical Examiner, the postmortem report, Magistrate's authorisation, a seal sample.
 - Maintain a register of everything sent.

Medico-legal significance

- ▶ Establishing the **manner** decides which penal section applies — poisoning that proves intent brings the case within **murder (S.101/103 BNS)**.
- ▶ Proving poisoning needs **three experts** — the investigating officer, the autopsy surgeon and the Chemical Examiner.
- ▶ The **Chemical Examiner's report** is the single most important piece of evidence.
- ▶ Poison in **blood, urine or liver** proves **absorption**; poison only in stomach contents does not.
- ▶ A doctor's failure to inform police (**S.211/212 BNS**), or concealing evidence (**S.238/239 BNS**), is itself punishable.
- ▶ A **negative chemical report does not exclude poisoning** — vomiting, metabolism or decomposition can cause a false negative.
- ▶ Correlate all evidence — clinical, autopsy, toxicological, circumstantial — and avoid the word "probably" in the final opinion.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Flowchart** — "Medico-legal handling of a poisoning case": suspected poisoning → *living*: inform police → consent → treat → collect evidence → dying declaration → Chemical Examiner's report → final opinion. *Dead*: autopsy → preserve viscera (5 bottles) → chain of custody → FSL → cause and manner of death.
- ▶ **Viscera diagram**: five labelled bottles (stomach+intestine; liver+kidney; blood; urine; control preservative) → sealed, locked box → FSL.

♦ ♦ ♦

Describe the mechanism of action, clinical features, laboratory investigations and forensic aspects of carbon monoxide toxicity

Asked in: Paper III Apr 2019 — RGUHS MD Forensic Medicine

Definition

- ▶ **Carbon monoxide (CO)**: colourless, odourless, tasteless, non-irritant gas, lighter than air.
- ▶ Formed by incomplete combustion of any carbon fuel; burns with a blue flame to form carbon dioxide.
- ▶ CO is the classic **systemic (chemical) asphyxiant** — it does not injure the airway, and does not simply displace oxygen.
- ▶ It kills by binding haemoglobin to form **carboxyhaemoglobin (COHb)**, causing severe tissue hypoxia.
- ▶ It gives no warning (no colour, smell or irritation), so it is a leading cause of fatal poisoning — mostly **accidental** (faulty heaters, charcoal braziers/*angeethi* in closed rooms, car exhaust, smoke inhalation in fires).

Classification of asphyxiants

- ▶ **Simple asphyxiants**: inert gases that kill only by excluding oxygen; harmless if extra oxygen is given. Examples: nitrogen, methane, helium.
- ▶ **Respiratory irritants**: injure the airway lining. Examples: ammonia, chlorine, phosgene, sulphur dioxide.
- ▶ **Systemic (chemical) asphyxiants**: poison by binding haemoglobin or blocking cell respiration; oxygen alone does not protect. Examples: **carbon monoxide**, hydrogen cyanide, hydrogen sulphide.

Mechanism of action

- ▶ CO is absorbed avidly by the lungs: **85% binds haemoglobin**, **15% binds myoglobin** (muscle's oxygen store); it leaves the body unchanged, unmetabolised.
- ▶ **High haemoglobin affinity**: CO binds haemoglobin about **200–270 times more strongly than oxygen**, so even low ambient CO converts a large share of haemoglobin to COHb.

- ▶ This sharply cuts the blood's oxygen-carrying capacity despite a normal arterial oxygen tension (PO_2).
- ▶ **Left shift of the oxyhaemoglobin curve:** CO on one haem site raises the oxygen affinity of the rest, so the haemoglobin that is oxygenated releases oxygen poorly.
- ▶ Reduced carriage plus poor release together cause hypoxia worse than an equal degree of anaemia.
- ▶ **Myoglobin/cytochrome binding:** CO also binds myoglobin (depressing heart muscle, worst in ischaemic heart disease) and inactivates mitochondrial cytochrome oxidase — a histotoxic effect like cyanide.
- ▶ **Vascular/oxidative injury:** CO displaces nitric oxide (NO) from platelets; the released NO damages cerebral blood-vessel lining, causing oxidative stress that demyelinates the basal ganglia, white matter, hippocampus and cerebellum, and triggers neuronal apoptosis — explaining delayed brain injury.
- ▶ Severe poisoning also causes profound hypotension from NO-mediated vasodilation.
- ▶ **Net effect:** an anaemic-plus-histotoxic hypoxia hitting the brain and heart hardest (formally, *anaemic anoxia*).

Clinical features

- ▶ Severity broadly tracks the COHb level; symptoms usually start only once **COHb reaches about 10%**.

COHb %	Severity	Key features
0–10%	none	no symptoms
10–20%	mild	mild headache, breathlessness on exertion
20–30%	—	throbbing headache, nausea, vomiting, drowsiness, impaired judgement
30–40%	moderate	cherry-red colour , chest pain, confusion, dizziness, poor muscle control
40–50%	severe	ataxia, confusion, hallucinations, collapse on exertion
50–60%	severe	coma with convulsions, weak pulse, tachycardia
60–70%	severe	deep coma, hypotension, myocardial ischaemia, arrhythmias
70–80%	severe	profound coma, absent reflexes, skin blisters
>80%	fatal	rapid death from respiratory arrest

- ▶ **Vulnerable groups:** the elderly, anaemic, cardio-respiratory patients, and those drunk or drugged are affected at lower COHb levels; the **fetus and newborn are especially vulnerable**, since fetal haemoglobin binds CO more avidly.
- ▶ **Delayed encephalopathy:** in roughly 30% of cases, 2–40 days after apparent recovery — akinetic mutism, memory/cognition deficits, dementia, parkinsonism, dystonia, psychosis, mood change.
- ▶ Differentiate from alcohol intoxication, migraine, meningitis, epilepsy, stroke and myocardial infarction.
- ▶ **Fatal level:** a COHb level above 60% is regarded as lethal.

Laboratory investigations

- ▶ **COHb estimation is the single most useful test.** Normal COHb is about 1% in non-smokers, 4% in smokers (up to ~10% in heavy smokers); above 2%/10% respectively confirms exposure.
- ▶ Measured with a **co-oximeter**, which spectrophotometrically reads the % of haemoglobin saturated with CO.
- ▶ **Routine pulse oximetry and arterial blood gas (ABG) are misleading:** both show a falsely normal oxygen saturation/ PO_2 , since neither detects COHb; a dedicated Masimo CO-oximeter is needed for accurate bedside detection.
- ▶ **Sodium hydroxide dilution test:** diluted CO-blood turns **straw-yellow** (COHb <20%) or **pink** (>20%); normal blood turns brown.
- ▶ Anaerobic metabolism causes **metabolic (lactic) acidosis** — lactate is a reliable severity marker; troponin/creatine phosphokinase (CPK) may rise from myocardial or muscle injury.
- ▶ **Neuroimaging:** CT/MRI show symmetrical necrosis in the **globus pallidus, putamen and caudate nuclei**; MRI is best for white-matter lesions.

Treatment (brief)

- ▶ Remove from the source, secure the airway, and give **100% oxygen** until COHb falls below 15–20%.
- ▶ **Hyperbaric oxygen (HBO)** at 2–3 atmospheres is the treatment of choice in severe poisoning — indicated for coma, seizures, focal neurological deficit, acidosis, **COHb >25% (>15% in pregnancy)**, or age over 50.
- ▶ Correct acidosis cautiously and follow up closely for delayed encephalopathy.

Autopsy / forensic findings

- ▶ **Cherry-red colour** of skin, lividity, blood and internal organs is the hallmark, appearing only above COHb ~40% — its absence does not exclude CO. In dark-skinned bodies check the inner lips, tongue, nail beds, palms and soles; it fades once putrefaction begins.
- ▶ **Blood stays fluid** and bright pink; serous effusions are found in all body cavities; **skin blisters** appear over pressure areas — calves, buttocks, wrists, knees.
- ▶ **Lungs** show congestion and oedema, with soot in the trachea if death occurred in a fire.
- ▶ **Heart** shows pericardial haemorrhages and focal myocardial necrosis, or frank infarction if coronary disease was present.

- ▶ **Brain** is firmer than normal; delayed deaths show necrosis and cavitation of the **globus pallidus** and **putamen** — the most characteristic lesion.
- ▶ **Always collect and preserve blood for COHb analysis** in every suspected case.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Oxyhaemoglobin dissociation curve:** X-axis = PO_2 (mmHg), Y-axis = % haemoglobin saturation.
- ▶ Plot the normal sigmoid curve, then a **left-shifted curve** labelled "**CO / carboxyhaemoglobin**"; mark P50 and label "impaired oxygen off-loading".
- ▶ Optional schematic: inhaled CO → binds haemoglobin → COHb → reduced O_2 carriage + reduced O_2 release (left shift) + binds myoglobin/cytochrome oxidase → tissue hypoxia (brain and heart); side branch: NO displacement → endothelial injury → delayed encephalopathy.

Medico-legal significance

- ▶ **Manner of death** is overwhelmingly **accidental** — faulty heaters/geysers, charcoal braziers in closed rooms, vehicle exhaust in closed garages, smoke inhalation. **Suicidal** CO death (historically coal gas, now car exhaust) and **homicide** (deliberate exhaust diversion) are rare.
- ▶ Scene findings — a confined space, closed windows, a lit fire, or a defective appliance/engine — are decisive.
- ▶ **COHb in blood is the surest sign the victim was alive during a fire**, i.e. the burns were antemortem; soot in the airway supports this. Its absence in a charred body suggests death preceded the fire.
- ▶ **Bruises sustained during CO poisoning look cherry-red**, not blue-purple — a recognised pitfall in injury interpretation.
- ▶ **Post-mortem artefact:** putrefaction can generate spurious COHb up to ~20%, so a modest rise in a decomposed body needs cautious interpretation.
- ▶ An unnatural death of this kind needs a **police inquest under Section 194 Bharatiya Nagarik Suraksha Sanhita (BNSS) 2023** (formerly Section 174 CrPC 1973), or a **magistrate inquest under Section 196 BNSS 2023** (formerly Section 176 CrPC 1973).
- ▶ Where CO release is criminal: **Section 286 Bharatiya Nyaya Sanhita (BNS) 2023** (formerly Section 284 IPC 1860, negligent conduct with a poisonous substance), **Section 123 BNS 2023** (formerly Section 328 IPC 1860, causing hurt by poison with criminal intent), and **Section 118 BNS 2023** (formerly Sections 324/326 IPC 1860, hurt/grievous hurt by dangerous means).
- ▶ **Doctor's duties:** resuscitate; collect and preserve blood for COHb estimation; document lividity colour and basal-ganglia changes at autopsy; report the unnatural death and assist the inquest; give expert evidence under **Section 39 Bharatiya Sakshya Adhiniyam (BSA) 2023** (formerly Section 45 Indian Evidence Act 1872).

♦ ♦ ♦

Designer Drugs

Asked in: Paper III Oct 2016 — RGUHS MD Forensic Medicine

Definition

- ▶ **Designer drugs** are synthetic psychoactive substances made by altering the chemical structure of an existing legal or controlled drug.
- ▶ The new compound mimics the parent drug's effects but escapes existing drug-law schedules, at least initially.
- ▶ They are manufactured in clandestine (secret, unregulated) laboratories.
- ▶ They are usually more potent, longer-acting, and cheaper than the parent drug, with higher and more unpredictable health risk.
- ▶ The practice began in the **1960s**; the term "**designer drug**" was coined in the **1980s** by *Dr Gary Henderson* of the University of California.
- ▶ They are now grouped under the global term **New Psychoactive Substances (NPS)**.

Concept and characteristics

- ▶ **Core idea:** modify the molecular structure of a known drug (an analogue) to create a compound pharmacologically similar to the parent but legally novel.
- ▶ This exploits the lag between a new molecule appearing and the law scheduling it.
- ▶ **Why made:** to circumvent the **Narcotic Drugs and Psychotropic Substances (NDPS) Act, 1985** and equivalent foreign laws.
- ▶ **Deceptive labelling:** often sold marked "not intended for human consumption" or "for research purposes only" — itself a device to evade the law, though the drugs are meant for recreational use.
- ▶ **Setting of use:** night clubs and rave parties, widely and easily obtained over the **Internet**.
- ▶ **Synonyms:** recreational drugs, club drugs, party drugs, "legal highs."

Classification with examples

Designer drugs are grouped by the parent drug class whose effect they reproduce.

Group	Parent class	Examples
A. Synthetic amphetamines	CNS stimulants	MDMA ("Ecstasy"/"Adam"), MDEA ("Eve"), MDA ("love drug"), methamphetamine
B. Methaqualone derivatives	Sedative-hypnotics	Mecloqualone, nitromethaqualone
C. Opiate derivatives	μ -opioid agonists	Fentanyl analogues ("China White"), MPPP, MPTP
D. Phencyclidine (PCP) group	Dissociative hallucinogens	PCP analogues
E. Mescaline derivatives	Hallucinogens	Mescaline-type analogues

Group	Parent class	Examples
F. Newer additions	Mixed stimulant/cannabinoid	Bath salts, Spice, MDPV, Mephedrone ("Meow Meow")

- ▶ **MPTP — key forensic point:** MPTP forms as a by-product during illicit MPPP synthesis.
- ▶ It is metabolised to **MPP⁺**, which destroys dopamine-producing neurons of the substantia nigra.
- ▶ This produces an **irreversible Parkinsonism** — the classic example of designer-drug neurotoxicity.

Ecstasy (MDMA) — the prototype designer drug

- ▶ **Origin:** developed by the Merck Pharmaceutical company in **1914**.
- ▶ **Mechanism:** neurotoxicity is due to depletion of serotonin (5-HT) in the brain.
- ▶ **Dose:** usually taken orally, **100–150 mg**; may also be injected or inhaled.
- ▶ **Duration of effect:** **3–6 hours**.
- ▶ **Clinical features:**
 - Euphoria and a sense of intimacy/emotional closeness with others (the "entactogenic" effect).
 - Hyperactivity, increased alertness and wakefulness.
 - **Bruxism** (teeth grinding) and **trismus** (spasm of the jaw muscles).
 - **Hyperthermia** and hallucinations.
 - Sudden death from cardiac arrhythmia.
- ▶ **Causes of death:**
 - **Disseminated intravascular coagulation (DIC)**, causing thrombosis of the superior sagittal sinus.
 - **Hyperthermia, rhabdomyolysis, and renal failure.**
- ▶ **Hyponatraemia:** excessive water drinking during rave dancing, plus an MDMA-induced inappropriate ADH effect, causes dangerous dilutional low blood sodium.
- ▶ **"Stacking":** combining ecstasy (a stimulant) with alcohol (a depressant) — each masks the other's effect, so overdose risk rises.
- ▶ **Antidotal note:** tryptophan and 5-hydroxytryptophan have been used for the serotonin depletion.

Clinical features and management

- ▶ Most designer drugs are amphetamine-type stimulants.
- ▶ Their toxidrome resembles the sympathomimetic/serotonergic picture, so management mirrors amphetamine and cocaine poisoning.
- ▶ **Clinical features:**
 - Euphoria, agitation, headache, paranoia, anorexia.
 - **Hyperthermia, hyperreflexia, convulsions, intracerebral haemorrhage.**
 - Cardiovascular: tachycardia, hypertension, arrhythmia, myocardial ischaemia.

- Sympathetic: dilated pupils, sweating, tremor, nausea, fast breathing, muscle rigidity, rhabdomyolysis, pulmonary oedema.
- ▶ **Complications:** psychosis, myocardial infarction, cerebral infarction, ventricular fibrillation, aortic dissection, acute renal failure.
- ▶ **Fatal dose (amphetamine):** 20–25 mg/kg body weight (individual designer analogues vary widely in potency).
- ▶ **Management — hyperthermia:** oxygen, active cooling (ice baths/packs, fanned cool air), paracetamol, **dantrolene 1 mg/kg** if resistant.
- ▶ **Management — agitation/convulsions:** intravenous **diazepam** (5–10 mg for agitation, 10–20 mg for convulsions) or lorazepam, titrated; refractory seizures need ICU ventilation.
- ▶ **Management — hypertension/arrhythmia:** benzodiazepine first, then glyceryl trinitrate, nifedipine or phentolamine, with BP/ECG monitoring.
- ▶ **Supportive care:** secure the airway, give intravenous fluids to protect the kidneys, and decontaminate if ingestion was recent.

Laboratory detection

- ▶ **Best sample:** urine — amphetamines are largely excreted unchanged, about 40% of the dose.
- ▶ Addicts have collected this yellow urine in vials and sold it as "liquid gold."
- ▶ **Method:** immunoassay screening first, then confirmatory **TLC, HPLC, and GC-MS**.
- ▶ Amphetamine above **2 mg/100 mL** urine indicates acute toxicity, detectable for **2–4 days**.
- ▶ **Detection difficulty:** because the molecules are novel and constantly changing, detection in blood is often slow.
- ▶ Routine immunoassays may not be calibrated for the new analogue.
- ▶ Clinicians may be unfamiliar with the compound, which delays diagnosis and specific treatment.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Classification chart:** a central box "DESIGNER DRUGS (synthetic psychoactive analogues)" branching to six boxes — A. Synthetic amphetamines (MDMA/MDEA/MDA/methamphetamine), B. Methaqualone derivatives, C. Opiate derivatives (α -methylfentanyl, MPPP, MPTP), D. PCP group, E. Mescaline derivatives, F. Newer additions (Bath salts, Spice, MDPV, Mephedrone).
- ▶ **MDMA toxic-death pathway:** MDMA → 5-HT depletion + sympathomimetic surge → Hyperthermia → Rhabdomyolysis + DIC (superior sagittal sinus thrombosis) → Renal failure / fatal arrhythmia → Death.

Medico-legal significance

- ▶ Trafficking and possession are punishable under the **NDPS Act, 1985**; drugs are scheduled progressively, with quantities graded small / intermediate / commercial (e.g. amphetamine and methamphetamine commercial quantity **1.5 kg** each).

- ▶ **Consumption offence** — Section 27, NDPS Act 1985: up to 1 year imprisonment and/or ₹20,000 fine for cocaine, morphine or heroin; up to 6 months and/or ₹10,000 fine for any other narcotic/psychotropic substance.
- ▶ **Repeat commercial-quantity offence** — Section 31A, NDPS Act 1985: a previously convicted repeat offender may attract the **death penalty**.
- ▶ Sudden, unexpected death of a young person at a rave, club or party should raise suspicion of a stimulant designer drug.
- ▶ Such deaths need an **inquest under Section 174 CrPC 1973 (now Section 194 BNSS 2023)**, or, if suspicious or in custody, under **Section 176 CrPC 1973 (now Section 196 BNSS 2023)**.
- ▶ **Sample preservation**: blood, urine, vitreous humour, stomach contents and viscera, since gross autopsy findings are usually non-specific.
- ▶ **Expert evidence**: admissible under **Section 45 IEA 1872 (now Section 39 BSA 2023)**; FSL reports are central evidence.
- ▶ **Drug-facilitated crime**: club/designer drugs and dissociatives such as ketamine feature in "date-rape"; early urine preservation is critical because these drugs clear fast.
- ▶ Clinicians must stay alert and report, since unfamiliar compounds delay both diagnosis and treatment.

Recent advances [RA]

- ▶ **Nitazenes** are a potent new synthetic-opioid class now displacing fentanyl analogues; several exceed fentanyl in potency, and nearly every fatal case is polydrug. [PMID 40422647] [PMID 40085042] [PMID 37423031]
- ▶ **Xylazine ("tranq")** is a common fentanyl adulterant causing naloxone-resistant sedation and skin ulcers; **medetomidine**, about 200 times more potent, is emerging as its successor. [PMID 42251817]
- ▶ Untargeted high-resolution mass spectrometry (LC-HRMS/LC-QTOF) is replacing immunoassay, catching nitazenes, synthetic cathinones, designer benzodiazepines and adulterants older tests miss. [PMID 42096994] [PMID 42251817] [PMID 41942675]
- ▶ Self-reported drug history is unreliable: in one 2044-case emergency registry, only 14.3% of self-reports matched analytical findings, so conclusions must rest on lab confirmation. [PMID 42298751]
- ▶ Newer assays help: a nanozyme immunoassay screens xylazine on-site to 0.011 ng/mL, and mephedrone metabolite mapping gives stable markers for retrospective confirmation. [PMID 42048805] [PMID 40806784]
- ▶ Naloxone still reverses nitazene poisoning, at a median dose of about **1.2 mg**; routine "mega-dosing" is not supported, though some cases need repeat doses and extended observation. [PMID 40422647] [PMID 42392847]
- ▶ Synthetic cannabinoids are the commonest cause of NPS-related psychosis and now dominate the NPS market with disproportionate morbidity and death. [PMID 39273431] [PMID 35914767]

- ▶ Structured drug early-warning systems are being urged worldwide to shorten the lag before a public-health response. [PMID 40795642]
- ▶ **Regulatory actions:** the US FDA restricted unlawful xylazine import (Feb 2023); the UN Commission on Narcotic Drugs placed five new NPS, including the nitazene butonitazene, under international control (Mar 2024).
- ▶ India's NDPS Order amendment G.S.R. 71(E) (23 Jan 2025) added fentanyl/methamphetamine precursors to Schedules B and C, but India still lacks a dedicated NPS early-warning system. [FDA 2023-Feb] [UN CND 2024-Mar] [NDPS G.S.R. 71(E) 2025-Jan]



Discuss about Chelating agents

Asked in: Paper III Apr 2025 · Paper III Oct 2022 (2×) — RGUHS MD Forensic Medicine

Definition

- ▶ **Chelating agents** (chelants, metal-complexing agents) are drugs used to treat **heavy-metal poisoning**.
- ▶ The word comes from Greek *chela*, meaning "claw" — the agent grips the metal like a claw.
- ▶ The term *chelate* was coined by **Morgan and Drew in 1920**.
- ▶ A chelator binds the metal **more strongly than the body's own enzymes** do, so it pulls the metal off the poisoned enzymes.
- ▶ The resulting **chelate** (agent + metal) is water-soluble, non-ionised and non-toxic.
- ▶ Being water-soluble, the chelate is easily excreted by the kidney, removing the metal from the body.

Principle and mechanism

- ▶ **Complex formation:** the chelator carries electron-rich donor groups — usually **sulphydryl (–SH)** groups, or carboxyl/amino groups as in EDTA.
- ▶ These donor groups bind the metal ion through **two or more bonds**, closing a ring called the **chelate ring**.
- ▶ Formation of this ring is the defining feature of chelation.
- ▶ **Why it works:** heavy metals such as arsenic, mercury and lead bind the **–SH groups of respiratory enzymes**, inactivating them.
- ▶ A chelator with free –SH groups (for example dimercaprol) competes for the metal and frees the enzyme.
- ▶ **Antidote classification:** forensic antidotes fall into five groups — mechanical/physical, chemical, chelating agents, serological/immunotherapy, and physiological/pharmacological.
- ▶ Chelating agents act by **inert complex formation** (the same principle used by dicobalt edetate for cyanide).
- ▶ **Ideal chelator — key properties:**
 - High affinity for the toxic metal, low affinity for essential metals (zinc, calcium).
 - The complex formed must be non-toxic.

- High water solubility, with some lipid solubility to cross cell membranes.
- Good oral absorption when given by mouth.
- Minimal toxicity of its own.
- Rapid renal excretion of the complex.

Classification of chelating agents

Agent	Metal(s) it treats	One key point
BAL (dimercaprol)	Arsenic, mercury, lead ("MAL")	Chelator of choice in renal impairment
CaNa ₂ EDTA	Lead	Never use plain disodium EDTA
D-Penicillamine	Copper (max efficiency), lead, mercury	Orally effective
DMSA (succimer)	Lead, mercury, arsenic	Oral, safer than EDTA in lead
DMPS (unithiol)	Mercury, lead, arsenic	Water-soluble BAL analogue
Desferrioxamine	Iron	Bacterial siderophore
Prussian blue	Thallium	Blocks enterohepatic recirculation
Dicobalt edetate	Cyanide	Binds cyanide directly

- ▶ **BAL (dimercaprol):** 3–4 mg/kg deep intramuscular injection, 4-hourly for the first 2 days, then twice daily for up to 10 days.
 - Has **2 free –SH groups**.
 - Excreted in bile, so it is the **chelator of choice in renal failure**.
 - Alkalinise the urine — the chelate dissociates in acid urine.
 - Give it **at least 4 hours before EDTA**.
 - Avoid in **G6PD deficiency** (causes haemolysis), **iron and cadmium poisoning**, **organic mercury** (redistributes mercury to the brain), and **liver damage**.
 - Developed at Oxford during World War II against the arsenical war gas **Lewisite** — hence "British Anti-Lewisite."
- ▶ **CaNa₂EDTA:** 25–35 mg/kg/day by slow IV infusion, twice daily for 5 days.
 - Works by **ion exchange** — calcium is swapped for the heavy-metal ion.
 - Raises urinary lead excretion **20–50 fold**.
 - **Plain disodium EDTA must never be used** — it causes fatal hypocalcaemia.
 - In **lead encephalopathy**, BAL is given first — EDTA alone can mobilise lead from tissue stores and worsen symptoms.
- ▶ **D-Penicillamine:** 30 mg/kg/day (up to 2 g/day) orally for about a week.
 - A hydrolysis product of penicillin; about 25% of penicillin-allergic patients react to it.
 - **N-acetyl-D-penicillamine (NAPA)** is used for chronic mercury poisoning.
- ▶ **DMSA (succimer):** a water-soluble analogue of BAL, given orally.

- **Superior to EDTA in lead poisoning** — it does not redistribute lead to the brain.
- **Safe in G6PD deficiency.**
- ▶ **DMPS (unithiol):** shares BAL's dithiol group but is water-soluble, with a **better therapeutic index.**
- ▶ **Desferrioxamine:** a bacterial **siderophore** (an iron-scavenging molecule) used for **acute iron poisoning.**
 - Given orally to bind iron still in the stomach, and IV to bind iron already absorbed.
- ▶ **Prussian blue:** the chelator of choice for **thallium** — binds the metal in the gut and blocks its reabsorption from bile (enterohepatic recirculation).
- ▶ **Dicobalt edetate:** used for **cyanide** — cobalt binds the cyanide ion directly.
- ▶ **Metallothionein** is the body's own natural chelator — a cysteine-rich protein that binds physiological metals (zinc, copper) as well as toxic ones (cadmium, mercury, arsenic).
- ▶ **Two important negative points, often tested:**
 - Chelation therapy **does not work in arsine (AsH_3) gas poisoning.**
 - It is **not very effective for organic mercury compounds.**

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **The chelate ring ("claw") of a metal–chelator complex:** draw the central heavy-metal ion (M) held within a ring by a chelating molecule, with at least two donor atoms binding it. Label: *Heavy-metal ion (M), Donor groups ($-\text{SH}$ / $-\text{COO}^-$ / $-\text{NH}_2$), Chelate ring, Soluble, non-toxic, excretable complex $\rightarrow$ urine.*
- ▶ **Mechanism flow box** — three steps: (1) *Metal bound to tissue/enzyme $-\text{SH}$ groups (toxic) $\rightarrow$* (2) *Chelator competes — greater affinity $\rightarrow$* (3) *Chelate formed $\rightarrow$ water-soluble $\rightarrow$ renal excretion.*

Medico-legal significance

- ▶ In suspected metallic poisoning, the doctor must preserve stomach wash, viscera and **the urine** (chelate-rich) for chemical analysis, and document the antidote given.
- ▶ A **chelation challenge** with EDTA that shows raised urinary lead excretion helps confirm chronic lead poisoning, which matters in **occupational poisoning and compensation claims.**
- ▶ The treating doctor must give emergency care (including the right chelating antidote), preserve samples, keep meticulous records, and report to police when a cognizable offence is suspected.
- ▶ A suspected poisoning death requires inquest under **Section 174 CrPC 1973 (now Section 194 BNSS 2023).**
- ▶ If death occurs within 7 years of marriage, or in custody, inquest instead falls under **Section 176 CrPC 1973 (now Section 196 BNSS 2023).**
- ▶ The doctor's record of the poison and antidote given may later be tendered as **expert opinion under Section 45 IEA 1872 (now Section 39 BSA 2023).**
- ▶ Choosing the correct chelator is a matter of medical competence — for example **BAL in renal impairment, DMSA over EDTA in lead, and avoiding BAL in iron or cadmium poisoning.**

- ▶ A wrong choice — such as using plain disodium EDTA (fatal hypocalcaemia) or giving BAL in organic mercury poisoning (redistributes mercury to the brain) — can raise a charge of negligence.



Ichthyosarcotoxicosis (Poisonous-Fish-Flesh Poisoning)

Asked in: Paper III Oct 2022 — RGUHS MD Forensic Medicine

- ▶ **Definition:** *Ichthyosarcotoxicosis* is poisoning from eating fish whose **flesh** carries a natural toxin.
- ▶ The toxin can sit in the muscle, viscera, skin, or slime.
- ▶ It is one type of *ichthyism*, the umbrella term for all fish/marine poisoning (by bite, sting, or eating toxic or spoiled flesh).
- ▶ **Key distinction:** a **poisonous fish** harms only when eaten.
- ▶ A **venomous fish** actively injects venom through spines instead.
- ▶ **Golden rule:** most fish-flesh toxins are **heat-stable** — ordinary cooking does not destroy them.
- ▶ They also do **not** change the fish's smell, colour, or taste.
- ▶ So sensory screening cannot protect the consumer.

Terminology

- ▶ **Ichthyotoxin:** a natural toxin produced by fish.
- ▶ **Ichthyotoxicity:** the reverse idea — poisoning *of* fish, by sponges, jellyfish/corals, or sea squirts that release toxins to deter predators.

Classification of poisonous fish

Poisonous fish fall into three groups; the flesh group is by far the most important.

Group	Toxin location	Examples
Ichthyosarcotoxic	Flesh (muscle, viscera, skin, slime)	Ciguatera fish, moray eel, puffer fish, oilfish, scombroid fish
Ichthyohaemotoxic	Blood/serum	Eels, lampreys (toxin destroyed by heat)
Ichthyotoxic	Gonads/roe	Fish poisonous during spawning season

The ichthyosarcotoxic group (ciguatera, gymnothorax, scombroid, oilfish, tetrodotoxin) is one branch of animal-origin food poisoning.

- ▶ A separate branch is **venomous fish** (catfish, lionfish, box jellyfish) — these inject venom and are not eaten.
- ▶ Another separate branch is **shellfish poisoning** (paralytic shellfish poisoning, saxitoxin).

Major syndromes

1. Ciguatera fish poisoning (CFP)

- ▶ The **commonest** marine poisoning — up to ~50% of reported cases.
- ▶ **Food chain:** the dinoflagellate *Gambierdiscus toxicus* grows on coral, algae, and seaweed, and makes **ciguatoxin**.
- ▶ Small herbivorous reef fish eat it, then larger carnivorous fish eat those fish.
- ▶ The toxin **bioaccumulates** up the chain — bigger fish carry more poison; the fish themselves stay unaffected.
- ▶ Common culprits: grouper, parrotfish, red snapper, barracuda, moray eel.
- ▶ Endemic to Caribbean, South Pacific, and Australian coral reefs.
- ▶ **Toxin properties:** heat-resistant, lipid-soluble, resistant to gastric acid.
- ▶ **Clinical course:** gastrointestinal symptoms (sweating, cramps, nausea, vomiting, watery diarrhoea) within 6–24 hours.
- ▶ These resolve over 1–4 days.
- ▶ **Hallmark sign: thermal allodynia** — hot/cold sensation is reversed, so an ice cube feels like it burns.
- ▶ Also myalgia, arthralgia, fatigue, and paraesthesias of the extremities and mouth.
- ▶ Severe cases show hypotension, bradycardia, and neuropsychiatric features.
- ▶ **Fatality:** rare (<0.1%); death is from respiratory failure.
- ▶ **Treatment:** IV mannitol 0.5–1.0 g/kg over 30–45 minutes, plus supportive care.

2. Gymnothorax (moray-eel) poisoning

- ▶ A special form of ciguatera caused specifically by the moray eel.
- ▶ It accumulates a ciguatoxin-like neurotoxin in its viscera, muscle, and gonads.
- ▶ **Onset:** about half an hour.
- ▶ Mainly neurotoxic: tingling and numbness of lips and tongue, inability to talk.
- ▶ Loss of thoracic breathing with prominent abdominal breathing.
- ▶ Tonic-clonic convulsions.
- ▶ **Treatment:** paraldehyde, sodium amytal, ether.
- ▶ **Fatal period:** 2–3 weeks.

3. Scombroid poisoning (scombrotoxicism)

- ▶ The **second commonest** seafood poisoning.
- ▶ Classic fish: mackerel, tuna, bonito, albacore, swordfish, sailfish.
- ▶ Also occurs with mahi-mahi and amberjack.
- ▶ **Mechanism:** dark-meat fish is rich in histidine.
- ▶ *Morganella morganii* bacteria convert histidine to **histamine** via histidine decarboxylase.
- ▶ This happens when fish is stored **above 16 °C**.
- ▶ Histamine is **not destroyed by cooking** — properly cooked spoiled fish is still poisonous.
- ▶ **Syndrome:** allergy-like — skin flushing, throbbing headache, oral burning, cramps, palpitations.
- ▶ Onset 10–30 minutes; self-limiting.
- ▶ **Chief differential:** a true fish allergy.

*4. Oilfish (*Ruvettus pretiosus*) poisoning*

- ▶ A snake mackerel with very oily flesh.
- ▶ Its wax esters cannot be digested normally.
- ▶ This causes **keriorrhea** — oily orange diarrhoea.
- ▶ **Medico-legal point:** oilfish is cheap and is deliberately mislabelled as butterfish or codfish.
- ▶ Japan, Italy, and Australia have restricted or banned its sale.

5. Tetrodotoxin (TTX) poisoning

- ▶ Most often from fish of the family Tetraodontidae.
- ▶ **Sources:** puffer fish (*fugu*) is commonest; also balloonfish, blowfish, globefish, toadfish.
- ▶ Also found in the blue-ringed octopus.
- ▶ TTX concentrates in the liver, ovaries, intestines, and skin.
- ▶ Heat- and freeze-stable.
- ▶ **Mechanism:** selective blockade of voltage-gated Na^+ channels.
- ▶ This is the exact opposite of aconitine — mixing the two can delay death.
- ▶ Same channel-blocking mechanism as paralytic shellfish poisoning.
- ▶ **Clinical grading:**
 - **Grade 1:** perioral numbness and paraesthesias (within one hour), maybe GI symptoms.
 - **Grade 2:** distal numbness, early motor paralysis, slurred speech, ataxia, urinary retention, "feeling of doom".
 - **Grade 3:** generalised flaccid paralysis, respiratory failure, aphonia, fixed dilated pupils — **patient still conscious.**
 - **Grade 4:** severe respiratory failure, hypotension, bradycardia, arrhythmias, unconsciousness, death within hours.
- ▶ **Fatal dose:** 1–2 mg of purified toxin (about 1.5 oz of puffer fish).
- ▶ **No antidote;** management is supportive.

Shellfish poisoning (related entity)

- ▶ Molluscan, not fish-flesh, but examined alongside ichthyosarcotoxiosis.
- ▶ Oysters, clams, and scallops can carry a **phycotoxin** (algal toxin).
- ▶ Mild form: tingling, numbness, headache, diarrhoea.
- ▶ Moderate form: ataxia, limb weakness, salivation, dyspnoea.
- ▶ **Paralytic shellfish poisoning (PSP)** follows eating bivalves that concentrate dinoflagellate toxins — chiefly **saxitoxin**.
- ▶ Saxitoxin is heat- and acid-resistant and blocks voltage-gated Na^+ channels.
- ▶ Classic rule: shellfish are dangerous "when there is no 'r' in the month" — warm-month algal blooms (red tides).
- ▶ Death is from respiratory paralysis; no antidote.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Ciguatera bioaccumulation pyramid:** *Gambierdiscus toxicus* on coral/algae → small herbivorous reef fish → large carnivorous predator fish (barracuda, grouper, moray eel, snapper) → **human (ciguatera poisoning)**.
- ▶ Side-label: ciguatoxin bioaccumulates, is heat-stable, and the host fish stay immune.
- ▶ **Sodium-channel schematic:** a neuronal axon membrane with a voltage-gated Na⁺ channel.
- ▶ Show tetrodotoxin and saxitoxin blocking the channel pore.
- ▶ Contrast box: aconitine instead *opens* the Na⁺ channel.

Medico-legal significance

- ▶ **Manner of death** is almost always **accidental** — unrecognised toxic fish, spoiled fish, or mislabelled oilfish.
- ▶ The oilfish substitution scam (sold as butterfish/codfish) is a recognised fraud with criminal liability.
- ▶ **Key teaching point:** heat-stability means properly cooked fish does not rule out poisoning.
- ▶ **Diagnostic pitfall:** scombroid is often mistaken for a true fish allergy.
- ▶ Ciguatera's thermal allodynia and TTX's "conscious paralysis with fixed dilated pupils" are near-pathognomonic clues.
- ▶ **Autopsy findings are largely non-specific** — no characteristic post-mortem lesion.
- ▶ Diagnosis rests on history (shared meal, reef/puffer fish, restaurant outbreak), clustering of cases, and toxin identification.
- ▶ Preserve stomach contents and the suspected food/fish sample for analysis.
- ▶ All food-poisoning cases must be reported to public-health authorities and police.
- ▶ **Negligent act likely to spread infection of disease dangerous to life:** Section 269 IPC 1860 (now Section 271 BNS 2023); up to 6 months' imprisonment or fine, or both.
- ▶ **Adulteration of food or drink intended for sale:** Section 272 IPC 1860 (now Section 274 BNS 2023).
- ▶ **Sale of noxious food or drink:** Section 273 IPC 1860 (now Section 275 BNS 2023).
- ▶ **Negligent conduct with respect to a poisonous substance:** Section 284 IPC 1860 (now Section 286 BNS 2023); up to 6 months' imprisonment or fine, or both.
- ▶ Deliberate food contamination is a recognised bioterrorism vector; out-of-season clustering should raise suspicion.

♦ ♦ ♦

Discuss food poisoning. What are the duties of a doctor while dealing it?*Asked in: Paper III Dec 2023 — RGUHS MD Forensic Medicine*

Definition / Introduction

- ▶ **Food poisoning** is any disease of an infectious or toxic nature caused by eating contaminated food or water (the ACMSF definition).
- ▶ It is usually a self-limiting gut illness, sometimes with neurological features, caused by food or drink contaminated with micro-organisms/toxins, plant or animal poisons, or chemicals.
- ▶ A **food-borne outbreak** is two or more cases of similar illness from a common food source.
- ▶ The poisoning may be **accidental, suicidal, or homicidal** — poison can be disguised in food.

Classification of food poisoning

- ▶ **Biological contaminants:**
 - **Bacterial** — the largest group.
 - **Viral** — *Norovirus* (commonest in adults), *Rotavirus* (commonest in children).
 - **Fungal (mycotoxins)** — **aflatoxin** (*Aspergillus flavus/parasiticus*, hepatocarcinogenic) and **ergot** (*Claviceps purpurea*).
- ▶ **Vegetable poisons:**
 - *Lathyrus sativus* (kesari dal) causes **neurolathyrism**, a toxic leg paralysis (toxin BOAA).
 - *Argemone mexicana* oil, a mustard-oil adulterant, causes **epidemic dropsy** (toxin sanguinarine).
 - Poisonous mushrooms (*Amanita phalloides*) contain heat-stable amatoxins.
- ▶ **Animal poisons:** fish poisoning (ciguatera, scombroid, tetrodotoxin from puffer fish) and shellfish/mussel poisoning (paralytic, neurotoxic, diarrhoeic, amnesic types).
- ▶ **Chemical poisoning** — flavouring agents like MSG ("Chinese restaurant syndrome"), colouring/preserving agents, and accidental pesticides.
- ▶ **Stale food (ptomaines)** — an obsolete term for bacterial food poisoning.
- ▶ **Food allergy** — egg, fish, meat, milk, peanut.

Bacterial food poisoning — the three groups

Bacterial food poisoning is commoner in summer, when warmth favours bacterial multiplication.

Feature	Infection type	Toxic type	Botulism
Mechanism	Live bacteria multiply in the host	Ingestion of preformed exotoxin	Preformed neurotoxin of <i>C. botulinum</i>
Incubation	Long, 24–48 hours	Short, under 6 hours	12–48 hours
Fever	Present	Absent	Absent
Dominant feature	Diarrhoea more than vomiting	Vomiting more than diarrhoea	Flaccid descending paralysis
Typical organisms	<i>Salmonella</i> , <i>Campylobacter</i> , <i>Shigella</i> , <i>E. coli</i> (EIEC/EHEC)	<i>Staph. aureus</i> , <i>B. cereus</i> , ETEC, <i>C. perfringens</i>	<i>Clostridium botulinum</i>

- ▶ **Salmonellosis** — raw or undercooked eggs and milk; incubation 12–36 hours.

- ▶ **Staphylococcal food poisoning** — the **commonest** bacterial cause; heat-stable enterotoxin causes sudden vomiting within 1–6 hours, settling in about a day.
- ▶ ***Bacillus cereus*** — reheated, unrefrigerated rice ("Fried Rice syndrome"); an emetic form and a diarrhoeal form.
- ▶ **EHEC (*E. coli* O157:H7)** — bloody diarrhoea with a real risk of **haemolytic-uraemic syndrome (HUS)** in children; incubation is longer, 3–5 days.
- ▶ **ETEC** — the commonest cause of traveller's diarrhoea.
- ▶ **Botulism — the most dangerous type:**
 - Caused by *Clostridium botulinum*, an anaerobic, spore-forming rod.
 - Human food-borne disease is mainly from toxin types **A, B, and E** (type E linked to seafood).
 - The toxin blocks **acetylcholine release**, producing symmetrical **descending flaccid paralysis**.
 - Early gastrointestinal symptoms come first — nausea, vomiting, abdominal pain, constipation.
 - These are followed by dry mouth, dysphagia, dysarthria, diplopia, ptosis, and fixed dilated pupils, then respiratory failure.
 - It is the most poisonous biological substance known.
 - Treatment is **trivalent (A, B, E) antitoxin** plus ventilatory support; the main differential is **Guillain-Barré syndrome**.

Diagnosis and post-mortem findings

- ▶ Suspect food poisoning when illness starts suddenly, with uniform symptoms, in a previously healthy person soon after a shared meal.
- ▶ Confirm by isolating the same organism from the suspected food and from the patient's vomit or stool.
- ▶ Other useful tests are stool culture, serum electrolytes, and toxin detection at the Forensic Science Laboratory (FSL).
- ▶ At autopsy, the stomach and intestinal mucosa are congested, swollen, and may be ulcerated.
- ▶ The liver shows fatty degeneration on microscopy.
- ▶ In botulism deaths, the organs are simply congested.

Duties of a doctor dealing with food poisoning

The doctor has two duties — **medical** (save the patient) and **medico-legal** (assist the law) — because food poisoning is legally a form of poisoning. Two duties are specific to food poisoning: collecting a food sample and notifying public-health authorities.

A. Medical duties

- ▶ Resuscitate first — secure the **Airway**, support **Breathing** (oxygen or ventilation, especially in botulism), maintain **Circulation**, correct **Depression** (CNS).
- ▶ Correct fluid and electrolyte loss with oral or intravenous rehydration — this alone manages most cases.

- ▶ Give gastric lavage and activated charcoal for a recently ingested chemical or plant poison, but not for corrosives.
- ▶ Give trivalent antitoxin and ventilatory support for botulism.
- ▶ Use antibiotics only for severe, prolonged, bloody, or febrile bacterial diarrhoea.

B. Medico-legal duties

- ▶ Record preliminary particulars — name, age, sex, address, two identification marks, thumb impression, date and time.
- ▶ Inform the police in **every** case of suspected poisoning — accidental, suicidal, or homicidal.
- ▶ This duty to report flows from **Section 39 CrPC 1973 (now Section 33 BNSS 2023)**.
- ▶ A doctor who fails to report a medico-legal case commits **omission to give information under Section 176 IPC 1860 (now Section 211 BNS 2023)**.
- ▶ Giving the police information known to be false is punishable under **Section 177 IPC 1860 (now Section 212 BNS 2023)**.
- ▶ Inform and consult a senior doctor, and do not allow a suspected person to remain with the patient.
- ▶ Prepare a medico-legal case (MLC) report in triplicate — one copy each for the police, the patient, and hospital records.
- ▶ Record the history, food-related symptoms, and any change in the food's colour, taste, or smell.
- ▶ Take informed consent for examination; a child over 12 may consent, otherwise a guardian consents.
- ▶ **Section 53 CrPC 1973 (now Section 51 BNSS 2023)** allows examining an arrested accused with reasonable force, even without consent.
- ▶ In a comatose patient, take consent from an attendant, or act in good faith if none is available.
- ▶ Collect, seal, and hand over evidence to the police against signature — vomitus, gastric-lavage fluid, blood, urine, faeces, soiled clothing, and any leftover food or its container.
- ▶ If the patient is likely to die, arrange a dying declaration — call a Magistrate and certify the patient is of sound mind.
- ▶ If the patient dies, do **not** issue a death certificate — inform the police and send the body for medico-legal autopsy.
- ▶ Collect a sample of the contaminated food for FSL chemical analysis, and notify the public-health authorities since food poisoning is notifiable.
- ▶ Give the final opinion on cause only after the FSL chemical-analysis report is received.
- ▶ Preserve medico-legal records for **10 years**, or until the case is disposed of in court.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Classification flowchart** — top box "FOOD POISONING" branching into six boxes (biological, vegetable, animal, chemical, stale food, allergy); the bacterial box further branches into infection type, toxic type, and botulism.
- ▶ **Three-column comparison chart** of bacterial food poisoning — columns for infection type, toxic type, and botulism; rows for incubation period, fever, dominant feature, organisms, and toxin.

Medico-legal significance

- ▶ Food poisoning is a recognised route for **homicidal poisoning**, since poison can be hidden in food or drink.
- ▶ A mass outbreak (two or more cases from a common food) triggers public-health notification and can attract criminal liability against the food handler.
- ▶ The treating doctor preserves the **chain of custody** — sealed samples go to the police/investigating officer against signature, then to the FSL.
- ▶ A broken seal raises allegations of tampering.
- ▶ If the patient dies, the death requires an inquest under **Section 174 CrPC 1973 (now Section 194 BNSS 2023)**.

♦ ♦ ♦

Discuss signs, symptoms and treatment of methyl alcohol poisoning. Add a note on the medico-legal importance*Asked in: Paper III Apr 2025 — RGUHS MD Forensic Medicine***Definition**

- ▶ **Methyl alcohol (methanol)** — also called wood alcohol or carbinol — is a colourless, volatile liquid with a faint sweetish odour.
- ▶ It is used as a solvent, antifreeze, and paint remover, and is the denaturant in **methyated spirit** (about 90% ethanol + 10% methanol).
- ▶ Methanol itself is only mildly intoxicating.
- ▶ Its danger lies in its metabolites — **formaldehyde** and especially **formic acid**.
- ▶ These metabolites cause severe metabolic acidosis, optic-nerve damage (blindness), and basal-ganglia injury.
- ▶ In India it is mostly a poison of accidental mass exposure through adulterated illicit liquor — the **hooch tragedy**.

Toxicokinetics and mechanism of toxicity

- ▶ **Absorption:** rapid, from the gut, lungs, and skin; peak blood level by **30–60 minutes**.
- ▶ **Metabolism:** liver **alcohol dehydrogenase (ADH)** converts methanol to **formaldehyde**.
- ▶ Formaldehyde is quickly converted to **formic acid** by **aldehyde dehydrogenase**.

- ▶ Formaldehyde is short-lived, so it is the **accumulated formic acid** that causes most of the toxicity.
- ▶ **Elimination is slow** — only about one-fifth the rate of ethanol.
- ▶ Unmetabolised methanol may be detectable in blood for **3–4 days**.
- ▶ **Mechanism of injury:**
 - Formic acid **inhibits cytochrome-oxidase**, so cells cannot use the oxygen delivered to them (histotoxic hypoxia).
 - This produces a **high anion-gap, high osmolal-gap metabolic acidosis**.
 - There is selective toxicity to the **optic nerve and retina**, causing optic neuritis that can progress to atrophy.
 - There is selective **putamen (basal ganglia) necrosis**, causing Parkinsonism-like movement disorders in survivors.

Signs and symptoms

- ▶ A **latent, symptom-free period of about 24 hours** (range 1–72 h) precedes symptoms.
- ▶ This latency is **longer if ethanol is co-ingested** (it competes for ADH).
- ▶ It is **shorter when the methanol dose is large**.

System	Features
CNS	Headache, neck stiffness, vertigo, confusion; drunkenness is not prominent ; later convulsions and coma
Gastrointestinal	Nausea, vomiting, abdominal cramps, pancreatitis
Eyes	Blurred/misty " snowfield " vision, photophobia, scotomata; later fixed dilated pupils and permanent blindness
Metabolic	Severe high anion-gap acidosis (delayed 18–24 h); blood pH < 7.0 is a poor prognosis
Cardiorespiratory	Tachycardia, hypotension, cyanosis, Kussmaul breathing
Renal	Acute tubular necrosis, renal failure
Survivor sequelae	Blindness (commonest), Parkinsonism-like movement disorder, toxic encephalopathy

- ▶ **Cardinal clinical pointer:** suspect methanol poisoning when **abdominal pain + visual disturbance + metabolic acidosis** follow a drinking episode, especially in a suspected hooch outbreak.

Diagnosis / investigations

- ▶ **High anion-gap and high osmolal-gap metabolic acidosis.**
- ▶ **Blood methanol level;** detectable formic acid in blood.
- ▶ **Fundoscopy** shows retinal oedema and optic-disc hyperaemia.

- ▶ **CT/MRI brain** may show basal-ganglia (putaminal) degeneration.
- ▶ Blood for analysis must be collected in an oxalate/fluoride tube, under a layer of oil, and stored frozen — formalin, EDTA, and heparin can give **false-positive** results.

Treatment / management

- ▶ Methanol poisoning is a **medical emergency**.
- ▶ **Decontamination**: gastric lavage with 5% sodium bicarbonate if the patient presents within about 2 hours.
- ▶ **Emesis is not recommended** because it risks further CNS depression.
- ▶ **Correct the acidosis**: generous **IV sodium bicarbonate** — central to survival.
- ▶ **Ethanol (antidote)**: has far higher affinity for ADH than methanol, blocking its conversion to formic acid — methanol is then excreted unchanged.
 - *IV route*: 10% ethanol, 10 mL/kg over 30 minutes, then ~1.5 mL/kg/h to keep blood ethanol at **100–125 mg%**; needs ICU monitoring.
 - *Oral route (if ICU unavailable)*: 1 mL/kg of 95% ethanol in fruit juice, then 0.2 mL/kg/h of 50% ethanol.
- ▶ **Fomepizole (4-methylpyrazole)**: a competitive ADH inhibitor and the preferred modern antidote — no inebriation, faster acting, no ICU needed.
 - Dose: 15 mg/kg IV loading, then 10 mg/kg every 12 hours for four doses.
 - Drawback: costly and **not readily available in India**.
- ▶ **Folinic acid (leucovorin)**: speeds up conversion of formic acid to CO₂ and water; advised in essentially all cases.
- ▶ **Haemodialysis** is the **most effective** way to remove both methanol and formic acid.
 - Indicated for arterial pH < 7.25, renal failure, visual impairment, or blood methanol ≥ 20 mg%.
- ▶ **Supportive care**: airway protection/ventilation, oxygen, thiamine and pyridoxine, and a **darkened room** to protect the eyes.

Fatal dose, fatal period and cause of death

- ▶ **Fatal dose**: roughly **60–200 mL**.
- ▶ As little as **15 mL** can cause permanent blindness.
- ▶ A blood methanol level of about **200 mg%** is regarded as fatal.
- ▶ **Fatal period**: **24–36 hours**, occasionally delayed up to 4 days.
- ▶ **Cause of death**: severe metabolic acidosis with respiratory failure and circulatory collapse.

Autopsy findings

- ▶ Marked **cyanosis**; congested, oedematous, over-inflated (emphysematous) lungs.
- ▶ Brain congested and oedematous, with subarachnoid haemorrhage.
- ▶ **Putamen (basal-ganglia) necrosis** in those who survive longer.
- ▶ Fatty change in the liver; acute tubular degeneration in the kidneys.

- ▶ **Preserve viscera** in saturated common-salt solution; also send blood (under oil, frozen) and vitreous humour.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Diagram 1 — Metabolic pathway of methanol toxicity.**
 - Methanol → (enzyme: alcohol dehydrogenase) → Formaldehyde → (enzyme: aldehyde dehydrogenase) → Formic acid.
 - Formic acid → inhibits cytochrome-oxidase → histotoxic hypoxia + high anion-gap acidosis.
 - Formic acid → optic-nerve toxicity → optic neuritis/atrophy → blindness.
 - Formic acid → putamen necrosis → extrapyramidal sequelae.
 - Mark the **block by ethanol/fomepizole at the ADH step**, and **folinic acid** speeding formic acid → CO₂ + H₂O.
- ▶ **Diagram 2 — Fundus in methanol poisoning.**
 - Labels: hyperaemia of the optic disc, retinal/peripapillary oedema, engorged retinal veins.
 - Caption: "late stage — optic atrophy, pale disc."

Medico-legal significance

- ▶ Almost always **accidental, mass exposure** — the classic Indian hooch (illicit-liquor) tragedy, where several people in one locality fall ill or die together after drinking spurious liquor.
- ▶ Every victim, living or dead, needs a **medico-legal case (MLC)** report; the treating doctor must record the drinking history and preserve samples.
- ▶ An unnatural/suspicious death needs a police inquest under **Section 174 CrPC 1973 (now Section 194 BNSS 2023)**, or a magisterial inquest under **Section 176 CrPC 1973 (now Section 196 BNSS 2023)**.
- ▶ Viscera, blood (under oil, frozen), and vitreous must be sent to the **Forensic Science Laboratory (FSL)** to confirm the cause of death.
- ▶ Manufacturers or sellers of adulterated liquor can be charged with:
 - **Adulteration of food or drink** — **Section 274 BNS 2023** (formerly Section 272 IPC 1860).
 - **Sale of noxious food or drink** — **Section 275 BNS 2023** (formerly Section 273 IPC).
 - **Negligent conduct with a poisonous substance** — **Section 286 BNS 2023** (formerly Section 284 IPC).
- ▶ If death results, **causing death by negligence** — **Section 106 BNS 2023** (formerly Section 304A IPC) applies.
- ▶ Depending on knowledge or intent, **culpable homicide or murder** — **Sections 105/103 BNS 2023** (formerly Sections 304/302 IPC) may apply instead.
- ▶ A doctor who treats a patient while intoxicated and a death results can also be charged under **Section 106 BNS 2023** — also professional misconduct under National Medical Commission ethics rules.

- ▶ Driving with blood alcohol over 30 mg/100 mL is an offence under Section 185, Motor Vehicles Act 1988.
- ▶ Hooch tragedies cluster on "dry days" (holidays, elections, festivals) and in prohibition states — relevant to outbreak investigation.



Discuss solvent abuse

Asked in: Paper III Jun 2024 — RGUHS MD Forensic Medicine

Definition

- ▶ **Solvent abuse** (inhalant abuse, glue sniffing, volatile substance abuse/misuse — VSA/VSM) is the deliberate inhalation of volatile hydrocarbon products to get a brief euphoric high.
- ▶ It is a form of **sociomedical toxicology** — toxicology tied to social and behavioural patterns of substance use.
- ▶ It is common among adolescents and lower socioeconomic groups because these agents are cheap, legal and freely available.
- ▶ Its forensic importance lies in **sudden, unexpected death in otherwise healthy young people**, often with a near-negative autopsy.
- ▶ Confirming the diagnosis needs a demanding sample-preservation technique — often the only way to prove the case.

Terminology and methods of inhalation

- ▶ Modern **glue sniffing** was first noticed in the early 1960s, when children misused *toluene-based* model-aeroplane glue.
- ▶ Users typically **start with sniffing and progress to more concentrated methods** for a stronger effect.

Method	Technique	Exposure
Sniffing	Vapour inhaled from an open container/bottle neck	Low
Huffing	Soaked cloth held over the mouth	Intermediate
Bagging	Volatile poured into a bag held over nose/mouth	High
Dusting	Aerosol sprayed directly into mouth/nose	High
Glading	Air-freshener sprayed into a room, then inhaled	Variable

Commonly abused agents

- ▶ Unlike most drugs of abuse, **inhalants are legally obtainable** — their genuine household/industrial use is exactly what eases misuse.

- ▶ **Toluene** is the most studied and most commonly misused volatile solvent worldwide — found in adhesives, paints, thinners, varnishes, inks and fuels.
- ▶ Other volatile hydrocarbons/solvents: benzene, petrol, kerosene, acetone, xylene (permanent markers), carbon tetrachloride, trichloroethylene, 1,1,1-trichloroethane.
- ▶ **Fuel gases/propellants**: butane (lighter refills), propane, isopropane, aerosol propellants.
- ▶ **Nitrites**: alkyl nitrite, butyl nitrite ("poppers").
- ▶ **Anaesthetic gases**: chloroform, ether, halothane, nitrous oxide.
- ▶ Everyday products misused: adhesives, aerosol sprays, correction fluid, cleaning fluid, paint thinner, lighter fluid, shoe polish, spray paint, degreaser, whipped-cream cartridges ("whippets").

Clinical features

- ▶ **Acute intoxication** begins within seconds; the high lasts about 15–60 minutes and is dose-dependent.
- ▶ It resembles alcohol intoxication: disinhibition, euphoria, a floating sensation, dizziness, slurred speech and ataxia.
- ▶ Perception is distorted and may progress to frank hallucinations and vivid dreams.
- ▶ Behaviour can turn irrational or antisocial, with amnesia for the episode, self-injury or even suicide.
- ▶ A **physical withdrawal syndrome is characteristically absent** with inhalants — an important distinguishing point.
- ▶ The key acute danger is **hypoxia from oxygen displacement** in the lungs — heavy vapours lower alveolar oxygen and cause unconsciousness or death.
- ▶ Alkyl/butyl nitrites specifically (not the hydrocarbon solvents) can cause **methaemoglobinaemia** — haemoglobin that cannot carry oxygen normally.

Chronic intoxication ("solvent syndrome") — seen in painters, shoemakers, dry-cleaning workers, air-conditioner repairers and anaesthesiologists.

- ▶ **Solvent/painter's syndrome**: headache, insomnia, depression, irritability, fatigue, memory lapses, alcohol intolerance and violent temper.
- ▶ **Solvent psychosis**: a dementia-like state.
- ▶ **Motor disorders**: cerebellar dysfunction and involuntary movements, especially in petrol abusers.
- ▶ **Degreaser's flush**: trichloroethylene-exposed workers who drink beer afterwards develop vivid facial red blotches — alcohol blocks trichloroethylene metabolism, raising blood levels and dilating skin vessels.
- ▶ **Fetal solvent syndrome**: inhalant abuse in pregnancy can cause fetal brain maldevelopment with mild atrophy and behavioural, cognitive and emotional problems.
- ▶ Long-term organ damage: cardiomyopathy, liver damage, pulmonary hypertension, dementia, toluene-related renal dysfunction.

Cause of death — Sudden Sniffing Death

- ▶ This is the highest-yield concept in the topic.

- ▶ Ventricular fibrillation causing sudden cardiac arrest is the most common cause of death.
- ▶ The solvent sensitises the myocardium to catecholamines.
- ▶ Any sudden "fight, flight or fright" stimulus — a startle, exertion, or being discovered/chased — can then trigger a fatal arrhythmia.
- ▶ This can happen **even some time after sniffing has stopped** — hence the term **Sudden Sniffing Death**.
- ▶ Other mechanisms: **hypoxia/anoxia** from rebreathing the solvent to the exclusion of oxygen, and **accidental asphyxia**, including plastic-bag asphyxia and smothering.
- ▶ Also: aspiration of vomit, drowning, falls, and burns/explosions (from lighting a cigarette after inhaling in a closed space).
- ▶ **Chronic deaths** are due to liver failure and renal failure.

Management

- ▶ **Mild intoxication** is usually self-limiting — supportive care, vital-sign monitoring, and a calm, quiet environment.
- ▶ Over-stimulation must be avoided, since it can itself trigger a fatal arrhythmia.
- ▶ **Severe agitation** may need a parenteral antipsychotic such as haloperidol.
- ▶ Correct hypoxia and acidosis, and give respiratory support for lung injury.
- ▶ **Avoid catecholamines/sympathomimetics** where possible, because the myocardium is sensitised.
- ▶ There is **no specific antidote**.

Autopsy findings and sample preservation

- ▶ Post-mortem findings are often scanty — a "negative autopsy".
- ▶ The skin around the nose and mouth may be reddened or excoriated from the irritant solvent.
- ▶ There may be toxic cellular damage in the brain, kidneys, liver and bone marrow.
- ▶ The lungs may be congested/oedematous, and a glue/solvent smell may be present.
- ▶ **Sample preservation is the critical technique** — the diagnosis depends on capturing the volatile before it evaporates.
- ▶ **Lung**: mobilise one lung, tie off the main bronchus with a strong ligature, divide the hilum, and seal the lung immediately in a **heat-sealed nylon bag**.
- ▶ **Never use polythene/plastic bags** — they are permeable to volatile poisons.
- ▶ **Blood**: add a 1–2 cm layer of liquid paraffin over the surface (or fill the container to the top) to stop evaporation; collect preferably from the femoral vessels.
- ▶ Also preserve brain, fat, kidney/liver tissue and nasal swabs; clothing may retain spilled inhalant.
- ▶ **Do not use heparin or EDTA** — they interfere with detection of some volatiles.

Medico-legal significance

- ▶ **Manner of death is usually accidental**, but suicide and, rarely, homicide must be excluded; document the scene — bag, glue tube, soaked rag, solvent containers.

- ▶ Suspect solvent abuse in any sudden unexpected death of an adolescent or young adult with a near-negative autopsy, especially with peri-oral excoriation or a solvent smell.
- ▶ Such a death needs a police **inquest under Section 174 CrPC 1973 (now Section 194 BNSS 2023)**; if the death is in custody or otherwise suspicious, it falls under **Section 176 CrPC (now Section 196 BNSS 2023)**.
- ▶ Causing hurt through poison or an intoxicating/stupefying substance (e.g. drug-facilitated crime) is punishable under **Section 123 BNS 2023 (formerly Section 328 IPC 1860)**.
- ▶ Causing hurt or grievous hurt by dangerous means falls under **Section 118 BNS 2023 (formerly Sections 324/326 IPC 1860)**; the generic offence of voluntarily causing hurt is under **Section 115 BNS 2023 (formerly Section 323 IPC 1860)**.
- ▶ Common solvents (toluene, petrol, glue, butane, correction fluid) are **not scheduled under the NDPS Act 1985** — there is no Indian penal section that criminalises self-inhalation of household solvents.
- ▶ The doctor must use the correct volatile-preservation technique; failure lets the diagnostic volatile evaporate and the case go unproven.
- ▶ Identify vulnerable groups for prevention — street/working children misusing cheap toluene-based adhesives, adolescents with conduct disorder, and adults with antisocial personality disorder.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Sudden Sniffing Death mechanism:** volatile solvent inhaled (sniffing/huffing/bagging) → myocardial sensitisation to catecholamines → sudden fight-flight-fright stimulus (startle/exertion) → catecholamine surge → ventricular fibrillation → sudden cardiac arrest/death; side branches show hypoxia/oxygen displacement and plastic-bag asphyxia as alternative lethal pathways.
- ▶ **Lung sampling technique:** lung mobilised → main bronchus tied off with ligature → hilum divided → lung sealed in a nylon bag (never polythene).



Discuss the pathophysiology, clinical features, postmortem findings and medico-legal aspects of death due to bee stings

Asked in: Paper III Dec 2023 — RGUHS MD Forensic Medicine

Definition

- ▶ Bees, wasps, hornets and ants belong to the insect order **Hymenoptera**.
- ▶ Three families sting humans: **Apidae** (honey bees), **Vespidae** (wasps and hornets) and **Formicidae** (ants).
- ▶ A sting is the injection of venom (**apitoxin**) through a female worker's modified ovipositor (stinger).
- ▶ Severity ranges from trivial local pain to fatal **systemic anaphylaxis**.
- ▶ Anaphylaxis is an **IgE-mediated Type-I hypersensitivity** reaction.

- ▶ Death is usually **accidental** and grossly disproportionate to the tiny venom dose.
- ▶ The killer is the body's own allergic response, not the venom's toxic mass — a classic **hypersensitivity death**.

Stinging apparatus and venom

- ▶ Only the female insect has a stinger — a modified egg-laying organ (ovipositor).
- ▶ The **honey bee** (*Apis mellifera*) stinger is **barbed**, 1.7–2.2 mm long, and anchors firmly in skin.
- ▶ When the bee flies off, the stinger, venom sac and part of the abdomen tear away, killing it within minutes.
- ▶ So a honey bee **can sting only once**.
- ▶ **Wasps and hornets** have a smooth, unbarbed stinger that is not left behind, so they can sting **repeatedly**.
- ▶ **Fire ants** pivot on their mandibles, stinging in a **circular pattern** (7–8 stings) that leaves sterile pustules.
- ▶ A single honey bee injects about **0.1 mg** of venom, a colourless **acidic liquid** (pH 4.5–5.5).
- ▶ About 1% of people are allergic to bee stings.

Venom component	Source	Main action
Melittin	Honey bee	Local pain; lyses cell membranes
Phospholipase A2	Honey bee (most destructive)	Destroys cell membranes; potent allergen
Hyaluronidase	Bee, wasp, ant	"Spreading factor" — raises vascular permeability
Peptide 401	Honey bee	Degranulates mast cells → histamine release
Antigen 5	Wasp	Wasp's most potent allergen
Solenopsin-A	Fire ant	Local pustule, allergy

Pathophysiology — three overlapping mechanisms

- ▶ (1) **Direct toxic effect of venom**. Even without allergy, venom enzymes cause local pain, redness and swelling.
- ▶ **Mass envenomation** (a swarm attack, or repeated wasp stings) can itself cause shock, haemolysis, rhabdomyolysis and acute renal failure.
- ▶ (2) **IgE-mediated Type-I hypersensitivity — the main lethal mechanism**.
- ▶ On first exposure the person is **sensitised**: venom-specific IgE antibodies form and fix onto mast cells.
- ▶ On a later sting, the allergen cross-links this IgE and triggers mast-cell **degranulation**.
- ▶ Degranulation releases histamine, tryptase and heparin, plus newly made leukotrienes, prostaglandins and platelet-activating factor.
- ▶ These mediators cause bronchospasm, vasodilatation and a sharp rise in capillary permeability.

- ▶ The result is **anaphylactic shock** and **laryngeal oedema** — the most serious outcome of a Hymenoptera sting.
- ▶ **(3) Mechanical airway obstruction.** A sting on the mouth, throat, face or neck can swell the airway mucosa directly.
- ▶ This causes choking and rapid death even without full systemic anaphylaxis.

Clinical features

- ▶ Onset is early, usually within **10 minutes** of the sting.
- ▶ Most anaphylactic deaths occur within **1–2 hours**; death can be as fast as **2–15 minutes**.
- ▶ **Local reaction (commonest, usually benign):** pain, redness and a small area of swelling.
- ▶ Fire-ant stings cause a burning wheal that becomes a **sterile pustule** in 18–24 hours.
- ▶ **Systemic reaction:** generalised itching, hives (urticaria), and facial or generalised angio-oedema.
- ▶ **Respiratory:** breathlessness from laryngeal oedema, hoarseness, stridor and bronchospasm — the airway is the main danger.
- ▶ **Cardiovascular:** hypotension causing light-headedness, fainting, tachycardia and shock.
- ▶ Severe anaphylaxis often brings a characteristic "**sense of impending doom.**"
- ▶ **Diagnosis in survivors:** allergic history, plus skin-prick tests and the **radioallergosorbent test (RAST)** for venom-specific IgE.

Management

- ▶ **Remove the stinger at once** — only the honey bee leaves one behind.
- ▶ The detached venom sac keeps pulsating and empties within about **60 seconds**, so speed matters.
- ▶ **Scrape it off** with the edge of a card; do not squeeze it.
- ▶ **Local reaction:** ice packs, analgesics, oral antihistamines; larger swellings need intramuscular antihistamines/steroids.
- ▶ **Anaphylaxis — first line: intramuscular adrenaline (epinephrine)** for respiratory difficulty.
- ▶ Also give inhaled beta-2 agonists, intravenous fluids for falling blood pressure, corticosteroids and antihistamines.
- ▶ **Calcium gluconate 1–2 g intravenously** is useful for urticaria.
- ▶ Give airway support, oxygen and tetanus immunisation as needed.
- ▶ **Long term:** venom immunotherapy (desensitisation); sensitised patients should carry self-injectable adrenaline.

Postmortem findings

- ▶ The autopsy is often **negative or non-specific**, especially with rapid shock.
- ▶ Diagnosis then rests on **history plus laboratory tests**.
- ▶ Examine early — **laryngeal oedema recedes soon after death**.
- ▶ **External:** sting mark(s) with redness, urticaria or a wheal.
- ▶ The retained barbed stinger may still be seen in honey-bee stings.
- ▶ Fire-ant stings show circular grouped pustules.

- ▶ **Airway (most important):** laryngeal or pharyngeal oedema, seen in about **41% of cases**.
- ▶ Lungs show hyperinflation with mucus plugging, plus oedema and congestion.
- ▶ Petechial haemorrhages in the airway mucosa point to asphyxial-type death by choking.
- ▶ **General:** visceral congestion and cerebral oedema from hypoxia.
- ▶ **Microscopy:** eosinophils infiltrate the bronchial walls and the splenic red pulp.
- ▶ **Serum mast-cell tryptase** is the single most useful postmortem marker.
- ▶ Raised levels (about **12–100 ng/mL** versus a normal **1–11.4 ng/mL**) support anaphylaxis.
- ▶ **Collect femoral blood, not cardiac blood** — cardiac mast cells release tryptase non-specifically.
- ▶ Also test **serum venom-specific IgE**.
- ▶ **Preserve the skin around the sting with a ~5 cm margin**, frozen at -70°C if delayed.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Diagram 1 — Honey bee vs wasp stinger.** Show the barbed honey-bee stinger with its two lancets, microbarbs and attached (still-pulsating) venom sac beside the torn abdomen that kills the bee; next to it, the smooth unbarbed wasp stinger that is retained and can sting repeatedly.
- ▶ **Diagram 2 — Pathogenesis of anaphylaxis (flowchart).** Sting → venom allergen (PLA₂, antigen 5) → cross-links IgE on mast cell → degranulation → histamine, leukotrienes, tryptase, PAF → bronchospasm + vasodilatation + rising capillary permeability → laryngeal oedema + anaphylactic shock → death.

Medico-legal significance

- ▶ Manner of death is almost always **accidental**; venom is only rarely alleged in suicide or homicide.
- ▶ A sudden collapse after a sting must be properly investigated, not assumed to be natural death.
- ▶ A negative autopsy does not rule out anaphylaxis — pursue tryptase and IgE testing before calling it natural disease.
- ▶ Such sudden/unnatural deaths need a **police inquest under Section 174 CrPC 1973 (now Section 194 BNSS 2023)** or a **magistrate's inquest under Section 176 CrPC 1973 (now Section 196 BNSS 2023)**.
- ▶ The autopsy surgeon's testimony is **expert evidence under Section 45 Indian Evidence Act 1872 (now Section 39 Bharatiya Sakshya Adhiniyam 2023)**.
- ▶ A sting's shock can cause a traffic accident; a driver alleging this should be checked for a sting mark.
- ▶ Stings are an **occupational hazard** for bee-keepers, honey workers, farmers and foresters — a fatal sting may attract compensation.
- ▶ Mismanaged anaphylaxis can bring a **negligence charge under Section 304A IPC 1860 (now Section 106 Bharatiya Nyaya Sanhita 2023)**.
- ▶ This carries a lighter **2-year** term for registered doctors, against 5 years for the general public.
- ▶ Patients given a potential allergen should be **observed for at least 30 minutes**.
- ▶ Preserve viscera/tissue in anaphylactic deaths even when classical poisoning is not suspected.



Discuss the role of alcohol in road traffic accidents. Add a note of permissible blood alcohol level in different countries while driving a vehicle

Asked in: Paper III Jun 2024 — RGUHS MD Forensic Medicine

- ▶ **Ethyl alcohol (ethanol)** is the commonest inebriant poison — it produces euphoria and false well-being by depressing the brain's higher centres first.
- ▶ **Drunken driving** — driving after alcohol (or drugs) impairs mental/motor skills enough to endanger safety — is a major preventable cause of road traffic accidents (RTA).
- ▶ The forensic physician certifies suspected drunken drivers, estimates blood alcohol concentration (BAC), performs the autopsy in fatal RTAs, and gives expert opinion in court.

Why alcohol causes road accidents

- ▶ **Impaired judgement:** inhibitions are released, so the driver takes more risks while feeling falsely confident.
- ▶ **Loss of coordination:** steering, gear-changing and braking (sensorimotor skills) all suffer.
- ▶ **Prolonged reaction time:** response to a sudden hazard is delayed.
- ▶ **Reduced vision and hearing:** visual acuity and field narrow, nystagmus (involuntary eye jerking) appears, and hearing dims.
- ▶ **Poor concentration:** attention wanders and judgement of speed and distance becomes faulty.
- ▶ **Drowsiness:** alcohol (and many co-ingested drugs) causes sleepiness — falling asleep at the wheel is itself a major cause of accidents.
- ▶ These deficits worsen steeply as BAC rises.

BAC and crash risk (dose–response)

- ▶ **Below 50 mg%:** most drivers are unaffected or only mildly so.
- ▶ **50–100 mg%:** braking and steering are affected; the driver becomes bolder, driving faster and more erratically.
- ▶ **100–200 mg%:** severe impairment in most people, strongly prone to accidents.
- ▶ **Above 200 mg%:** very high likelihood of accident or fall.
- ▶ **Quantified crash risk:** about 2-fold higher at 60 mg%, rising markedly from 80 mg%, about 12-fold at 100 mg%, and about 20-fold at 150 mg%.

Examining a suspected drunken driver

- ▶ A uniformed police officer may arrest a suspected drunken driver without warrant; the doctor may then examine him without consent, using reasonable force if necessary, under **Section 51 BNSS 2023 (formerly Section 53 CrPC 1973)**.
- ▶ **Clinical staging:**
 - **Signs of consumption:** smell of alcohol, flushed face, conjunctival suffusion.

- **Signs of influence:** slurred boastful speech, unsteady gait, inability to walk a straight line, alcohol-gaze nystagmus.
- **Signs of intoxication:** vomiting and altered sensorium (drowsy, semi-conscious or comatose).
- ▶ **SFST (Standardized Field Sobriety Test):** three roadside tests — Horizontal Gaze Nystagmus, Walk-and-Turn, One-Leg Stand.
- ▶ **Breath analyser:** exhaled air passed over acidified potassium dichromate turns green in proportion to BAC, based on a blood : breath ratio of about 2100 : 1.
- ▶ It is only a screening test — the Patna High Court (2024) held it is not conclusive proof and needs blood/urine confirmation.
- ▶ **Blood sample:** 10–20 mL with potassium/sodium oxalate (anticoagulant) plus sodium fluoride (preservative), stored frozen and analysed within 48 hours (a 20–30% loss can still occur).
- ▶ **Urine sample:** 10–20 mL, no preservative needed.
- ▶ **Vitreous humour** is also useful after death — both resist putrefaction and contain no glucose.
- ▶ **Opinion — four standard formats:**
 - Has not consumed alcohol.
 - Has consumed alcohol but is not under its influence.
 - Has consumed alcohol and is under its influence.
 - Has consumed alcohol and is intoxicated.

Widmark's formula

- ▶ Back-calculates BAC at the time of the accident, once alcohol reaches equilibrium in the body.
- ▶ $A = c \times p \times r$, where A = alcohol absorbed (g), c = BAC, p = body weight (kg), r = Widmark's distribution factor.
- ▶ $r \approx 0.68$ in males and 0.55 in females, reflecting body water content — since alcohol distributes only in body water, the same dose gives a woman a higher BAC than a man of equal weight.

Autopsy in alcohol-related fatal RTAs

- ▶ **Pedestrian — primary impact:** bumper strike causes a wedge-shaped tibial fracture; the fragment's base marks the impact site, the apex shows the direction of travel.
- ▶ This is followed by secondary impact against the bonnet/windscreen, then tertiary injury from striking the ground.
- ▶ **Other pedestrian signs:** "scooping-up" onto the bonnet, tyre run-over marks, grease soiling, and avulsion of skin/soft tissue.
- ▶ **Occupant — steering-wheel impact:** transverse sternal fracture with cardiac/aortic rupture.
- ▶ **Whiplash** (violent hyperflexion–hyperextension of the neck) causes atlanto-occipital dislocation in 20–30% of whiplash cases, and in about one-third of all fatal motor-vehicle accidents overall.
- ▶ **Other occupant injuries:** "dicing"/"sparrow-foot" facial lacerations from the shattered windscreen, "seat-belt syndrome", and airbag injury.
- ▶ **Trace evidence:** preserve clothing, paint, glass, tyre marks, hair and blood for grouping/DNA; measure leg-fracture height from the heels to identify a hit-and-run vehicle.

- ▶ **Alcohol sampling at autopsy:** take femoral venous blood, not blood near the stomach — the latter gives falsely high results from gastric diffusion.
- ▶ Also collect bladder urine and vitreous humour; post-mortem BAC stays valid up to 36 hours after death.
- ▶ In delayed death after head injury, preserve any extradural/subdural haematoma — clotted and outside the circulation, it retains the BAC at the time of injury.
- ▶ Beware putrefactive alcohol (up to ~0.2%): present in blood/viscera but absent in urine, it is putrefactive, not true intoxication.

Permissible BAC across countries

Permissible BAC	Representative countries
0 (zero tolerance)	Russia, Pakistan, Saudi Arabia, UAE, Bangladesh, Nepal
20 mg%	Norway, Poland, Sweden
30 mg% (India)	India, China, Japan
50 mg%	Australia, France, Finland
80 mg%	UK, Germany, USA
100 mg%	Ireland

- ▶ India's limit of **30 mg per 100 mL of blood** is fixed under **Section 185(a), Motor Vehicles Act 1988**: up to 6 months and/or ₹10,000 fine for a first offence, up to 2 years and/or ₹15,000 for a repeat offence within 3 years.

Medico-legal significance

- ▶ Drunken-driver certification must follow the four standard opinion formats, backed by clinical findings plus confirmatory blood/urine analysis.
- ▶ A female accused examined by a male doctor needs a female attendant present.
- ▶ Alcohol also raises the risk of suicide, homicide, and accidental falls or drowning.
- ▶ An intoxicated victim often shows fewer defence injuries (slowed reactions) and may bleed more or aspirate vomit.
- ▶ Before certifying intoxication, rule out mimics: head injury from the crash itself, epilepsy, meningitis, diabetic coma, and methanol or carbon-monoxide poisoning.
- ▶ **Causing death by negligent driving** is punishable under **Section 304A IPC 1860 (now Section 106 BNS 2023)**.
- ▶ **Hit-and-run (new)**: Section 106(2) BNS punishes a driver who causes death by rash/negligent driving and escapes without reporting to police, with imprisonment up to 10 years.
- ▶ **Rash driving on a public way** is punishable under **Section 279 IPC 1860 (now Section 281 BNS 2023)**.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Graph:** BAC (mg%) on the x-axis against relative crash risk (fold-increase) on the y-axis.
- ▶ Plot a curve rising gently to 50 mg%, about 2× at 60 mg%, about 12× at 100 mg%, about 20× at 150 mg%.
- ▶ Mark India's legal limit of 30 mg% with a vertical dashed line.
- ▶ **Pedestrian bumper injury:** draw the tibia–fibula with a wedge/triangular fracture.
- ▶ Label the base of the fragment as the impact site, the apex as pointing in the direction of vehicle travel, and the bumper height above the heel as indicating vehicle height.

♦ ♦ ♦

Drug of abuse*Asked in: Paper III Oct 2022 — RGUHS MD Forensic Medicine***Definition**

- ▶ A **drug of abuse** is any natural or synthetic substance taken for its mind-altering effect, not for genuine medical treatment.
- ▶ Repeated use produces **drug dependence** — a compulsion to keep taking the drug.
- ▶ The WHO (World Health Organization) Expert Committee coined the term "**drug dependence**" in 1964.
- ▶ It replaced *addiction* and *habituation*, since every drug produces a mix of physical and psychological dependence.
- ▶ Forensic importance: acute fatal poisoning, custodial and trafficking deaths, and drug-facilitated crime.
- ▶ They are governed by a dedicated penal statute, the **Narcotic Drugs and Psychotropic Substances (NDPS) Act, 1985**.

Key terminology

- ▶ **Drug addiction:** physical AND psychological dependence.
 - Compulsive use with craving.
 - Dose keeps increasing.
 - Harms both the individual and society.
 - Relapse after stopping.
 - Characteristic withdrawal on stopping.
 - Examples: alcohol, opioids, cannabis, cocaine, amphetamines, barbiturates.
- ▶ **Drug habituation:** psychological dependence only.
 - Mere desire, no true compulsion.
 - No dose escalation.
 - Harm mainly to the individual.
 - No relapse.

- Withdrawal is mild or absent.
- Examples: caffeine, nicotine, tea.
- ▶ **Tolerance:** a steadily increasing dose is needed for the same effect (e.g. LSD [lysergic acid diethylamide] tolerance builds in 2–3 days, lost in 4–6 days off the drug).
 - **Cross-tolerance:** tolerance to one drug also covers other drugs of the same class.
- ▶ **Withdrawal (abstinence) syndrome:** symptoms that appear when blood drug levels fall after prolonged heavy use.
 - Relieved by taking the drug again.
 - Severity depends on the dose, the drug, duration of addiction, and how suddenly it is stopped.
- ▶ **Substance Use Disorder (SUD):** the current diagnostic label.
 - DSM-5 (Diagnostic and Statistical Manual, 5th edition) lists 11 criteria — impaired control, social impairment, risky use, tolerance, withdrawal — graded mild/moderate/severe.

Classification

DSM-5 recognises 10 substance classes; exams use a legal-cum-pharmacological classification:

Group	Examples
Narcotics (NDPS-scheduled)	Coca leaf, cannabis, opium & poppy straw, manufactured drugs
Opioids	Morphine, codeine, heroin, pethidine, methadone, fentanyl
CNS stimulants	Amphetamine, methamphetamine, cocaine, caffeine
CNS depressants	Barbiturates, benzodiazepines, methaqualone
Hallucinogens	LSD, psilocybin, mescaline, PCP, ketamine
Cannabinoids	Bhang, ganja, charas (active principle THC)
Inhalants	Glue, petrol, nitrous oxide, chloroform

Routes & hazards

- ▶ **Oral ingestion.**
- ▶ **Inhalation/smoking** — e.g. nicotine, charas smoked in a chillum.
- ▶ *Chasing the dragon* — heroin vapour inhaled through a tube.
- ▶ **Snorting/sniffing** — e.g. cocaine.
- ▶ **Injection:**
 - **Mainlining** — intravenous, used for potent opioids.
 - **Skin-popping** — subcutaneous.
 - Intramuscular.
- ▶ **Adulterants** ("cutting" agents like talc or quinine) cause pulmonary granulomas.

- ▶ **Infections** from unsterile needles: Hepatitis B, HIV, abscess, thrombophlebitis, right-sided infective endocarditis.
- ▶ Other hazards: gangrene, anaphylaxis, and **body-packing** during trafficking.
- ▶ **General signs of abuse:** weight loss, unsteady gait, tremors, slurred speech, impaired memory, plus drug-specific withdrawal.

Important individual drugs

- ▶ **Opioids (opium, morphine, heroin):**
 - Heroin (diacetylmorphine, "brown sugar") is India's most-abused opioid, especially among urban youth.
 - Acute poisoning progresses from excitement to stupor to coma.
 - Classic triad: **pin-point pupils, depressed respiration, coma.**
 - Death is from respiratory failure.
 - **Fatal doses:** raw opium ~2 g, morphine ~200 mg, heroin ~50 mg, codeine ~800 mg, pethidine ~1 g, methadone ~100 mg.
 - **Antidote:** naloxone (IV/IM, repeated doses).
 - Chronic addicts are emaciated and constipated, with pin-point pupils and impotence.
 - A **neonatal withdrawal syndrome** (hyperactivity, twitching, convulsions) appears within 2 days in babies of addicted mothers.
- ▶ **Cannabis (Indian hemp):**
 - Earliest and most widely abused illicit drug worldwide; active principle Δ^9 -THC.
 - Three Indian forms of rising potency: **bhang** (leaf drink, weakest), **ganja** (flowering tops, smoked), **charas/hashish** (resin, most potent).
 - Chronic use causes **amotivational syndrome** and **cannabinoid hyperemesis syndrome**.
 - *Run amok* — an acute psychotic homicidal frenzy from hashish, with no criminal responsibility for the person.
 - Detected by the **Duquenois–Levine test** (violet colour) and confirmed on urinary THC.
 - **Cystolithic-hair microscopy** identifies the plant botanically.
- ▶ **Cocaine:**
 - An alkaloid of *Erythroxylum coca*; a powerful CNS stimulant and vasoconstrictor.
 - Snorted, smoked as "**crack**", or injected; "**speedball**" = cocaine + heroin.
 - Causes a euphoric "rush", then a "crash" (rebound depression).
 - Chronic abuse causes **Magnan's symptom** (formication — a sensation of insects crawling under the skin) and perforation of the nasal septum.
 - Fatal dose ~1 g orally.
- ▶ **Amphetamines & designer stimulants:**
 - Release brain monoamines, causing euphoria, hyperactivity, and psychosis.
 - Chronic abuse causes emaciation, skin-picking, and violence.

- MDMA (ecstasy) depletes serotonin and can kill through hyperthermia, rhabdomyolysis, and arrhythmia.
- ▶ **Hallucinogens (LSD, PCP):**
 - LSD can cause a "**bad trip**" (panic) or a **flashback** — re-experiencing the drug's effect months later without re-dosing.
 - PCP ("angel dust") causes dissociation and violent behaviour.
- ▶ **Inhalants (glue-sniffing):**
 - Mainly abused by adolescents (bagging, huffing, sniffing).
 - Causes alcohol-like intoxication.
 - Commonest cause of death: "**sudden sniffing death**" from ventricular fibrillation.

Medico-legal significance

- ▶ NDPS Act 1985, Section 2(xiv) defines a narcotic drug as coca leaf, cannabis, opium, poppy straw, and all manufactured drugs.
- ▶ It grades seizures into **small** and **commercial quantity** (e.g. heroin 5 g/250 g, cocaine 2 g/100 g, opium 25 g/2.5 kg), with escalating punishment.
- ▶ **Section 31A** prescribes the death penalty for certain repeat offenders.
- ▶ **Voluntary intoxication is no defence** to a crime — **Section 24 BNS 2023 (formerly Section 86 IPC 1860)**.
- ▶ **Involuntary intoxication is a valid excuse** — **Section 23 BNS 2023 (formerly Section 85 IPC 1860)**.
- ▶ An unnatural or suspicious poisoning death requires police intimation and inquest under **Sections 194/196 BNSS 2023 (formerly Sections 174/176 CrPC 1973)**.
- ▶ **Body-packers ("mules")** swallow well-sealed packets to smuggle drugs; **body-stuffers** hastily swallow poorly-packed drug when about to be arrested.
- ▶ Both are detected on X-ray or CT abdomen; packet rupture causes fatal poisoning and sudden custodial death.
- ▶ **Drug-facilitated sexual assault (DFSA):** a colourless, odourless, rapidly-acting agent (alcohol, GHB, benzodiazepines, ketamine) secretly added to a drink.
- ▶ **Urine within 72 hours** is the best sample for detection.
- ▶ Consent obtained during intoxication is not valid consent — **Section 28 BNS 2023 (formerly Section 90 IPC 1860)**.
- ▶ **Doctor's duties:**
 - Recognise and resuscitate acute intoxication.
 - Preserve blood, urine, vitreous, stomach contents, and skin around injection sites (opposite-limb control) for analysis.
 - Report custodial and trafficking deaths.
 - Never prescribe or dispense drugs to feed abuse — this is professional misconduct.

- ▶ **Autopsy findings in a chronic abuser:** emaciation, needle-track scars, perivenous fibrosis, perforated nasal septum, pulmonary granulomas from talc, and drug packets in the gut of a body-packer.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Venn diagram of "drug dependence" (WHO 1964):** two overlapping circles — **drug addiction** (physical + psychological dependence, craving, dose escalation, relapse, characteristic withdrawal) and **drug habituation** (psychological dependence only, mere desire, no escalation, no relapse, mild/no withdrawal) — both enclosed in an outer ring labelled **drug dependence**.
- ▶ **Flow-chart of opioid withdrawal:**
 - **Early (within 12 h):** lacrimation, runny nose, yawning, sweating, craving, muscle aches.
 - **Intermediate (12–24 h):** dilated pupils, gooseflesh, tremor, increased bronchial secretions.
 - **Late (24 h–10 days):** abdominal cramps, leg pains, vomiting, diarrhoea, fever, hypertension.
 - Resolves in 7–10 days.



Drunken driving and road traffic accidents

Asked in: Paper III Oct 2017 — RGUHS MD Forensic Medicine

Definition and introduction

- ▶ Drunken driving (DUI) is driving with **blood alcohol concentration (BAC)** above the legal limit, or too impaired by alcohol/drugs to control the vehicle.
- ▶ Alcohol progressively impairs judgement, reaction time, coordination, and vision/hearing — a major, preventable cause of **road traffic accidents (RTA)**.
- ▶ The forensic doctor works at three levels: certifying a drunken driver, interpreting BAC, and autopsying RTA victims.
- ▶ Governing law: the **Motor Vehicles Act 1988 (MVA)**, amended 2019, with the **Bharatiya Nyaya Sanhita (BNS) 2023** (replaced IPC 1860) and **Bharatiya Nagarik Suraksha Sanhita (BNSS) 2023** (replaced CrPC 1973).

Alcohol pharmacokinetics relevant to driving impairment

- ▶ **Absorption:** ~20% of ethanol is absorbed from the stomach, ~80% from the small intestine, where it is fastest.
- ▶ Peak BAC is reached in **45–90 minutes** (~30 minutes on an empty stomach).
- ▶ Food and strong drinks (>40%) delay absorption via pylorospasm (spasm of the stomach outlet).
- ▶ **Distribution:** alcohol spreads with body water and crosses the blood–brain barrier readily, giving a **higher BAC in women** (smaller body-water volume).

- ▶ **Metabolism:** ~90% is oxidised in the liver via alcohol dehydrogenase to acetaldehyde, then acetic acid; the rest is excreted unchanged in urine/breath.
- ▶ BAC falls at a steady **15–18 mg%/hour**, allowing the level at the accident to be **back-extrapolated** from a later sample.

Effect of rising BAC on driving ability

BAC (mg%)	Effect on driving
Up to 50	Most drivers unaffected; some mild impairment
60	About 2× more likely to crash than sober
100	About 12× crash risk; all drivers affected
150	About 20× crash risk; driving distinctly impaired
Above 200	High likelihood of accident or fall

- ▶ India's legal BAC limit for driving is **30 mg%** (Section 185, Motor Vehicles Act 1988).
- ▶ **Mechanisms:** impaired concentration, over-confidence, dulled judgement, slowed reaction time, poor coordination, and reduced visual/auditory acuity.

Clinical examination and certification of a drunken driver

- ▶ The doctor must decide three things: was alcohol consumed, is the person under its influence, and how much control has been lost.
- ▶ **Consent:** blood, urine or breath need written consent.
 - Exception: an arrested driver may be examined without consent under **Section 53 CrPC 1973 (now Section 51 BNSS 2023)**.
 - Exception: an unconscious person may be examined under **Section 92 IPC 1860 (now Section 30 BNS 2023)**, taking a guardian's consent where possible.
- ▶ **Rule out mimics:** CO poisoning, sedative/insulin drug effects, head injury, high fever, stroke, and neuro/psychiatric disease can mimic drunkenness.
- ▶ The **odour of alcohol on the breath** is the only reliable single sign.
- ▶ **Examination covers:** intake history, vital signs, speech, pupils/nystagmus, gait, and coordination.
- ▶ **SFST (NHTSA):** three roadside tests — Horizontal Gaze Nystagmus (HGN), Walk-and-Turn, and One-Leg Stand.
 - HGN onset $\leq 40^\circ$ from midline suggests BAC >100 mg%; BAC >80 mg% is consistently linked to HGN.
- ▶ **Opinion — one of four conclusions:**
 - No alcohol consumed.
 - Consumed, but not under its influence.
 - Consumed and under its influence.
 - Under the influence of alcohol.

Laboratory estimation and interpretation of BAC

- ▶ **Breath analyser (screening only):** blood-to-breath alcohol ratio is constant at **1:2100** at 34°C.
- ▶ **The Patna High Court (2024)** held it is **not conclusive proof**; blood/urine confirmation is needed.
- ▶ **Sampling:** 10–20 mL blood with oxalate anticoagulant and sodium-fluoride preservative, sealed with an oil layer, stored frozen at –20°C.
- ▶ Serum/plasma alcohol reads 12–20% higher than whole blood; multiply urine alcohol by 0.75 to estimate blood level.
- ▶ **Gas–liquid chromatography** is the most reliable laboratory method.
- ▶ ***Widmark's formula:** $A = c \times p \times r$ (A = alcohol in g, c = blood alcohol decigram%, p = body weight kg, r = 0.68 men, 0.55 women*) — valid only once absorption and equilibrium are complete.

Autopsy and reconstruction in road traffic accidents

- ▶ **Objectives:** reconstruct the accident, give cause and manner of death, and identify the victim and driver.
- ▶ **Pedestrian injuries:** primary impact (bumper height), secondary impact (bonnet/windscreen), and ground/run-over injury.
- ▶ Run-over produces tyre-tread imprints, grease soiling, brush burns, and avulsion (skin torn away).
- ▶ **Speed shapes the pattern:**
 - Low speed: pedestrian thrown clear.
 - Higher speed: victim "scooped" onto the bonnet.
 - Tall, straight-fronted vehicles (trucks, buses): pelvic/trunk injury, then run-over.
- ▶ **Occupants:** an unrestrained driver gets steering-wheel chest injury (sternal fracture, crushed heart, split aorta) and dashboard knee/femur injury.
- ▶ Shattered windscreen glass causes **dicing lacerations** ("sparrow-foot" cuts).
- ▶ **Whiplash** can dislocate the atlanto-occipital joint (~1/3 of fatal RTAs) and tear the aorta with "ladder tears".
- ▶ **Two-wheeler riders:** head injury in ~50% of helmetless riders (hinge fractures, foramen magnum ring fracture); helmets cut head-injury risk ~30%, fatalities ~40%.
- ▶ **Restraints:**
 - Seat belts cut death risk ~40% but can cause "seat-belt syndrome" (intestinal tears).
 - Air bags cut driver fatality ~14% alone, ~50% combined with belts.
- ▶ **Scene/trace evidence:** skid marks, tyre/paint/glass fragments, and the victim's blood/hair/fibres.
- ▶ In hit-and-run: check clothing for tyre-tread imprints, preserve blood for DNA matching, and measure fracture height to identify the vehicle.
- ▶ Other RTA contributors: sedative drugs, hypoglycaemia, coronary disease, and epilepsy.
- ▶ In delayed death, alcohol may clear from circulating blood but stays fixed in a sequestered extradural/subdural haematoma — preserve it for analysis.

- ▶ In advanced putrefaction, preserve the **brain** for alcohol analysis instead.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Pedestrian RTA injury sequence:** pedestrian and vehicle, labelled — primary impact, secondary impact, tertiary/ground impact, run-over, direction of travel.
- ▶ **BAC vs crash-risk curve:** BAC (mg%) 0–200 on the X-axis, relative crash risk on the Y-axis, marking 30 mg% (legal limit), 60 (2×), 100 (12×), 150 (20×).

Medico-legal significance

- ▶ **Doctor's duties:** certify the drunken driver, dispatch samples, give the four-format opinion, and in a fatal RTA perform a complete autopsy with documented, scaled injuries.
- ▶ **Section 185, MVA 1988** (amended 2019): an offence to drive with blood alcohol above 30 mg%, or while incapable due to a drug.
- ▶ First offence: up to 6 months and/or ₹10,000 fine. Repeat offence within 3 years: up to 2 years and/or ₹15,000.
- ▶ **MVA arrest/testing powers:**
 - **S.202:** a uniformed police officer may arrest without warrant for a S.185 offence committed in his presence.
 - **S.203:** police may breath-test a suspected drunken driver; refusal allows arrest without warrant, and the result is admissible.
 - **S.204:** a registered medical practitioner may lab-test the blood of a person arrested under S.203; result admissible.
- ▶ **Criminal law (dual-cited):**
 - Rash/negligent driving — **Section 279 IPC 1860 (now Section 281 BNS 2023)**.
 - Death by negligence — **Section 304A IPC 1860 (now Section 106 BNS 2023)**.
 - Drunken misconduct in public — **Section 510 IPC 1860 (now Section 355 BNS 2023)**.
- ▶ A female examinee must be examined by, or under the supervision of, a female registered medical practitioner (**Section 53(2) CrPC 1973, now Section 51 BNSS 2023**).
- ▶ **Interpretation cautions:** putrefaction can itself generate alcohol (usually <200 mg%); auto-brewery syndrome (gut fermentation producing alcohol) and embalming fluid can also confound results.
- ▶ **Mellanby's effect:** impairment at a given BAC is greater on the rising limb than the falling limb.

♦ ♦ ♦

Enlist various poisonous seeds with their active principles, fatal dose and fatal period. Comment on their medico-legal aspects

Asked in: Paper III Dec 2023 — RGUHS MD Forensic Medicine

Definition

- ▶ Poisonous seeds are seeds whose active principle can kill or cause serious harm on ingestion, injection, skin contact or use on cattle.
- ▶ They matter forensically because they are cheap, freely available and easy to hide in food.
- ▶ Abrus, Datura and oleander seeds recur in homicide, cattle poisoning, stupefying robbery and criminal abortion.
- ▶ Their active principles fall into five chemical families, each with its own mechanism:
 - **Toxalbumins (abrin, ricin, crotin):** block protein synthesis, damage blood vessels and cause bleeding tendencies with DIC (disseminated intravascular coagulation).
 - **Cardiac glycosides (oleanders):** act like digitalis — bradyarrhythmias, conduction block, hyperkalaemia, cardiac failure.
 - **Anticholinergic alkaloids (Datura, belladonna):** produce the classic "mad, hot, red, dry, blind" syndrome.
 - **Spinal stimulant (strychnine, nux vomica):** blocks glycine, the inhibitory neurotransmitter at anterior-horn motor cells, causing tetanic convulsions.
 - **Irritant resins/vesicants (croton oil, marking nut, capsicum):** cause local blistering and gut irritation.

Poisonous seeds — active principle, fatal dose, fatal period

Seed (common name)	Active principle	Fatal dose	Fatal period
<i>Abrus precatorius</i> (jequirity, rosary pea)	Abrin (toxalbumin)	1–2 seeds (90–120 mg); subcutaneous abrin 20–70 mg	3–5 days
<i>Ricinus communis</i> (castor)	Ricin (toxalbumin); the oil itself has no ricin	5–10 seeds (~60 mg ricin)	2–5 days
<i>Croton tiglium</i> (jamalgota)	Crotin (toxalbumin); oil has a separate vesicant resin	4–5 seeds; 1–2 mL oil	6 hours – 3 days
<i>Strychnos nux-vomica</i> (kuchla)	Strychnine, brucine	50–100 mg; 1–3 g crushed seeds	A few hours
<i>Nerium oleander</i> (white oleander, kaner)	Cardiac glycosides — oleandrin, karabin	Karabin 150 mg; leaves 5–15 g	Hours–days
<i>Thevetia peruviana</i> (yellow oleander)	Cardiac glycosides — thevetin, neriifolin	8–10 seeds (adult), 1–2 (child)	Hours–days
<i>Datura stramonium</i> (dhatura)	Hyoscine, hyoscyamine	50–100 crushed seeds	1–2 days

Seed (common name)	Active principle	Fatal dose	Fatal period
<i>Atropa belladonna</i>	Atropine	~80 grains of root	3–6 hours
<i>Semecarpus anacardium</i> (marking nut)	Irritant resin (semecarpol)	5–10 g of juice	12–24 hours
<i>Argemone mexicana</i> (satyanashi)	Sanguinarine	Chronic — mustard-oil adulterant	Weeks (insidious)

Clinical features by group

► Toxalbumin seeds (abrin/ricin/croton):

- Onset is delayed — from a few hours up to 2–3 days.
- Severe gastritis with bloody diarrhoea and a weak rapid pulse.
- Cytotoxic damage to the CNS, liver, kidney and adrenals develops over 2–5 days.
- Abrin injected under the skin (the *sui*/needle method) causes local necrosis, then convulsions and cardiac failure, closely mimicking a viper bite.
- There is no effective antidote for abrin, so treatment is supportive.

► Cardiac-glycoside seeds (oleanders):

- A gastrointestinal phase (vomiting, salivation, diarrhoea) is followed by a lethal cardiac phase of hypotension, dysrhythmias and conduction block.
- Autopsy shows subendocardial haemorrhages and dilated cardiac chambers.
- Yellow oleander resists heat and is detectable even in cremated remains.

► Anticholinergic seeds (Datura):

- Remembered as the "D's": dry mouth, dysphagia, dilated pupils, flushed face, dry hot skin, delirium, drowsiness, dysuria, death.
- The victim is restless and hallucinating, and is left with complete amnesia afterwards.
- This amnesia is why Datura is the classic stupefying-robbery poison.
- Antidote: physostigmine 1–2 mg given intravenously.

► Spinal-stimulant seed (nux vomica):

- Only crushed seeds are dangerous.
- Neck and facial stiffness is followed by violent, symmetrical tetanic spasms.
- Spasms produce opisthotonos (arched back) and risus sardonicus (grinning spasm), triggered by the slightest stimulus.
- The mind stays clear between spasms, and death comes from asphyxia and exhaustion.

► Irritant/vesicant seeds:

- Croton seed or oil causes burning oral pain, violent purging and skin blistering.
- Marking-nut and Calotropis juice cause bruise-like vesicating lesions, sometimes used to fake assault injuries.
- Capsicum (chilli) powder is thrown into the eyes to disable a robbery victim.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ Draw the four classical poisonous seeds side by side, each labelled.
- ▶ **Abrus (jequirity)**: egg-shaped, scarlet seed about 8×6 mm, one large black spot at one end.
- ▶ **Ricinus (castor)**: smooth, flattened-oval, mottled brown/grey seed with a caruncle.
- ▶ **Croton**: oval, dark-brown seed with longitudinal lines.
- ▶ **Nux vomica**: flat, disc-shaped, ash-grey, silky-hairy seed, one concave and one convex face.
- ▶ Add an inset of the Datura fruit — a spiny "thorn apple" capsule with reniform black seeds.
- ▶ Add a side-by-side comparison of mustard seed versus Argemone seed — Argemone is larger, rougher and blackish.

Medico-legal significance

- ▶ **Homicide and cattle poisoning — the Abrus "sui"**: Decorticated Abrus seeds are mixed with datura, opium and onion, made into a paste and moulded into sharp needles (*suis*), then sun-dried.
- ▶ A sui, set in a wooden handle, is driven into cattle to obtain cheap hides, or into humans to kill.
- ▶ At autopsy, look for fragments of the needle plus local oedema and petechiae under the skin and serous membranes.
- ▶ Death by poison is charged as murder under **Section 302 IPC 1860 (now Section 103 BNS 2023)**, using the definition of murder in **Section 300 IPC (now Section 101 BNS 2023)**.
- ▶ Hurt or grievous hurt caused by a dangerous means such as poison falls under **Section 324/326 IPC (now Section 118(1)/118(2) BNS 2023)**.
- ▶ **Stupefying robbery (Datura)**: Crushed seeds are mixed into sweets, *pan* or food to stupefy travellers, children or rape victims for robbery, charged under **Section 328 IPC (now Section 123 BNS 2023)**.
- ▶ **Suicide and accidental poisoning**: Yellow-oleander seed/kernel ingestion is a common suicidal poison in South India, and castor/oleander seeds cause accidental poisoning in children.
- ▶ Argemone-contaminated mustard oil causes epidemic dropsy, a chronic mass poisoning with oedema, glaucoma and cardiac failure.
- ▶ **Criminal abortion**: Croton oil/root, Calotropis and oleander root are pushed onto abortion sticks or the cervical os to cause miscarriage, an offence under **Section 312 IPC (now Section 88 BNS 2023)**.
- ▶ **Fabricating injuries**: Marking-nut and Calotropis juice applied to skin produce vesicating lesions that mimic bruises to support a false assault charge.
- ▶ **Death inquiry**: A death by poisoning needs a police inquest under **Section 174 CrPC 1973 (now Section 194 BNSS 2023)**, with a magisterial inquiry under **Section 176 CrPC (now Section 196 BNSS 2023)**.
- ▶ **Doctor's duties**: Preserve the stomach with contents, intestine, liver, kidney, blood and urine in saturated saline, and search the gut contents for seed fragments — often the only diagnostic clue.

- ▶ Report suspected poisoning to police, record a dying declaration if the patient is serious (**Section 32 IEA, now Section 26 BSA 2023**), and avoid issuing a death certificate.
- ▶ Forward all exhibits to the Forensic Science Laboratory / Chemical Examiner, whose report is admissible as expert opinion under **Section 45 IEA 1872 (now Section 39 BSA 2023)** and **Section 293 CrPC (now Section 329 BNSS 2023)**.
- ▶ **Detection:** Yellow oleander, Datura and strychnine resist putrefaction and are identifiable even in decomposed or cremated remains.
- ▶ Argemone contamination is confirmed by ferric-chloride or paper chromatography.



Forensic herpetology

Asked in: Paper III Apr 2019 — RGUHS MD Forensic Medicine

- ▶ **Forensic herpetology** applies the study of snakes to medico-legal problems.
- ▶ It covers species identification, recognising **ophitoxaemia** (venom poisoning), deciding manner of death, and lab detection of venom.
- ▶ Snakebite is a notified medical emergency and a leading cause of accidental death in rural India; every fatal bite is a medico-legal death needing inquest and autopsy.

Epidemiology and venomous snakes of India

- ▶ Worldwide there are over 3,500 snake species; only about 250 are venomous.
- ▶ India has about 216 species, of which **52 are venomous**.
- ▶ WHO: over 2.5 million bites and over 125,000 deaths worldwide yearly; snakebite is a WHO **Neglected Tropical Disease**.
- ▶ Only **five Indian snakes are dangerously poisonous**: king cobra, common cobra, common krait, Russell's viper, saw-scaled viper.
- ▶ The "**Big Four**" — cobra, krait, Russell's viper, saw-scaled viper — cause almost all envenomations; cobra and krait are neurotoxic, the two vipers vasculotoxic.
- ▶ **Most common venomous snake: common krait. Most bites and deaths: saw-scaled viper** (abundant, aggressive).

Identifying the biting snake

- ▶ Deciding **venomous vs non-venomous**, then species, decides antivenom choice and medico-legal opinion.
- ▶ **Venomous**: large belly scales, two long hollow (canalised) fangs, compressed tail.
- ▶ **Non-venomous**: small belly scales, short solid fangs, tail not compressed.
- ▶ **Cobra**: spectacle-marked hood, third labial touching eye and nasal shield, round pupil; **king cobra** is the world's longest venomous snake (~5 m).
- ▶ **Common krait**: steel-blue/black with white arches, painless bite often on a sleeper; toxin is β -bungarotoxin.
- ▶ **Russell's viper**: stout body, chain of dark spots, vertical pupil, live-bearing.

- ▶ **Saw-scaled viper:** smallest Big Four member (~0.5 m); serrated scales give a rustling "saw" sound.

Cobra vs viper — the classic differentiator:

Feature	Cobra	Viper
Head	Small, large scales	Large, triangular, small scales
Pupil	Round	Vertical
Fangs	Short, grooved, fixed	Long, canalised, mobile
Venom	Neurotoxic	Haemotoxic (vasculotoxic)
Bite swelling/bleeding	Minimal or absent	Extensive, persistent
Cause of death	Respiratory failure	Haemorrhage/circulatory shock

Snake venom

- ▶ Venom is modified saliva from poison glands behind each eye, delivered through the fangs — water/alcohol-soluble, a mix of toxic proteins and enzymes.
- ▶ **Neurotoxic venom** (elapids) has neurotoxins acting on the respiratory/cardiac centres, producing flaccid paralysis.
- ▶ **Vasculotoxic venom** (vipers) causes local necrosis, haemolysis and coagulopathy; Russell's viper venom activates the clotting cascade.
- ▶ **Sea-snake venom is myotoxic**, causing rhabdomyolysis.
- ▶ **Hyaluronidase**, the "spreading factor," is present in every snake venom.
- ▶ **Krait venom is ~10× more toxic than cobra venom** — highest case-fatality rate of the Big Four.
- ▶ **Fatal doses of dried venom, increasing order:** krait 6 mg, saw-scaled viper 8 mg, cobra 12 mg, Russell's viper 15 mg.
- ▶ **Dry bite:** up to 20% of viper bites and 75% of sea-snake bites inject no venom; most snakes inject only ~10% per strike, Russell's viper up to 75%.
- ▶ **Swallowed venom is harmless** — digested in the gut like any protein.

Clinical features of ophitoxaemia

- ▶ A **fright reaction** occurs with any bite, venomous or not — palpitation, cold clammy skin, hypotension; shock alone can kill.
- ▶ **Neurotoxic bite (cobra/krait):** local signs are minimal.
 - Paralysis progresses through ptosis, diplopia, dysarthria, dysphonia, dyspnoea, then dysphagia.
 - Death is from respiratory failure.
- ▶ Krait bites are painless, often on a sleeper who may die within 4–6 hours.
- ▶ **Vasculotoxic bite (viper):**
 - Local pain and swelling spreading up the limb, blistering by about 12 hours.
 - Persistent bleeding, ecchymosis, necrosis, compartment syndrome.

- Coagulopathy and haemolysis leading to **acute renal failure** — the leading cause of death in viper bite.
- ▶ **Sea-snake bite:** little local reaction; myalgia and rhabdomyolysis after 30–60 min, leading to renal failure and ascending paralysis.

Laboratory and DNA-based identification

- ▶ ELISA on serum, urine or wound aspirate is the mainstay for detecting venom and confirming species.
- ▶ RIA is the most sensitive test, down to about 0.4 µg/L.
- ▶ **20-minute whole-blood clotting test:** blood undisturbed for 20 minutes; failure to clot signals viper envenomation (normal clots in ~8 minutes).
- ▶ A **herpetologist** can positively identify a killed snake or its parts.
- ▶ [RA] **DNA barcoding** (cytochrome-b/16S rRNA mtDNA plus species-specific PCR) identifies the snake from shed skin, venom traces or saliva, even without the snake itself.
- ▶ India's **Dr Lalji Singh** discovered the **Bkm DNA probe**, improving DNA fingerprinting accuracy.
- ▶ [RA] **Antivenom research** is moving toward region-specific/recombinant antivenoms, since India's polyvalent ASV fails against species like the hump-nosed pit viper.

Management

- ▶ **First aid "R.I.G.H.T.":** Reassurance, Immobilization, Get to hospital, Tell the doctor the symptoms; remove tight clothing.
- ▶ Avoid incision, suction, tourniquets, electric shock and herbal remedies.
- ▶ **Pressure-immobilization (Sutherland wrap):** crepe bandage at 55–70 mmHg with a splint — for neurotoxic/sea-snake bites only, **never for viper bites** (worsens necrosis).
- ▶ **Polyvalent ASV**, raised in horses against the Big Four, is the definitive treatment.
- ▶ Give it **IV only**, never IM or locally, and early — it neutralises only unbound venom.
- ▶ Indications: swelling crossing a joint, spontaneous bleeding, incoagulable blood, shock, neurotoxic signs.
- ▶ Adjuncts: neostigmine with atropine, ventilation, dialysis, fasciotomy for true compartment syndrome, tetanus prophylaxis; watch for anaphylactoid reactions to ASV.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Head/fang comparison, cobra vs viper.** Labels: small head, small scales (viper); rounded head, large shields, third labial touching eye and nasal shield (cobra); round pupil (cobra); vertical slit pupil (viper); short fixed grooved fang (cobra); long mobile canalised fang (viper).
- ▶ **Fang-mark patterns.** Labels: two deep punctures 8 mm–4 cm apart (venomous); colubrine ~1.5 cm and viperine ~2.5 cm deep; semicircular tooth-row (non-venomous).

Medico-legal significance

- ▶ Every snakebite death is medico-legal — police inquest under **Section 174 CrPC 1973 (now Section 194 BNSS 2023)**, magistrate's inquest where needed under **Section 176 CrPC 1973 (now Section 196 BNSS 2023)**, then autopsy.
- ▶ **Manner of death is usually accidental** (over 98% of bites are on the extremities); **suicide is very rare** (classically Cleopatra).
- ▶ **Homicide is uncommon but documented** — e.g. a snake thrown on a sleeping victim, or the 2023 Uttarakhand engineered cobra-bite murder, chargeable as murder under **Section 302 IPC 1860 (now Section 103 BNS 2023)**.
- ▶ Negligent handling of a venomous snake, such as by a snake charmer, is punishable under **Section 289 IPC 1860 (now Section 291 BNS 2023)**.
- ▶ Expert opinion identifying the species is admissible evidence under **Section 45 IEA 1872 (now Section 39 BSA 2023)**.
- ▶ **Autopsy findings:** two (occasionally one) fang punctures, colubrine ~1.5 cm and viperine ~2.5 cm deep; venom on clothing dries to yellow crystals.
- ▶ **Cause-specific findings:**
 - **Elapid death:** minimal local change, congested brain.
 - **Viper death:** local discoloration, haemorrhage, visceral petechiae, congested kidneys with tubular necrosis.
 - **Sea-snake death:** rhabdomyolysis with acute tubular necrosis.
- ▶ Preserve fang-mark skin, blister fluid, serum and urine for testing, and the snake itself for the herpetologist/FSL.
- ▶ **Safety:** a freshly killed snake keeps its bite reflex for about an hour, even a severed head — never handle bare-handed.
- ▶ Distinguish true ophitoxaemia from *Abrus precatorius* "crotin" poisoning (mimics viperine envenomation) and from fright alone.

Recent advances [RA]

- ▶ A 2024 meta-analysis (663,460 bites) put global incidence at ~69.4/100,000/year and mortality at 0.33/100,000, Asia the highest burden. [PMID 38574167]
- ▶ Acute kidney injury affects ~23% of envenomed victims, ~37% after Russell's viper bites, with 10% pooled mortality. [PMID 41776424]

- ▶ Stroke is under-recognised — vipers cause 96% of snakebite strokes, 23% case-fatality. [PMID 41343481]
- ▶ Wound infection complicates ~27% of bites, usually *Morganella morganii*, and predicts death. [PMID 38507793]
- ▶ Cytochrome-b PCR can now identify species from saliva or bite-site swabs, even without the snake. [PMID 41875484]
- ▶ A fully human antibody and engineered "consensus-antigen" antibody domains both broadly neutralise elapid α -neurotoxins, pointing toward a recombinant, species-agnostic antivenom. [PMID 38381847; PMID 40581770; PMID 40681851]
- ▶ The BRAVO phase II trial of oral varespladib with antivenom showed no significant overall benefit, but a signal when started within 5 hours of the bite. [PMID 39442939]
- ▶ India's National Action Plan (NAPSE, March 2024) targets a 50% cut in snakebite deaths by 2030; snakebite is now a notifiable disease. [PIB 2024-Mar; MoHFW 2024-Nov]
- ▶ Kerala launched a "zero snakebite deaths" model with certified rescuers, mobile-app early care, and a digital registry. [PMID 42260676]



Tobacco (Nicotine) Poisoning — Clinical Features, Post-mortem Appearance and Medico-legal Aspects

Asked in: Paper III Oct 2019 — RGUHS MD Forensic Medicine

Definition / Introduction

- ▶ Tobacco is prepared from the cured, dried leaves of *Nicotiana tabacum*.
- ▶ Its main toxic alkaloid is **nicotine** — a colourless, oily liquid with a burning acrid taste and a disagreeable odour.
- ▶ Every part of the plant is poisonous **except the ripe seeds**.
- ▶ Dried leaves contain about **1–8% nicotine**; an average cigarette delivers roughly **1–3 mg**.
- ▶ Tobacco is classed as a **cardiac (cardiovascular) poison** because of its dominant action on the heart and autonomic ganglia.
- ▶ It is also a leading cause of chronic substance abuse (nicotine dependence).
- ▶ Acute fatal poisoning is uncommon and almost always **accidental**; chronic toxicity carries the real public-health burden.

Toxin, mechanism and fatal dose

- ▶ **Other alkaloids** besides nicotine: nornicotine, anabasine, nicotianine, and lobeline (the last is described in Indian tobacco).
- ▶ **Mechanism**: nicotine acts on the **autonomic ganglia**, both sympathetic and parasympathetic.
- ▶ The action is **biphasic** — early **stimulation**, followed by **depression and ganglionic blockade** at higher/later doses.
- ▶ It also stimulates the vagus nerve, the somatic neuromuscular junction, sensory nerve endings, and the central nervous system, before depressing all of them in turn.

- ▶ **Pupils are a useful clue:** miosis (constriction) at low dose, mydriasis (dilatation) at high dose — pupils are typically constricted first, then dilated, in acute poisoning.
- ▶ **Fatal dose:** nicotine 50–100 mg; crude tobacco 15–30 g.
- ▶ **Fatal period:** about 5–15 minutes (roughly 10 minutes) — one of the shortest fatal periods among plant poisons.

Clinical features — acute poisoning

An early stimulant phase is followed, about an hour later, by a late depressant/paralytic phase.

- ▶ **Gastrointestinal:** burning sensation in mouth and throat, hypersalivation, nausea, vomiting, abdominal pain, and a tobacco odour on the breath/vomit.
- ▶ **Cardiovascular:** early tachycardia and hypertension, then bradycardia, hypotension, arrhythmias, and finally circulatory collapse.
- ▶ **Respiratory:** early tachypnoea (rapid breathing), then bradypnoea and respiratory depression/paralysis.
- ▶ **Central nervous system:** headache, restlessness, confusion, vertigo, sweating, tremors, convulsions, and coma.
- ▶ **Cause of death:** respiratory failure from neuromuscular and ganglionic paralysis, with cardiovascular collapse contributing.

Clinical features — chronic poisoning (nicotine dependence)

Chronic toxicity is nicotine dependence, a substance-use disorder recognised in DSM-5.

- ▶ **Respiratory:** chronic cough, wheeze, dyspnoea, chronic bronchitis, and lung carcinoma — tobacco smoke contains the carcinogen benzopyrene.
- ▶ **Cardiovascular:** angina pectoris, palpitations.
- ▶ **GI / haematological:** vomiting, diarrhoea, anorexia, anaemia.
- ▶ **Neuropsychiatric:** insomnia, impaired memory, headache, anxiety, tremors.
- ▶ **Severity is graded** using the Fagerström Test for Nicotine Dependence.

Treatment

- ▶ **Acute poisoning:**
 - Gastric lavage with potassium permanganate or tannic acid, or warm water with activated charcoal; purgatives.
 - **Atropine sulphate** for parasympathetic (muscarinic) symptoms and hypotension.
 - **Hexamethonium chloride**, a ganglionic blocker.
 - **Mecamylamine (Inversine) is the specific antidote.**
 - **Diazepam** for convulsions.
 - Oxygen, assisted/artificial ventilation, cardiac monitoring, and supportive care.
- ▶ **Chronic poisoning (addiction):**
 - Nicotine replacement therapy — transdermal patch, nicotine gum, nasal spray.
 - Drug therapy: bupropion, varenicline, clonidine, lobeline.

Post-mortem appearance

Findings largely resemble an asphyxial death, with a few agent-specific pointers.

- ▶ Signs of asphyxia — cyanosis and congestion of the internal organs.
- ▶ **Brownish froth at the mouth and nostrils.**
- ▶ Stomach contents show tobacco leaf fragments and/or a tobacco odour; gastric and bronchial mucosa are congested, with froth and mucus in the airway.
- ▶ **Nicotine resists putrefaction** and can be recovered from the viscera long after death — it is detectable even in decomposed or exhumed bodies.
- ▶ On toxicological grouping, nicotine is a **steam-volatile poison**, isolated by steam distillation.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Tobacco plant (Nicotiana tabacum):** labelled line diagram — broad ovate leaves (highest nicotine), erect stem, tubular/funnel-shaped flowers, capsule fruit, and ripe seeds (non-toxic); label "dried leaves = 1–8% nicotine."
- ▶ **Biphasic action flowchart:** Stage 1 — Stimulation (tachycardia, hypertension, tachypnoea, miosis, salivation) → Stage 2 — Depression/Blockade (bradycardia, hypotension, bradypnoea/respiratory paralysis, mydriasis, collapse) → Cause of death: respiratory failure.

Medico-legal significance

- ▶ **Manner of poisoning:** accidental poisoning is the commonest, classically from drinking hookah (hukka) water, excessive smoking, or applying leaves/juice to a wound or skin (transcutaneous absorption).
- ▶ Suicidal and homicidal cases are rare — the very short fatal period and characteristic odour/taste make concealment difficult.
- ▶ **Malingering:** to avoid duty, a person soaks tobacco leaves in water and holds them in the axilla (armpit) with a bandage overnight; poisoning symptoms appear by the next morning, simulating illness.
- ▶ **Detection after death:** nicotine resists putrefaction, so it can be isolated from putrefied viscera.
- ▶ Nicotine is completely excreted within about 16 hours — after this, the danger to life has passed, which matters when assessing survivability and timing.
- ▶ **Bidis vs cigarettes:** bidis are considered more harmful in India — the wrapping tendu/temburni leaf (*Diospyros melanoxylon*) burns poorly, so the smoker inhales more deeply and draws in more tar.
- ▶ **Doctor's duties:** take a careful history (including occupational/contextual details), preserve and label the viscera, and send the stomach and contents, blood, and urine to the Forensic Science Laboratory with a copy of the post-mortem report.
- ▶ Give the final cause-of-death opinion only after the chemical analysis report, and assist the inquest.
- ▶ **Criminal law:** causing hurt by poison with intent to commit an offence is punishable under Section 328 IPC 1860 (now Section 123 BNS 2023).

- ▶ If used homicidally, it attracts murder under **Sections 300/302 IPC (now Sections 101/103 BNS 2023)**, or culpable homicide not amounting to murder under **Section 299 IPC (now Section 100 BNS 2023)**, punishable under **Section 304 IPC (now Section 105 BNS 2023)**.
- ▶ Any unnatural or poisoning death requires a **police inquest under Section 174 CrPC 1973 (now Section 194 BNSS 2023)**, and where needed a **magistrate's inquest under Section 176 CrPC 1973 (now Section 196 BNSS 2023)**.
- ▶ Expert medical opinion in court is admissible under **Section 45 IEA 1872 (now Section 39 BSA 2023)**.
- ▶ **Public-health law:** sale, advertising, and smoking of tobacco products are further regulated by the Cigarettes and Other Tobacco Products Act (COTPA 2003).



Glue sniffing

Asked in: Paper III Oct 2018 — RGUHS MD Forensic Medicine

- ▶ **Glue sniffing** is deliberate inhalation of volatile organic solvents (from adhesives, model-aircraft "dope", contact glues) to get a rapid, alcohol-like intoxication.
- ▶ It is the best-known form of **inhalant abuse**, also called **volatile substance abuse (VSA)** or **solvent abuse**.
- ▶ It is a sociomedical problem because the agents are cheap, legal, everyday household products.
- ▶ Abusers are chiefly male teenagers and street children.
- ▶ Death can occur suddenly even in a first-time user.

Background

- ▶ Inhaling volatile vapours for altered states is ancient (Greek priestesses inhaled ethylene vapours to enter a trance).
- ▶ "Ether frolics" were fashionable in the 1790s and again in the 1850s.
- ▶ Glue sniffing became a recognised public problem in the early 1960s, when children inhaled model-aircraft glue.
- ▶ **Epidemiology:** mostly male teenagers; in India, urban school and street children (e.g. Delhi) are typically affected.
- ▶ Conduct disorder (in teens) and antisocial personality disorder (in adults) are over-represented among abusers.
- ▶ **Why solvents are abused:** unlike drugs like cocaine, they are legally and cheaply available for household/industrial use, which increases abuse potential.

Commonly abused agents

- ▶ **Toluene** — the most studied and most misused solvent worldwide; present in paint thinners, varnishes, inks, fuels and adhesives.
- ▶ Other hydrocarbons: acetone, benzene, petrol, butane, propane, carbon tetrachloride, trichloroethylene, xylene, kerosene, and aerosol propellants.
- ▶ **Nitrites ("poppers")** — amyl nitrite, butyl nitrite and other alkyl nitrites.

- ▶ **Anaesthetic gases** — chloroform, ether, halothane, nitrous oxide.
- ▶ **Everyday sources:** adhesives/glues, aerosol sprays, correction fluid, paint thinners, spray paints, shoe polish, cleaning fluids, lighter gas, and whipped-cream chargers ("whippets").

Methods of inhalation

- ▶ **Sniffing (snorting):** direct inhalation from the neck of a bottle/container.
- ▶ **Huffing:** a cloth soaked in the volatile is held over the mouth.
- ▶ **Bagging:** the volatile is poured into a plastic bag held over nose and mouth, with deep breaths.
 - Bagging is the **most dangerous** method — it adds a rebreathing/asphyxia risk on top of the intoxication.
- ▶ **Dusting:** spraying an inhalant directly into the mouth or nose.
- ▶ **Glading:** inhaling air-freshener aerosol sprayed into a room.
- ▶ Users typically start with sniffing and progress to huffing/bagging.
- ▶ The glue may be heated (more volatilisation), bubbled through water (removes irritants), or mixed with alcohol.

Mechanism and clinical features

- ▶ Volatile solvents are lipophilic and cross the blood–brain barrier rapidly.
- ▶ They act as CNS depressants: they first **disinhibit**, then depress the cortex.
- ▶ Symptoms begin within seconds; the effect lasts about 15–60 minutes, depending on dose.
- ▶ **Acute intoxication** resembles alcoholic drunkenness.
 - Disinhibition gives way to euphoria, a "floating" sensation, dizziness, slurred speech and unsteady gait.
 - Perception is distorted, progressing to hallucinations and vivid dreams.
 - Behaviour can turn irrational — antisocial acts, self-injury, even suicide.
 - The episode is typically followed by **complete amnesia**.
 - A physical withdrawal syndrome is *not* usually seen.
- ▶ **Chronic abuse effects:**
 - **Solvent syndrome:** depression, fatigue, headache, insomnia, alcohol intolerance, irritability, memory lapses, violent temper. Occupational paint-thinner exposure causing this is called *painter's syndrome*.
 - **Solvent psychosis:** a dementia-like state, part of the solvent syndrome.
 - **Neurological/systemic damage:** peripheral neuropathy, cerebellar signs, cardiomyopathy, hepatic damage, pulmonary hypertension, bone-marrow suppression (from benzene).
 - Chronic **toluene** abuse causes **renal tubular acidosis (RTA)** with severe **hypokalaemia** and muscle weakness.
 - **Degreaser's flush:** chronic trichloroethylene exposure (3+ weeks) followed by alcohol causes red facial blotches, because alcohol blocks TCE metabolism and dilates skin vessels.
 - **Fetal solvent syndrome (inhalant embryopathy):** inhalant abuse in pregnancy can cause mild fetal brain atrophy with behavioural, cognitive and emotional problems.

Causes of death

- ▶ **Sudden cardiac arrest ("sudden sniffing death") — the major cause of death.**
 - Solvents sensitise the heart muscle to circulating catecholamines (stress hormones).
 - A sudden "fight, flight or fright" stimulus (e.g. being startled or chased) then triggers a fatal arrhythmia such as ventricular fibrillation.
 - This can strike even some time **after** sniffing has stopped, and even in a first-time user.
- ▶ **Asphyxial mechanisms:** rebreathing solvent excludes oxygen, causing anoxia/hypercapnia; plastic-bag asphyxia and accidental smothering, especially with bagging.
- ▶ **Aspiration** of vomit or fluid.
- ▶ **Accidents while intoxicated:** drowning, falls from height, burns or explosions (e.g. lighting a cigarette after inhaling in a confined space like a car).
- ▶ **Other:** direct lung injury, profound CNS depression, allergic reactions, trauma during violent behaviour; chronic deaths from liver failure/tumours and renal failure.

Treatment

- ▶ **Acute:** mostly supportive — remove from the source, keep the patient calm and quiet (avoid a catecholamine surge that could trigger arrhythmia), and monitor vital signs and cardiac rhythm. Most mild cases resolve on their own.
- ▶ **Cardiac:** treat arrhythmias; avoid sympathomimetic drugs, which can worsen ventricular irritability.
- ▶ **Respiratory:** lung injury/oedema may need CPAP or mechanical ventilation with PEEP.
- ▶ **Chronic:** correct hypokalaemia and acid–base disturbance from toluene RTA; psychiatric/social rehabilitation and de-addiction counselling.

Autopsy findings and special sample preservation

- ▶ **External:** skin around the nose and mouth may be red or excoriated — "glue-sniffer's rash" (*huffer's eczema*) from irritant contact; body/clothing may smell of solvent.
- ▶ **Internal:** degenerative changes in brain, liver, kidneys and bone marrow; congested, oedematous lungs. Findings are often otherwise non-specific.
- ▶ **Special specimen collection (high-yield):**
 - The lung must be sealed before it loses its volatiles.
 - One lung is mobilised, its main bronchus tied off with a ligature, the hilum divided, and the lung placed immediately in a sealed **nylon bag**.
 - **Never use a plastic/polythene bag** — it is permeable to volatile substances.
 - Also preserve blood, brain, fat, and nasal swabs; soiled clothing may itself reveal the inhalant.
 - Fill blood/viscera containers to the brim, or add a 1–2 cm liquid-paraffin layer, to prevent evaporative loss.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Face/head of a glue-sniffer showing methods of use:** plastic bag over nose and mouth (bagging), glue-tin neck at the nostril (sniffing), solvent-soaked cloth over the mouth (huffing), peri-oral/peri-nasal red excoriated rash, glue tin or aerosol can in hand.
- ▶ **Special lung preservation flow box:** Mobilise lung → tie main bronchus with ligature → divide hilum → place in NYLON bag → seal (never polythene/plastic).

Medico-legal significance

- ▶ Manner of death is usually **accidental** (sudden sniffing death, asphyxia, falls); suicide and rare homicide must be excluded by scene reconstruction.
- ▶ **Scene examination is vital** — glue tins, soaked rags, plastic bags, aerosol cans and solvent-stained clothing support the diagnosis, since toxicology may turn negative once volatiles have evaporated.
- ▶ Because the death is unnatural or sudden, it needs a medico-legal autopsy and a **police inquest under Section 174 CrPC 1973 (now Section 194 BNSS 2023)**, with a magistrate's inquest where applicable under **Section 176 CrPC 1973 (now Section 196 BNSS 2023)**.
- ▶ The autopsy surgeon/toxicologist gives expert evidence under **Section 45 Indian Evidence Act 1872 (now Section 39 BSA 2023)**.
- ▶ Since abusers are predominantly minors, the doctor should document the social context and support de-addiction and preventive measures; sale of certain solvents to minors is restricted in many jurisdictions.
- ▶ Chronic solvent syndrome ("painter's syndrome") and degreaser's flush also carry occupational-disease compensation implications.

**How do the different poisons affect the postmortem changes occurring in body?**

Asked in: Paper III Dec 2023 — RGUHS MD Forensic Medicine

Definition / Introduction

- ▶ Postmortem changes are the events that follow death: cooling (**algor mortis**), blood settling under gravity (**postmortem lividity**), muscle stiffening (**rigor mortis**), and **decomposition**.
- ▶ These changes depend on environment, but also on the **cause of death**.
- ▶ A poison alters tissue chemistry, oxygen-carriage, and bacterial growth.
- ▶ So different poisons change the colour, onset, duration, and rate of these postmortem changes.
- ▶ An altered lividity colour, or an unusual tempo of rigor or putrefaction, can be the first autopsy clue to the poison.
- ▶ It can also make a routine time-since-death estimate unreliable.

Effect on body temperature (algor mortis and postmortem caloricity)

- ▶ **Algor mortis** is the normal cooling after death — about 0.4–0.6 °C/hour in tropical India, about 1 °C/hour in temperate climates.
- ▶ Some poisons cause a **sharp rise in body temperature around the time of death**.
- ▶ This makes the body start cooling from an abnormally high baseline, so the standard cooling formula over-estimates the time since death.
- ▶ Agents causing this terminal pyrexia include **carbon monoxide poisoning** and **heroin/cocaine intoxication** (along with non-toxic causes like sunstroke, septicaemia, and pontine haemorrhage).
- ▶ **Postmortem caloricity** is a paradox: body temperature stays raised, or even rises, for about the first two hours after death.
- ▶ The toxic cause is convulsant/spinal poisons — **tetanus and strychnine poisoning** — because convulsions raise heat production in muscle.
- ▶ Non-toxic causes include excessive bacterial activity (septicaemia, cholera) and disturbed heat-regulation (sunstroke).

Effect on the colour of postmortem lividity (hypostasis)

- ▶ Normal lividity is bluish-purple to reddish-purple.
- ▶ Several poisons alter the haemoglobin pigment and give lividity a distinctive colour, which is itself a clue to the poison.

Poison	Colour of lividity	Mechanism
Carbon monoxide	Cherry-red	Carboxyhaemoglobin
Cyanide (HCN) / burns	Bright-red/pink	Oxygen stays bound; cytochrome inhibition
Nitrites, chlorates, nitrobenzene, aniline, acetanilide, bromates	Chocolate-brown	Methaemoglobinaemia
Phosphorus / copper	Dark-brown or yellow	Jaundice / hepatotoxicity
Hydrogen sulphide	Bluish-green	Sulphaemoglobin
Carbon dioxide	Deep-blue	Deoxygenated haemoglobin
Opiates	Bluish-black	—

- ▶ Caution: the chocolate-brown methaemoglobin hue can rarely occur without poisoning.
- ▶ In decomposition, lividity itself turns brown, then green, then fades.
- ▶ So colour is only a pointer — it must always be confirmed by chemical analysis.

Effect on rigor mortis

- ▶ Rigor mortis is stiffening from muscle ATP depletion, which locks actin and myosin into rigid actomyosin.
- ▶ The cause of death changes how early rigor appears and how long it lasts.
- ▶ **Onset early and persists longer:** hydrocyanic acid (cyanide) and strychnine.

- ▶ **Onset early:** organophosphate poisoning, strychnine, electrocution.
- ▶ **Disappearance delayed:** carbon monoxide poisoning.
- ▶ **Onset delayed:** asphyxial deaths and severe haemorrhage.
- ▶ **May be absent or very rapid:** deaths with widespread bacterial infection (e.g. gas gangrene), where putrefaction starts early.
- ▶ Convulsant/spinal poisons (strychnine, cyanide) and cholinergic poisons (organophosphates) deplete muscle ATP fast through pre-mortem muscular activity, so rigor sets in early.
- ▶ Early-onset rigor also passes off quickly, so its value for estimating time since death is reduced in poisoning.

Effect on cadaveric spasm

- ▶ **Cadaveric spasm** is instantaneous rigor — the immediate stiffening of muscles that were contracting at the moment of death.
- ▶ It has no preceding stage of flaccidity, cannot be mimicked, and reflects the body's last act.
- ▶ **Convulsant poisons, especially strychnine**, predispose to it because of intense, sustained muscular contraction at death.
- ▶ It is medico-legally valuable: an object firmly grasped because of cadaveric spasm helps distinguish suicide from homicide.

Effect on putrefaction

- ▶ Poisons affect putrefaction in five distinct ways, and one poison may fall into more than one group.
- ▶ **Delay putrefaction** (preserve tissue or inhibit bacteria): carbolic acid (phenol), chronic heavy metals (especially arsenic), zinc chloride, strychnine (if death follows only a few seizures).
- ▶ **Hasten putrefaction** (raise heat or bacterial activity): chronic alcoholism, hydrogen sulphide, strychnine (if death follows prolonged, repeated seizures).
- ▶ **Resist putrefaction** (still detectable in decomposed bodies): corrosives, barbiturates, cyanide, datura, organophosphates, phosphorus, nicotine, pancuronium, heavy metals, strychnine.
- ▶ **Destroyed by putrefaction** (undetectable later): aconitine, morphine, succinylcholine.
- ▶ **Appear due to putrefaction** (false positives): alcohol (usually below 200 mg%), carbon monoxide, cyanide, ptomaines, substituted phenols.
- ▶ **Heavy metals and strychnine both delay and resist putrefaction** — a frequent dual-membership exam point.
- ▶ **Cyanide both appears due to and resists putrefaction** — another dual-membership favourite.
- ▶ Irritant poisons (arsenic, antimony) cause vomiting and diarrhoea, which dehydrates the body.
- ▶ Since moisture is needed for putrefaction, this indirectly slows decomposition.
- ▶ **Phosphorus** also causes fatty change in the liver and has a garlicky odour and luminescence at autopsy, besides resisting putrefaction.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Colour chart of postmortem lividity in poisoning:** body outlines or swatches labelled — carbon monoxide (cherry-red), cyanide (bright-red/pink), methaemoglobin-formers (chocolate-brown), phosphorus/copper (dark-brown/yellow), hydrogen sulphide (bluish-green), carbon dioxide (deep-blue), asphyxia control (bluish-violet).
- ▶ **Five-way classification box for poisons and putrefaction:** a central box with five arrows — Delay (carbolic acid, arsenic, zinc chloride, strychnine); Hasten (alcohol, H₂S, strychnine); Resist (corrosives, barbiturates, cyanide, datura, organophosphates, phosphorus, metals); Destroyed (aconitine, morphine, succinylcholine); Appear (alcohol, CO, cyanide, ptomaines, phenols).

Medico-legal significance

- ▶ **Time since death:** poison-induced calorificity, early or delayed rigor, and altered putrefaction all distort routine time-since-death estimates.
- ▶ The autopsy opinion on cause of death, allowing for these poison-modified changes, is admissible as expert evidence under **Section 39 BSA 2023 (formerly Section 45 IEA 1872)**.
- ▶ **Cause-of-death clue:** an unusual lividity colour prompts directed chemical sampling even before history is available.
- ▶ **Preservation of evidence:** poisons that resist putrefaction (corrosives, barbiturates, cyanide, datura, organophosphates, phosphorus, heavy metals, strychnine) stay detectable, and metals persist in hair, nails, and bone.
- ▶ So viscera and these tissues must be preserved even in decomposed or exhumed bodies.
- ▶ Conversely, aconitine, morphine, and succinylcholine may be destroyed by putrefaction, so a negative chemical result does not exclude them.
- ▶ **Pitfall:** the defence may argue that alcohol, carbon monoxide, or cyanide found at autopsy arose from putrefaction, not ante-mortem poisoning.
- ▶ Putrefactive ethanol is almost always below 200 mg%, which helps the expert counter this.
- ▶ **Statutory duties:** the police inquest in a poisoning death is held under **Section 194 BNSS 2023 (formerly Section 174 CrPC 1973)**.
- ▶ The Magistrate's inquest is held under **Section 196 BNSS 2023 (formerly Section 176 CrPC 1973)**.
- ▶ Criminal administration of poison is punishable under **Section 123 BNS 2023 (formerly Section 328 IPC 1860)**.
- ▶ Negligent conduct with a poisonous substance is punishable under **Section 286 BNS 2023 (formerly Section 284 IPC 1860)**.
- ▶ A victim's dying declaration is admissible under **Section 26 BSA 2023 (formerly Section 32 IEA 1872)**.

♦ ♦ ♦

Illicit use of drugs in sports

Asked in: Paper III Oct 2025 — RGUHS MD Forensic Medicine

Definition

- ▶ **Doping**: an athlete's deliberate use of a substance or method banned by the **International Olympic Committee (IOC) Medical Commission** to gain an unfair advantage in performance.
- ▶ The word *dope* originally meant a drug given to a **racehorse** to alter its speed.
- ▶ The IOC **banned or restricted performance-enhancing substances and methods in 1967**, because of serious health harm and the ethical wrong of cheating.
- ▶ Doping is a **medico-legal problem** — drug toxicity, sudden death, adulteration.
- ▶ It is also a **socio-ethical problem** — fair play and the integrity of sport.
- ▶ It falls under **sociomedical toxicology**, the study of drug misuse as it affects society.

Why athletes dope

- ▶ The motive is to enhance **muscle bulk and strength**.
- ▶ Or to enhance **oxygen-carrying capacity and endurance**.
- ▶ Or to enhance **alertness, aggression and reaction time**.
- ▶ Or to **mask** the use of another banned drug, or to lose weight rapidly.
- ▶ The practice is **totally prohibited** in organised sport.
- ▶ The harm is dual: direct **drug toxicity** (sudden cardiac death, liver damage, psychosis, dependence) and **distortion of fair competition**.
- ▶ Doping is regulated internationally by the IOC Medical Commission and the **World Anti-Doping Agency (WADA)**, which publishes an annually updated *Prohibited List*.

Classification of doping agents

Class	Examples	Effect sought
Stimulants	Amphetamine, cocaine, strychnine, ephedrine, caffeine	Alertness, aggression, masks fatigue
Anabolic agents	Anabolic-androgenic steroids (testosterone and derivatives)	Muscle mass, strength, recovery
Narcotic analgesics	Opium/opioids	Masks pain of injury
Blood doping	Packed-cell transfusion, erythropoietin (EPO)	More red cells, more oxygen, endurance
Masking agents	Diuretics	Dilute/hide the banned drug, rapid weight loss

- ▶ **Stimulants**: amphetamine releases dopamine and noradrenaline and produces adrenaline-like effects.
- ▶ This causes tachycardia, hypertension, arrhythmia and myocardial ischaemia.
- ▶ The fatal dose of amphetamine is about **20–25 mg/kg body weight**.
- ▶ Strychnine in low doses has historically been used as a stimulant.

- ▶ **Anabolic steroids** are taken orally or by injection.
- ▶ They cause acne-like skin lesions.
- ▶ They cause mood swings, paranoia, depression with suicidal tendency, and aggression — colloquially "**roid rage**."
- ▶ **Blood doping** by packed-cell transfusion is common in endurance sports.
- ▶ It is detected by typing **minor red-cell antigens** (for example **Kidd/Jk**) when the re-infused blood does not perfectly match the athlete's own.
- ▶ **Narcotic analgesics**: opium has classically been used to dope racehorses.
- ▶ In humans, opioids are abused to suppress the pain of injury.

Historical landmarks

- ▶ **1904 St Louis Olympics**: British marathon winner **Thomas Hicks** took *strychnine* — there were no restrictions on performance-enhancing drugs then.
- ▶ **1992 Barcelona Olympics**: Chinese volleyball player **Wu Dan** took *strychnine*.
- ▶ **1967**: the IOC formally banned/restricted performance-enhancing substances and methods, starting organised anti-doping.

Why doping kills — toxic effects

- ▶ **Stimulants** can cause myocardial infarction, ventricular fibrillation and aortic dissection.
- ▶ They can also cause cerebral infarction, hyperthermia and rhabdomyolysis (muscle breakdown releasing harmful products into the blood).
- ▶ They can cause acute renal failure, psychosis and sudden death.
- ▶ **Anabolic steroids** cause acne, liver damage (hepatotoxicity) and cardiovascular disease.
- ▶ They cause psychiatric disturbance — "roid rage," depression with suicidal tendency.
- ▶ In young athletes they cause premature closure of the bone growth plates, stunting growth.
- ▶ **Blood doping/EPO** raises the haematocrit sharply, causing hyperviscosity (abnormally thickened blood).
- ▶ This leads to thrombosis, stroke and sudden cardiac death.
- ▶ **Adulteration risk**: street amphetamines, cocaine and heroin are often adulterated with strychnine.
- ▶ So the toxic effect may come from the contaminant rather than the labelled drug.

Detection — the forensic laboratory role

- ▶ **Urine is the specimen of choice** for stimulant detection.
- ▶ Amphetamine is detected by **thin-layer chromatography (TLC)**, **high-performance liquid chromatography (HPLC)** and **gas chromatography–mass spectrometry (GC-MS)**.
- ▶ A urine amphetamine level above **2 mg/100 mL** indicates acute toxicity.
- ▶ Amphetamine remains detectable in urine for about **2–4 days**.
- ▶ **Blood doping by transfusion** is detected by demonstrating a mixed red-cell population, via typing of minor blood-group antigens such as **Kidd/Jk**.

- ▶ An "athlete biological passport" — serial monitoring of blood and steroid parameters over time — is used internationally to flag manipulation.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ Flowchart — "Doping in sport: classes by effect sought."
- ▶ Central box: *DOPING (IOC-banned substance or method)*.
- ▶ Branch 1: **Stimulants** → **alertness/aggression** (amphetamine, cocaine, strychnine, ephedrine).
- ▶ Branch 2: **Anabolic steroids** → **muscle bulk** (testosterone derivatives, "roid rage").
- ▶ Branch 3: **Narcotic analgesics** → **pain masking** (opioids).
- ▶ Branch 4: **Blood doping/EPO** → **endurance** (packed-cell transfusion, raised haematocrit).
- ▶ Branch 5: **Diuretics/masking agents** → **conceal drug, lose weight**.
- ▶ Side box: *Detection — urine GC-MS/HPLC/TLC; minor antigens (Kidd) for transfusion.*
- ▶ **Sample-collection box:** *Specimen of choice = urine; confirmatory test = GC-MS; chain of custody, sealed sample, witness signatures.*

Medico-legal significance

- ▶ In a collapsed or suddenly dead athlete, doping must always be considered at autopsy.
- ▶ Look for stimulant cardiotoxicity — myocardial infarction, contraction-band necrosis (a microscopic pattern of heart-muscle death seen with catecholamine excess).
- ▶ Look for anabolic-steroid cardiac changes.
- ▶ Look for polycythaemia (an abnormally raised red-cell count) with thrombosis from blood doping.
- ▶ **Viscera and urine must be preserved** for chemical analysis.
- ▶ Correct **collection, labelling, sealing, chain of custody and transport** of the urine/blood sample to the forensic science laboratory is essential.
- ▶ A doping result is contested evidence, so tampering or masking-agent use must be excluded.
- ▶ A registered medical practitioner must **not prescribe or supply** banned performance-enhancing drugs to a sportsperson — doing so is professional misconduct.
- ▶ Where the doping agent is a narcotic or psychotropic substance, its production, possession, transport, sale, purchase or use attracts the **Narcotic Drugs and Psychotropic Substances (NDPS) Act, 1985** and the **Prevention of Illicit Traffic in Narcotic Drugs and Psychotropic Substances Act, 1988** (imprisonment; death sentence for repeat offenders).
- ▶ Where supply of the doping agent causes death or grievous hurt, general criminal liability now falls under the **Bharatiya Nyaya Sanhita (BNS) 2023**, which replaced the Indian Penal Code 1860 from 1 July 2024.

High-yield exam pointers

- ▶ **Doping** = deliberate use of an IOC-banned substance/method to enhance performance; *dope* originally = drug given to a **racehorse**.

- ▶ IOC banned doping in 1967; the modern regulator is WADA with its annual *Prohibited List*.
- ▶ Five effect-based classes: stimulants, anabolic steroids, narcotic analgesics, blood doping/EPO, diuretics/masking agents.
- ▶ Amphetamine — athletic enhancer; fatal dose 20–25 mg/kg; urine >2 mg/100 mL = acute toxicity; detected by TLC/HPLC/GC-MS for 2–4 days.
- ▶ Strychnine — historic enhancer: Thomas Hicks (1904 St Louis), Wu Dan (1992 Barcelona); also a street-drug adulterant.
- ▶ Anabolic steroids — acneiform lesions, mood swings, "roid rage."
- ▶ Blood doping — packed-cell transfusion in endurance sports; detected via minor antigens (Kidd/Jk).
- ▶ Urine is the specimen of choice; chain of custody is critical; supply of narcotic dopants attracts the NDPS Act.



Management of cyanide toxicity

Asked in: Paper III Apr 2019 — RGUHS MD Forensic Medicine

Definition and why it is an emergency

- ▶ Cyanide is a systemic (histotoxic) asphyxiant — it stops cells using oxygen rather than blocking oxygen delivery.
- ▶ It exists as the gas hydrogen cyanide (HCN), the liquid hydrocyanic acid (prussic acid), and salts such as potassium cyanide (KCN) and sodium cyanide (NaCN).
- ▶ The fatal period is extremely short — seconds to minutes after inhaling HCN gas, and within an hour after swallowing a salt.
- ▶ So treatment is a true emergency — stabilisation, antidote and decontamination proceed almost together.

Toxic mechanism — why every treatment step exists

- ▶ The toxic effect is histotoxic anoxia: the cells are bathed in oxygen but cannot use it.
- ▶ Cyanide ion (CN^-) binds the ferric (Fe^{3+}) iron of cytochrome oxidase, the terminal enzyme of the mitochondrial electron-transport chain.
- ▶ This blocks oxidative phosphorylation, so aerobic ATP production stops and cells switch to anaerobic metabolism.
- ▶ This produces a high anion-gap lactic acidosis.
- ▶ The organs with the highest oxygen demand — brain and heart — fail first; death is due to central respiratory arrest.
- ▶ The body's own defence is the enzyme rhodanese (mainly in the liver), which converts cyanide to non-toxic thiocyanate; acute poisoning overwhelms this pathway.
- ▶ Antidotes therefore either pull cyanide off cytochrome oxidase or speed up rhodanese detoxification.

Clinical features that drive urgency

- ▶ **CNS:** headache, anxiety, confusion, convulsions, coma; pupils dilated and sluggish.
- ▶ **Cardiovascular:** early hypertension with reflex bradycardia, later hypotension, tachycardia and ventricular dysrhythmias.
- ▶ **Respiratory:** early fast breathing, then respiratory depression; pulmonary oedema may follow.
- ▶ **Skin:** classically **bright (brick) red** skin and mucosa; **cyanosis is a late finding**, appearing only once circulation collapses.
- ▶ A **bitter-almond odour** may be present on the breath, but **20–40% of people cannot smell it** (an inherited trait) — its absence never rules out poisoning.

General management — stabilisation and decontamination

- ▶ **Remove the patient from the source** first; rescuers must wear **gown, gloves and eye protection**.
- ▶ This guards against **secondary poisoning** — a patient who swallowed cyanide salts can still give off HCN gas, and so can the vomitus.
- ▶ **Stabilise using the ABC sequence:** secure the airway and give **100% oxygen**, which helps even though haemoglobin saturation is already normal.
- ▶ Obtain IV access, start continuous **cardiac monitoring**, and check an **arterial blood gas**.
- ▶ Correct **lactic acidosis** with sodium bicarbonate and treat hypotension with vasopressors.
- ▶ **Decontaminate only after stabilisation and antidotes have begun:**
 - **Skin:** remove clothing, wash with soap and water.
 - **Ingestion:** **gastric lavage**, preferably with 5% **sodium thiosulfate** or potassium permanganate.
 - Activated charcoal may follow, but it binds cyanide poorly.
 - **Emesis is not recommended** — seizures, coma or apnoea can develop suddenly.

Specific antidotal therapy — the classic three-step regimen

The goal is to free cytochrome oxidase of cyanide, given as early as possible — even before gastric lavage.

Step	Drug	Dose	Action
1	Amyl nitrite (inhaled)	Crushed perle inhaled ~30 seconds of each minute; replace every 1–3 minutes	Induces methaemoglobinaemia
2	Sodium nitrite 3%	10 mL (300 mg) slow IV over 5–10 minutes	Converts haemoglobin to methaemoglobin , which pulls cyanide off cytochrome oxidase
3	Sodium thiosulfate 25%	50 mL (12.5 g) slow IV over ~15 minutes	Sulfur donor so rhodanese forms non-toxic thiocyanate

- ▶ **Keep methaemoglobin below ~25%** — exceeding the sodium-nitrite dose can cause fatal methaemoglobinaemia.

- ▶ If IV access is ready and poisoning is severe, **amyl nitrite may be skipped**, giving IV sodium nitrite and thiosulfate directly.
- ▶ Cyanmethaemoglobin itself is toxic and cannot be broken down by the body, which is why thiosulfate follows to mop up free cyanide.

Alternative / newer antidotes

- ▶ **Hydroxocobalamin (vitamin B_{12a})**: binds cyanide to form **cyanocobalamin**, excreted in urine.
 - Dose: 5 g in 200 mL normal saline, slow IV over 30 minutes; does **not** cause methaemoglobinaemia.
 - Safer in smoke-inhalation and paediatric cases — now often the first-line antidote.
- ▶ **Dicobalt edetate**: chelates cyanide without causing methaemoglobinaemia.
 - Dose: 300 mg IV over 1 minute, repeated up to 900 mg if no response.
 - Reserved for confirmed poisoning, given its serious side-effects if used wrongly.
- ▶ **Methylene blue is no longer used** for cyanide — it can worsen the clinical picture.
- ▶ **Refractory cases** needing large thiosulfate doses may need **haemodialysis**, to maintain serum sodium and clear thiocyanate.

Diagnostic confirmation

- ▶ **Lee–Jones test** (bedside): ferrous sulfate crystals and 2% sodium hydroxide added to gastric aspirate, boiled, cooled, then 10% hydrochloric acid added.
 - A **greenish-blue colour indicates cyanide**; purplish indicates salicylates instead.
- ▶ **Blood cyanide level** is confirmatory: **above 0.2 microgram/mL is toxic**, **above 1 microgram/mL is fatal**.
- ▶ Supportive markers: serum lactate above 7–10 mmol/L, raised anion gap, and erratic ECG rhythms.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Mechanism flowchart**: cyanide → binds cytochrome oxidase (Fe³⁺) → blocked oxidative phosphorylation → histotoxic anoxia + lactic acidosis. Antidote arrows: nitrites → methaemoglobin → cyanmethaemoglobin; thiosulfate + rhodanese → thiocyanate (urine); hydroxocobalamin → cyanocobalamin (urine).
- ▶ **Antidote kit box**: amyl nitrite perles, sodium nitrite 3% ampoules, sodium thiosulfate 25% ampoule, Ryle's tube and syringe.

Medico-legal significance

- ▶ **Manner of poisoning is almost always accidental** — building fires releasing HCN gas, laboratory handling, and the jewellers' gold-stripping process.
- ▶ Suicide is well recognised, notably among jewellers and chemists with access; homicide is rare, given the bitter taste and rapid action.
- ▶ **Autopsy**: open the **cranial cavity first**, to detect the bitter-almond odour in the brain before it is masked.

- ▶ Expect bright or cherry-red lividity, frothing at the mouth, congested viscera, pulmonary and cerebral oedema, and an eroded gastric mucosa.
- ▶ **Spleen is the best specimen** for cyanide analysis; also preserve blood (with sodium fluoride), stomach contents, lung (sealed in a nylon bag), liver, kidney, brain and heart.
- ▶ **Doctor's duties in a living case:** treat first, then inform the police in every suspected poisoning; prepare a **medico-legal case (MLC)** record and obtain valid consent.
- ▶ Collect, seal and hand over evidence — vomitus, lavage fluid, blood, urine, the poison container — and defer the final opinion until the Forensic Science Laboratory report.
- ▶ A cyanide death is unnatural/suspicious, so a police **inquest is held under Section 174 CrPC 1973 (now Section 194 BNSS 2023)**; the doctor must give all information at that inquest under **Section 175 CrPC 1973 (now Section 195 BNSS 2023)**.
- ▶ Anyone aware of a cognizable offence — including murder (**Section 302 IPC 1860, now Section 103 BNS 2023**) or culpable homicide (**Section 304 IPC 1860, now Section 105 BNS 2023**) — must inform the police under **Section 39 CrPC 1973 (now Section 33 BNSS 2023)**.
- ▶ Failure to report is itself punishable under **Section 176 IPC 1860 (now Section 211 BNS 2023)** and **Section 202 IPC 1860 (now Section 239 BNS 2023)**.

High-yield exam pointers

- ▶ **Fatal dose:** HCN gas or hydrocyanic acid ~50–100 mg; cyanide salts ~100–200 mg. **Fatal period:** seconds to minutes by inhalation, within an hour by ingestion.
- ▶ **Triad of management:** 100% oxygen, antidote, and gastric lavage — the antidote comes before lavage.
- ▶ Beware **secondary poisoning** of rescuers and autopsy staff from evolved HCN gas.



Metal fume fever

Asked in: Paper III Apr 2025 — RGUHS MD Forensic Medicine

Definition

- ▶ Metal fume fever (MFF) is a self-limiting, acute, influenza-like illness.
- ▶ It follows inhalation of freshly generated metallic oxide fumes.
- ▶ The classic cause is white fumes of **zinc oxide (ZnO)**, released when zinc is heated above its melting point.
- ▶ It is a benign occupational lung disease of welders, galvanisers, smelters and foundry workers.
- ▶ Symptoms begin hours after exposure and clear within a day or two once exposure stops.

Synonyms (eponyms examiners reward)

- ▶ **Monday morning fever:** the key synonym — tolerance is lost over the weekend, so symptoms return, worse, on resuming work, then settle through the week.
- ▶ *Smelter's shakes* / smelter's chills.
- ▶ *Brass chills* / *brass founder's ague*.

- ▶ *Brazier's disease*.
- ▶ Zinc chills, zinc fume fever, galvanizer's poisoning, copper fever, foundry fever.
- ▶ First described by *Potissier* in 1822.

Aetiology

- ▶ **Causative metals:** zinc is commonest, followed by copper and iron.
- ▶ Also caused by magnesium, manganese, chromium, cobalt, nickel, cadmium, lead, antimony, silver and aluminium.
- ▶ **Cadmium and tin** produce a more severe illness than the rest.
- ▶ **Classic agent:** zinc oxide (ZnO) fume, formed when zinc is heated above its melting point.
- ▶ ZnO forms at a relatively low temperature, which is why zinc is the commonest cause.
- ▶ **Particle size:** the fume particles are under about 0.5–1.0 micron — small enough to reach the alveoli.
- ▶ **High-risk occupations:** welding, galvanizing, metal refining, electroplating, alloy making, smelting, soldering, forging and casting.
- ▶ All of these involve oxidation of heated metal. More than 1000 cases are reported each year.

Pathophysiology (why the fever occurs)

- ▶ The illness reflects an immune/inflammatory response to inhaled metal-oxide particles, not direct chemical burn injury.

Proposed mechanism	Explanation
Endogenous pyrogen release	Fume triggers release of the body's own fever-causing mediators.
Antigenic metal proteinates	Metal binds body protein, forming a new antigen that provokes an immune reaction.
Delayed hypersensitivity pneumonitis	A delayed allergic inflammation of the lung to the inhaled metal.
Direct alveolar toxicity	The fine fume injures the alveolar lining cells directly.

- ▶ The Monday-morning pattern fits this: daily exposure builds partial tolerance, which is lost over a break.

Clinical features

- ▶ **Latent period:** symptoms begin 4–8 hours after inhaling the fumes, not immediately.
- ▶ **Onset:** sudden, flu-like.
- ▶ **Constitutional:** fever (up to ~104°F in severe attacks), chills and rigors, sweating, thirst.
- ▶ Also frontal headache, generalised **myalgia**, joint and low-back pain, weakness, fatigue, salivation.
- ▶ **Respiratory:** dry cough, breathlessness, chest tightness.
- ▶ Cyanosis appears in heavier exposures.

- ▶ **Cardiovascular:** tachycardia; a metallic taste and nausea may occur.
- ▶ **Course:** self-limiting. Symptoms subside within **24–48 hours** of stopping exposure.
- ▶ Recovery is complete, with no sequelae.

Investigations

- ▶ **Transient leucocytosis** is typical, resolving within 24–48 hours.
- ▶ **Chest X-ray** may show transient, ill-defined opacities that clear with recovery.
- ▶ Diagnosis is essentially clinical — occupational exposure history plus the typical delayed, self-limiting flu-like picture.

Differential diagnosis

- ▶ **Influenza / common cold:** the picture is flu-like; only the occupational history distinguishes MFF.
- ▶ **Polymer fume fever:** caused by inhaling fumes from overheated PTFE (Teflon), e.g. burnt non-stick cookware.
 - Clinically almost indistinguishable from MFF — only the exposure history separates the two.
- ▶ **Cadmium fume inhalation:** also flu-like, but more dangerous.
 - Latent period is longer, about 24–36 hours.
 - Can progress to chemical pneumonitis and non-cardiogenic pulmonary oedema.
 - The resulting cyanosis is called "cadmium blues."

Treatment

- ▶ **Remove the worker from the source of exposure** — the single most important step.
- ▶ Give **oxygen** for hypoxia or cyanosis.
- ▶ Give an antipyretic/analgesic, typically **paracetamol**, for fever and body aches.
- ▶ **Supportive care:** rest and fluids, with observation for progression (to exclude cadmium pneumonitis).
- ▶ **Chelation therapy** is reserved for heavy metal/fume exposure, not an ordinary attack.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Time-course of an MFF attack:** inhalation of fresh ZnO fume → latent period 4–8 h → flu-like onset (fever, chills, headache, myalgia, cough, dyspnoea, tachycardia) → transient leucocytosis → recovery in 24–48 h after removal from exposure.
- ▶ Add an arrow for "weekend break → loss of tolerance → worse Monday-morning recurrence."
- ▶ **Lung schematic:** airway → trachea → bronchi → alveoli, labelling fume particle size $< 0.5\text{--}1.0\ \mu\text{m}$ reaching the alveoli, leading to alveolar inflammation and pyrogen release.

Medico-legal significance

- ▶ MFF is an accidental, work-related inhalational illness of welders, galvanisers, smelters and foundry workers.

- ▶ It is relevant to occupational-health certification and workmen's/employee compensation claims, not to criminal litigation.
- ▶ Unlike heavy-metal poisons used for homicide or suicide (arsenic, copper sulphate, mercury), MFF carries no criminal angle.
- ▶ Inquest under **Section 174 CrPC 1973 (now Section 194 BNSS 2023)** is therefore not ordinarily engaged.
- ▶ The doctor's role is recognition of the illness, attributing it to the workplace, and prevention.
- ▶ **Attribution:** the delayed onset (4–8 h), the Monday-morning recurrence, and full recovery on removal support linking the illness to occupational fume exposure.
- ▶ **Prevention:** advise local exhaust ventilation, respiratory protective equipment for welders and smelters, enclosure of fume-generating processes, and periodic medical surveillance.
- ▶ The examiner-relevant duty is distinguishing benign MFF from polymer (Teflon) fume fever and, critically, from the potentially lethal cadmium fume pneumonitis.



Metallic irritants

Asked in: Paper III Oct 2017 — RGUHS MD Forensic Medicine

Definition and classification

- ▶ **Irritant poisons** cause inflammation of the tissues they contact, chiefly the gastrointestinal (GI) tract, without the intense destruction seen with true corrosives.
- ▶ They are divided into **inorganic, organic and mechanical** irritants, with inorganic splitting further into **metallic** and **non-metallic**.
- ▶ **Metallic irritants** are heavy-metal salts that act **locally** (GI irritation, even corrosion) and **systemically** as cumulative poisons.
- ▶ Mnemonic **MALICO**: **M**ercury, **A**rsenic, **L**ead, **I**ron, **C**opper — plus thallium, antimony, cadmium, manganese, zinc and others.
- ▶ Many metals are harmless in their **elemental state** but toxic as **salts**.
- ▶ For example, metallic mercury, metallic arsenic and a copper coin are inert if swallowed, whereas mercuric chloride, arsenic trioxide and copper sulphate are highly poisonous.

Mechanism of toxicity

- ▶ The heavy-metal cation binds the **sulfhydryl (–SH) groups** of mitochondrial and cellular enzymes.
- ▶ This disrupts cellular respiration and oxidative phosphorylation.
- ▶ This shared mechanism is why **chelating agents** are the antidote class for the whole group.
- ▶ Common chelators: **BAL (dimercaprol)**, **CaNa₂EDTA**, **DMSA (succimer)**, **DMPS**, **D-penicillamine**.
- ▶ Iron poisoning is chelated with **desferrioxamine**; thallium poisoning with **Prussian blue**.

- **Dual action:** a local irritant/corrosive effect on the mucosa (burning pain, salivation, vomiting, purging, colic) plus a remote systemic effect after absorption (cardiovascular collapse, and hepatic, renal, neurological and haematological damage).
- **Cumulative behaviour:** lead, arsenic, mercury and thallium deposit long-term in bone, keratin and kidney, producing distinct chronic-poisoning syndromes on top of the acute illness.
- **Acute presentation** often mimics gastroenteritis or food poisoning — metallic taste, intense thirst, repeated vomiting, colicky pain, purging, prostration and shock. This is a key medico-legal pitfall.

The principal metallic irritants

Metal	Fatal dose	Key clinical / autopsy features
Arsenic (As_2O_3)	200–300 mg	Throat pain, then vomiting, then purging; rice-water stools, garlicky breath. Chronic: raindrop pigmentation, Aldrich–Mees lines, leucomelanosis. Autopsy: red velvety stomach mucosa, subendocardial petechiae, delayed putrefaction.
Mercury (mercuric chloride)	1–2 g	Corrosive salt. Chronic <i>hydrargyria</i> : gingivitis and salivation, tremor, erethism, acrodynia (pink disease), Minamata disease.
Lead (acetate/carbonate)	~20 g / ~40 g	Chronic <i>plumbism</i> : Burtonian line on the gums, anaemia with basophilic stippling, wrist/foot drop, encephalopathy.
Copper (sulphate/subacetate)	10–20 g / 15–30 g	Blue-green vomit and metallic taste; chalcosis, Kayser–Fleischer ring, vineyard-sprayer's lung.
Iron (ferrous salts)	20–30 g	Staged illness — GI irritation, then a latent phase, then metabolic acidosis/hepatic damage, then late stricture.
Thallium (sulphate)	250 mg–1 g	"Silent" homicidal poison; thallium triad of alopecia, painful neuropathy and mental change.
Manganese (KMnO_4)	5–10 g	Corrosive; chronic inhalation causes Parkinsonism-like manganism.
Barium (soluble salts)	~1 g	Severe GI irritation, hypokalaemia, muscle paralysis, cardiac arrest.

Metal	Fatal dose	Key clinical / autopsy features
Cadmium	~5 g	Proteinuria and painful bone lesions — itai-itai ("ouch-ouch") disease.

- ▶ **Antimony** poisoning resembles arsenic and is treated with tannic acid and BAL.
- ▶ **Nickel** inhalation is linked to lung cancer.
- ▶ **Metal fume fever** (brass-founder's ague) is an inhalational syndrome: a flu-like illness from heated zinc-oxide fumes (welding/galvanising), starting 6–8 hours after exposure and settling within 24–48 hours.

Arsenic poisoning vs cholera

- ▶ Acute arsenic poisoning closely mimics cholera — a classic exam differentiator.
- ▶ **Sequence:** arsenic gives throat pain, then vomiting, then purging; cholera gives purging, then vomiting, then throat pain.
- ▶ **Stools:** arsenic stools are dark or bloody before turning rice-watery; cholera stools are rice-watery and painless from the start.
- ▶ **Vomit:** arsenic vomitus contains mucus, bile and blood; cholera vomitus is watery only.
- ▶ **Other clues:** tenesmus and inflamed conjunctivae favour arsenic; a stool culture positive for *Vibrio cholerae* confirms cholera.
- ▶ Arsenic cases are usually solitary; cholera occurs as an outbreak affecting many people.

Medico-legal significance

- ▶ **Homicidal poisoning:** arsenic is the classic homicidal poison — cheap, colourless, odourless, tasteless, and it mimics cholera.
- ▶ Thallium is the "ideal silent" homicidal poison.
- ▶ Both are detectable in **hair, nails, bone, charred remains and ashes**, which matters for delayed or exhumation cases.
- ▶ **Suicidal/accidental use:** copper sulphate and potassium permanganate are taken suicidally.
- ▶ Children are accidentally poisoned by lead in paint/toys and by copper sulphate crystals mistaken for sweets.
- ▶ Arsenic-laden groundwater causes endemic arsenicosis from contaminated food and water.
- ▶ **Criminal abortion:** copper sulphate, mercuric chloride, vaginally inserted potassium permanganate, and lead (as diachylon) have all been used to procure abortion.
- ▶ **Occupational disease:** chronic plumbism (painters, plumbers, smelters), hydrargyrisms (hatters), manganism, cadmium itai-itai disease and metal fume fever (welders) are compensable occupational diseases under **Section 3, Employees' Compensation Act 1923**.
- ▶ **Administering poison to cause hurt** is punishable under **Section 328 IPC 1860 (now Section 123 BNS 2023)**.
- ▶ **Negligent handling of a poisonous substance** that endangers life is punishable under **Section 284 IPC 1860 (now Section 286 BNS 2023)**.

- ▶ If the poison is used to kill, the case becomes murder or culpable homicide under **Section 302/300 IPC (now Section 103/101 BNS 2023)** or **Section 299/304 IPC (now Section 100/105 BNS 2023)**.
- ▶ Attempt to murder falls under **Section 307 IPC (now Section 109 BNS 2023)**.
- ▶ Inquest and viscera preservation follow **Section 174 CrPC 1973 (now Section 194 BNSS 2023)**.
- ▶ The chemical examiner's opinion is admitted under **Section 45 IEA 1872 (now Section 39 BSA 2023)** and **Section 293 CrPC (now Section 329 BNSS 2023)**.
- ▶ **Doctor's duties:** stabilise the patient with decontamination, supportive care and specific chelation.
- ▶ Preserve vomitus, gastric lavage fluid, blood, urine, hair and nails for chemical analysis, and keep a meticulous medico-legal record.
- ▶ Inform police whenever criminal poisoning is suspected.
- ▶ At autopsy, preserve the stomach and contents, intestine, liver, kidney, blood and urine — plus **bone, hair and nail** whenever arsenic or thallium is suspected.
- ▶ Preserve viscera in **saturated common salt**, never spirit, for metallic poisons.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Classification tree of irritant poisons:** root box "IRRITANTS" branching into *Inorganic* (Metallic — MALICO; Non-metallic — phosphorus, halogens, formaldehyde), *Organic* (plant — Abrus, croton, castor, Calotropis; animal — cantharides, venoms) and *Mechanical* (powdered glass, diamond dust, chopped hair).
- ▶ **Chronic lead poisoning composite:** a face/mouth panel showing the Burtonian line at the gum-tooth junction, an arm panel showing wrist drop, and a blood-smear inset labelled basophilic stippling and Cabot's ring.

High-yield exam pointers

- ▶ Mnemonic **MALICO** — Mercury, Arsenic, Lead, Iron, Copper — plus thallium, antimony, cadmium, manganese, zinc.
- ▶ All act by binding **sulphydryl (–SH) enzyme groups**; antidotes are chelators (BAL, EDTA, DMSA, penicillamine, desferrioxamine, Prussian blue).
- ▶ Eponyms to recall: **Burtonian line** (lead), **Aldrich–Mees lines** (arsenic, thallium), **raindrop pigmentation/leucomelanosis** (arsenic), **erethism/acrodynia/Minamata** (mercury), **thallium triad** (alopecia + neuropathy + mental change), **itai-itai** (cadmium), **chalcosis/Kayser–Fleischer ring** (copper).
- ▶ Arsenic autopsy triad: red velvety stomach, subendocardial petechiae, delayed putrefaction/mummification.
- ▶ The elemental metal is inert but the **salt** is poisonous for mercury, arsenic and copper.
- ▶ Dual citations to remember: poisoning to cause hurt **IPC §328 → BNS §123**; negligent poisonous substance **IPC §284 → BNS §286**; homicide **IPC §302/300 → BNS §103/101**.

♦ ♦ ♦

Methyl Isocyanate (MIC)

Asked in: Paper III Apr 2018 — RGUHS MD Forensic Medicine

Definition / Introduction

- ▶ **Methyl isocyanate (MIC)**, formula $\text{H}_3\text{C}-\text{N}=\text{C}=\text{O}$, is a colourless, highly reactive liquid that turns to gas at room-warm temperature.
- ▶ It belongs to the **isocyanate** group, along with toluene di-isocyanate (TDI) and diphenylmethane di-isocyanate (MDI).
- ▶ Industrial use: intermediate for **carbamate pesticides** and **polyurethane** manufacture.
- ▶ Forensically it matters as an **environmental/industrial toxic gas**, not a deliberate poison.
- ▶ It is the agent behind the **Bhopal gas disaster of 1984**, the worst industrial chemical catastrophe in history.
- ▶ Among asphyxiant gases, MIC is classed as a **respiratory irritant**.

Physico-chemical properties

- ▶ **Physical state**: colourless liquid with a sharp, pungent odour.
- ▶ **Boils at 39 °C** (turns to gas readily); freezes around **-80 °C**.
- ▶ **Extremely reactive** — must be stored with great care.
- ▶ **Water triggers a violent exothermic reaction**, hydrolysing to carbon dioxide and methylamine.
- ▶ Strong heating (~427 °C) decomposes MIC into **hydrogen cyanide (HCN) and carbon monoxide (CO)**, plus ammonia.
- ▶ MIC vapour is **heavier than air**, so it settles near the ground and accumulates over low-lying populated areas — this worsened exposure at Bhopal.

Mechanism of action

MIC injures by **two distinct mechanisms**.

- ▶ **Direct irritation**: a powerful irritant of mucous membranes — eyes and the whole respiratory tract.
- ▶ It reacts with tissue water, penetrating skin, conjunctiva and airway lining to produce a **chemical burn-type injury**.
- ▶ **Sensitisation**: MIC can sensitise the airways and provoke **bronchospasm**.
- ▶ Acute exposure causes a **Type I hypersensitivity reaction** — an early asthmatic response.
- ▶ High or repeated exposure can cause a **delayed IgG-mediated hypersensitivity**, with airway inflammation persisting **months to years**.
- ▶ A single exposure can sensitise; re-exposure later triggers a severe, delayed asthma-like attack.

Routes, toxic concentration and fatal dose

- ▶ Chief routes: **inhalation, ocular contact, and dermal absorption** of the liquid.
- ▶ The warning odour **cannot be relied upon** at low concentrations, but its lachrymatory (tear-producing) action at 2–4 ppm gives some early warning.

Airborne concentration	Effect
0.02 ppm	Quoted safe limit
2 ppm	Irritation and lacrimation; odour often undetected
4 ppm	Markedly worse; strongly irritant to eyes
21 ppm	Unbearable — cannot be tolerated

► **Fatal dose (experimental data):**

- Inhalation, 4 hours: $\approx 100 \mu\text{g}$.
- Oral, rat: $\approx 70 \text{ mg/kg}$.
- Skin, rabbit: $\approx 0.22 \text{ mL/kg}$.

Clinical features

- **Eyes (acute):** irritation, redness, lacrimation, photophobia, blurred vision.
- ***Eyes (chronic — Bhopal eye syndrome):** *corneal erosion/opacity, Bitot's spots, pterygium**.
 - Survivors show more trachoma (**40%**), lid infection (**36%**) and irritant symptoms (**45%**); **ocular damage can be permanent**.
- **Upper airway:** nasal irritation, rhinorrhoea, severe throat burning. **Skin:** chemical burns.
- **Lower respiratory:** cough, frothy expectoration, chest pain, breathlessness.
 - Progresses to **asthma, pulmonary oedema, emphysema**, haemorrhage and bronchopneumonia — can be fatal.
 - Onset may be **immediate** (within 30 min), **late** (after an hour or more), or **dual**.
- **Reproductive:** menstrual disruption, leucorrhoea, dysmenorrhoea, **abortion** in pregnant women.
 - MIC crosses the **placental barrier**; data suggest teratogenic potential.

Treatment and supportive management

- **No specific antidote exists** — treatment is decontamination plus supportive/symptomatic care.
- Remove from the source, strip contaminated clothing, and wash skin and eyes with **saline**.
- Irrigate eyes with **0.9% saline or water for at least 15 minutes**, removing contact lenses first; persistent irritation needs an **ophthalmological examination**.
- Topical antibiotics treat secondary eye infection; severe iritis may need **atropine or homatropine**.
- On ingestion, **activated charcoal** may help, but **gastric lavage (stomach wash)** is **contraindicated** — the agent is corrosive and reactive.
- Give **oxygen and airway support**; treat pulmonary oedema and bronchospasm.
- Monitor ECG, chest X-ray, pulse oximetry, blood gases and renal/hepatic function.
- **Cyanide antidotes (nitrites, sodium thiosulfate) must NOT be used** — isocyanates are not cyanides; HCN was not the toxic agent at Bhopal.

Autopsy features

- ▶ **Bhopal victims:** cerebral haemorrhage and oedema, cherry-red blood, fatty liver, renal tubular necrosis.
- ▶ General: signs of **asphyxia**, pulmonary and cerebral oedema, visceral congestion.
- ▶ **Respiratory tract:** severe necrotising lesions of the airway mucosa, bronchioles, alveoli and pulmonary capillaries; lungs enlarged, oedematous, consolidated.
- ▶ All mucosal surfaces — eye, nose, trachea, bronchi — intensely congested.
- ▶ **Delayed deaths** (beyond a week): parenchymatous degeneration of brain, heart, lung, liver and kidney.
- ▶ HPLC (high-performance liquid chromatography) is the specific, sensitive test for MIC in blood.

The Bhopal gas disaster

- ▶ On the night of 2–3 December 1984, about 42,000 kg (42 tonnes) of MIC leaked from underground storage tanks at the **Union Carbide India Limited (UCIL)** factory, Bhopal — water entering a tank triggered the runaway reaction.
- ▶ Because MIC vapour is **heavier than air**, it settled over the densely populated surrounding area.
- ▶ Roughly **500,000 people were exposed; 8,000 died within the first week**, a further 8,000 later (~16,000 total).
- ▶ The **Bhopal Gas Leak Disaster (Processing of Claims) Act, 1985** let the Government represent all victims as *parens patriae* (state as guardian).
- ▶ India claimed **US\$3,300 million**; settled **February 1989** for about **US\$470 million**.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ Flowchart — pathophysiology of MIC toxicity: top box *MIC vapour (heavier than air, settles low)*.
- ▶ Branch 1: *Direct mucosal irritation*, leading to eyes (Bhopal eye syndrome), upper airway and skin burns.
- ▶ Branch 2: *Sensitisation*, leading to Type I hypersensitivity (early asthma) or delayed IgG response (chronic inflammation).
- ▶ Both branches converge on *Pulmonary oedema*, leading to bronchopneumonia, leading to asphyxial death.
- ▶ Side box: *Thermal decomposition*, yielding HCN, CO and ammonia.
- ▶ Labelled eye diagram (Bhopal eye syndrome): conjunctival congestion, lacrimation, corneal erosion/opacity, Bitot's spots, pterygium.

Medico-legal significance

- ▶ MIC poisoning is almost always **accidental** (occupational/environmental) — the **Bhopal gas tragedy**, never homicide or suicide.
- ▶ Mass casualties raise **civil liability and compensation** — in India via the **Bhopal Gas Leak Disaster (Processing of Claims) Act, 1985**, State acting *parens patriae*.

- ▶ Culpable plant management may attract **causing death by negligence** — Section 304A IPC 1860 (now Section 106 BNS 2023).
- ▶ Depending on facts, this could instead be **culpable homicide** — Section 304 IPC (now Section 105 BNS 2023), or **murder** — Section 300/302 IPC (now Section 101/103 BNS 2023).
- ▶ The autopsy surgeon must document the injuries, preserve blood for HPLC, and correlate with exposure history for the **inquest** — Section 174/176 CrPC 1973 (now Section 194/196 BNSS 2023).
- ▶ The disaster prompted India's environmental-protection and industrial-safety legislation.

High-yield exam pointers

- ▶ MIC = $\text{H}_3\text{C}-\text{N}=\text{C}=\text{O}$, respiratory-irritant asphyxiant; boils at 39 °C; vapour **heavier than air**.
- ▶ Two toxic mechanisms: **direct mucosal irritation + sensitisation** (Type I early asthma, delayed IgG response).
- ▶ *Bhopal eye syndrome* — chronic ocular damage (trachoma 40%, lid infection 36%, irritant symptoms 45%).
- ▶ Autopsy quartet: **cerebral oedema/haemorrhage, cherry-red blood, fatty liver, renal tubular necrosis**.
- ▶ **No antidote** — supportive only; stomach wash contraindicated; HPLC detects MIC in blood.
- ▶ **Cyanide antidotes must NOT be used** — isocyanate is not cyanide.
- ▶ **Bhopal**: 2–3 Dec 1984, ~42 tonnes MIC, UCIL, ~8,000 early deaths, settled Feb 1989 for ~US\$470 million.
- ▶ Criminal head = Section 304A IPC (now Section 106 BNS 2023).



Poison information centre

Asked in: Paper III Dec 2023 • Paper IV Apr 2022 (2×) — RGUHS MD Forensic Medicine

Definition / Introduction

- ▶ A **Poison Information Centre (PIC)**, also called a **Poison Control Centre (PCC)**, is a specialised medical facility.
- ▶ It gives **free, immediate, expert telephone advice**, round the clock, to doctors, hospitals and the public in poisoning cases.
- ▶ It acts as a central toxicology database and advisory service.
- ▶ It covers all classes of poisons — drugs, household chemicals, pesticides, plants, animal venoms and industrial agents.
- ▶ Quick advice within minutes of exposure reduces poisoning deaths, most of which are caused by delay in reaching definitive care, and it cuts down unnecessary hospital referrals.

Concept, purpose and need

- ▶ A PIC runs a **toll-free telephone service, 24 hours a day, 7 days a week, all year**.
- ▶ It is backed by a continuously updated poisons database and trained toxicology staff.

- ▶ **Core rationale:** most poisoning deaths are due to delay — time lost transporting the patient to hospital and in identifying the agent.
- ▶ A PIC compresses this delay by giving immediate first-aid and antidote advice over the phone.
- ▶ **Triage efficiency:** about 80–90% of poison calls are managed safely by telephone advice and home observation alone.
- ▶ This spares patients unnecessary hospital visits and decongests emergency departments.
- ▶ Advice also goes to **hospital emergency departments and private practitioners**, who often lack ready access to toxicology data.

Historical development

Year	Place / event	Significance
Late 1940s (1949)	The Netherlands	First poison information service in the world
1953	Chicago, USA	First US poison control centre (Illinois Chapter, American Academy of Pediatrics; founder Dr Edward Press)
1958	AAPCC founded	American Association of Poison Control Centers — standardised centre operations
1961–1963	Leeds, then Guy's Hospital, London	UK's National Poison Information Service established
1964	EAPCCT founded	European Association of Poisons Centres and Clinical Toxicologists
Dec 1994	NPIC, AIIMS New Delhi	India's first poison information centre

- ▶ Modern centres use standardised computer poison databases: **POISINDEX** in the USA and **TOXBASE** in the UK.
- ▶ In the USA, poisoning calls made to the emergency number **911** are directly diverted to poison control centres.

Poison Information Centres in India

- ▶ India's first PIC, the **National Poisons Information Centre (NPIC)**, was set up in **December 1994** in the **Department of Pharmacology, AIIMS New Delhi**.
- ▶ It became operational in **1995**.
- ▶ NPIC runs on **INTOX**, a poisons software compiled by the **World Health Organization (WHO)**.
- ▶ The **National Institute of Occupational Health (NIOH)**, **Ahmedabad**, also runs a centre.
- ▶ **Regional centres** exist at **Chennai and Cochin**, using the **POISINDEX** database.

Functions of NPIC (AIIMS New Delhi):

- ▶ Gives **round-the-clock, free, immediate expert advice** by telephone for any case of poisoning.

- ▶ Advises on **pre-hospital first aid, antidote therapy and supportive/symptomatic care**.
- ▶ Provides **toxicity assessment and treatment recommendations** for all classes of poisons.
- ▶ Runs **teaching and training programmes** for doctors and the public on poisoning prevention and management.
- ▶ Plans for and assists the response to **chemical disasters**.

Services and how a PIC is contacted

- ▶ **Contact:** a **toll-free telephone number**, available 24 hours a day, 7 days a week, all year.
- ▶ **Toxicity (risk) assessment:** identify the agent, estimate the dose or exposure, and grade severity to decide home observation versus hospital referral.
- ▶ **Management advice:** decontamination, supportive therapy, **antidote selection and dosing**, and methods of enhanced elimination.
- ▶ **Database and surveillance:** maintains a poisons database and collects epidemiological data on poisoning trends.
- ▶ **Education and prevention:** trains health professionals and teaches the public poison-prevention measures — child-proof packaging, safe locked storage, keeping poisons away from food.
- ▶ **Disaster preparedness:** advises during chemical and industrial mass-exposure incidents.

Relevance to the Indian poisoning burden

- ▶ India is an agriculture-based country, so the commonest poisons are **agricultural poisons** — organophosphorus compounds, carbamates and aluminium phosphide.
- ▶ India also has **over 4000 poisonous plants** (datura, nux vomica, oleander, aconite, castor, poppy), which makes plant poisoning common and accessible.
- ▶ NPIC data from New Delhi (April 1999–March 2002) recorded **2719 poison calls**.
- ▶ The commonest mode was **suicidal (53%)**, followed by accidental (47%).
- ▶ The chief route was **oral (88%)**.
- ▶ The leading agents were **household products (44.1%)**, drugs (18.8%) and agricultural pesticides (12.8%).
- ▶ **Children accounted for 36.5%** of all cases, most of these accidental.
- ▶ This profile shows why an accessible PIC matters for both rural pesticide poisoning and paediatric accidental exposures.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Flow chart — "Functioning of a Poison Information Centre":** Poison exposure → Caller (patient/family/hospital/GP) → Toll-free 24×7 telephone → PIC toxicologist + poisons database (INTOX/POISINDEX/TOXBASE) → Toxicity (risk) assessment → (a) Home observation & first-aid advice (~80–90%) OR (b) Refer to hospital → Decontamination/antidote/supportive care → Follow-up & data record.
- ▶ **Box diagram — "PIC organisation in India":** central box NPIC, AIIMS New Delhi (Dept. of Pharmacology, 1994/95, software INTOX–WHO), with branches to NIOH Ahmedabad, Regional centre Chennai (POISINDEX) and Regional centre Cochin (POISINDEX).

Medico-legal significance

- ▶ A PIC helps the clinician and the forensic physician identify an unknown poison, plan emergency management, and select the correct **antidote** — directly affecting survival and the medico-legal record.
- ▶ In every case of **suspected criminal/homicidal or unnatural poisoning**, the doctor must **inform the police**.
- ▶ The police inquest into an unnatural or suspected-poisoning death is governed by **Section 174 CrPC 1973 (now Section 194 BNSS 2023)**.
- ▶ The doctor must also preserve and send samples — vomitus, gastric lavage fluid, blood, urine, viscera — to the **chemical examiner / Forensic Science Laboratory**.
- ▶ The doctor must **maintain a register** of all materials forwarded.
- ▶ Failing to report a medico-legal poisoning to the police is punishable as **intentional omission to give information of an offence by a person bound to inform** — **Section 202 IPC 1860 (now Section 239 BNS 2023)**.
- ▶ Doing a rash or negligent act with a poisonous substance so as to endanger life is punishable under **Section 284 IPC 1860 (now Section 286 BNS 2023)**.
- ▶ Causing hurt by poison with intent to commit an offence is punishable under **Section 328 IPC 1860 (now Section 123 BNS 2023)**.
- ▶ PIC epidemiological data also feed **public-health policy, poison-prevention programmes and chemical-disaster planning**.

Recent advances [RA]

- ▶ **WHO Guidelines for establishing a poison centre (2021)** replaced the 1997 guidelines, reflecting two decades of experience since the WHO INTOX programme and the emphasis of the International Health Regulations (2005) on chemical-incident preparedness. WHO estimates unintentional poisoning caused **106,683 deaths and 6.3 million DALYs in 2016**. [WHO 2021]
- ▶ The original INTOX software has evolved into a web-enabled **Data Management System (DMS)** for standardised case recording, antidote information and cross-centre toxicovigilance. [WHO/IPCS]

- ▶ In the USA, all ~55 regional poison centres upload de-identified case data to the **National Poison Data System (NPDS)** within minutes, creating near-real-time surveillance for outbreak detection and chemical/bioterrorism preparedness; the 2024 annual report logged **2,418,426 encounters**. This automated model is the proposed template for a national Indian poisons network. [PMID 41432769]
- ▶ NPIC AIIMS now runs a 24×7 toll-free helpline (**1800-116-117**). The National Centre for Disease Control (NCDC)/Ministry of Health & Family Welfare maintains a national directory of poison centres, and setting up more regional centres under one pan-India toll-free number remains a public-health priority. [NCDC/MoHFW]

High-yield exam pointers

- ▶ PIC/PCC = **free, immediate, expert, telephone-based, 24×7 toxicology advisory service**.
- ▶ World's first poison information service — **The Netherlands (~1949)**.
- ▶ First US centre — **Chicago, 1953**; AAPCC founded 1958; EAPCCT founded 1964.
- ▶ India's first centre — **NPIC, AIIMS New Delhi, Dec 1994/operational 1995**, Department of Pharmacology, software **INTOX**; toll-free **1800-116-117**.
- ▶ Other Indian centres — **NIOH Ahmedabad**, regional centres at **Chennai and Cochin (POISINDEX)**.
- ▶ Databases: **POISINDEX (USA)**, **TOXBASE (UK)**, **INTOX (WHO/AIIMS)**.
- ▶ About **80–90%** of poison calls are managed by telephone advice and home observation alone.
- ▶ Relevant statutes: negligent conduct with poison — **Section 284 IPC 1860 (now Section 286 BNS 2023)**; failure to inform police — **Section 202 IPC 1860 (now Section 239 BNS 2023)**.



Road poison and medico legal importance

Asked in: Paper III Oct 2018 — RGUHS MD Forensic Medicine

- ▶ "Road poison" (also called *rail-road poison* or *highway poison*) is the forensic name for **Datura**.
- ▶ It is a deliriant plant poison of the family **Solanaceae**.
- ▶ Criminals use it to stupefy travellers before robbery, kidnapping, rape, or abduction.
- ▶ Robbers often pose as sadhus (mendicants) and offer *prasad*, sweets, tea, or a beedi laced with crushed Datura seeds.
- ▶ The victim is plundered while unconscious or amnesic.
- ▶ The plant grows wild on roadsides and barren land across India — cheap and freely available.
- ▶ It produces a confused, amnesic, hallucinating victim who remembers nothing afterwards, making it the archetypal Indian **stupefying agent**.

The plant and its identification

- ▶ **Botanical identity:** *Datura stramonium* / *Datura alba* / *Datura metel*, family **Solanaceae**.
- ▶ **Common names:** thorn apple, Jimson weed, Jamestown weed, devil's trumpet, Hell's bell.
- ▶ The name Datura derives from the Sanskrit *Dhurta*, meaning "cheat".

- ▶ **Morphology:** bell-shaped (trumpet) white or purple flowers, large brinjal-like leaves.
- ▶ The fruit is a globular, spiny "thorn-apple" capsule that splits on drying to release brownish-black seeds.
- ▶ **All parts of the plant are poisonous; the seeds carry the highest concentration of alkaloids.**
- ▶ **Active principles** (tropane alkaloids, about 0.2–1.4% of the plant):
 - Hyoscine (scopolamine).
 - Hyoscyamine.
 - Atropine (older name *Daturine*).
- ▶ Atropine and hyoscyamine are isomers — hyoscyamine is the levo-isomer of atropine.
- ▶ **Mechanism:** all three alkaloids competitively block muscarinic acetylcholine receptors.
- ▶ This is an **anticholinergic (parasympatholytic)** action, producing the classic anticholinergic toxidrome.

Datura seed versus chilli (capsicum) seed — seeds are mixed into food to disguise them, so this is a recurring viva/autopsy point:

Feature	Datura seed	Chilli seed
Size / shape	Large, thick, kidney-shaped	Small, thin, rounded
Colour	Dark or yellow-brown	Pale yellow
Margin	Double-edged	Single, sharp edge
Surface	Pitted (numerous depressions)	Smooth
Smell / taste	Odourless, bitter	Pungent
Embryo	Curved outwards at hilum	Curved inwards , like "6"

Clinical features — the anticholinergic toxidrome

- ▶ Remember the mnemonic: "**hot as a hare, blind as a bat, red as a beet, dry as a bone, mad as a hatter.**"
- ▶ **Onset:**
 - About 30 minutes after eating seeds.
 - About 5 minutes after a decoction.
 - Within seconds after the pure alkaloid.
- ▶ **Dryness of mouth and throat**, intense thirst, and dysphagia (difficulty swallowing).
- ▶ **Dilated pupils (mydriasis)** with loss of accommodation, causing blurred vision, diplopia, photophobia, and temporary blindness.
- ▶ **Dry, hot, flushed skin** ("red as a beet"); hyperpyrexia raises body temperature by 3–4°C.
- ▶ **Ataxic (drunken) gait** and dysarthria (slurred speech).
- ▶ **Delirium** — restless, noisy, incoherent behaviour.
- ▶ The patient makes purposeless picking movements at imaginary threads (**carphologia**) and a pill-rolling movement.

- ▶ Visual and auditory hallucinations occur; the patient fails to recognise relatives.
- ▶ **Drowsiness progresses to stupor and coma.**
- ▶ **Urinary retention** and reduced bowel sounds (paralytic ileus) occur.
- ▶ Tachycardia (120–150/min), raised blood pressure, and hyperreflexia are seen.
- ▶ **Amnesia for the whole episode is characteristic** — this is central to the medico-legal use of the poison.

Fatal dose, fatal period, diagnosis and treatment

- ▶ **Fatal dose:** Datura seeds 50–100 (some texts: 75–125, with a criminal "stupefying" dose of only 40–50 seeds).
- ▶ Atropine or hyoscyamine fatal dose: about 120 mg.
- ▶ Scopolamine (hyoscine) fatal dose: about 30 mg (15–30 mg in some texts).
- ▶ **Fatal period:** 1–2 days (about 24 hours) if untreated.
- ▶ **Mydriatic (cat's-eye) test:** the patient's urine or a seed extract, instilled into a cat's or rabbit's eye, causes immediate mydriasis.
- ▶ **Pilocarpine test:** 2–3 drops of 1% pilocarpine in the patient's eye fail to constrict the pupil within half an hour.
- ▶ Alkaloids can be detected in blood, urine, and hair (segmental hair analysis by GC-MS) to time the exposure over roughly 3 weeks.
- ▶ **Decontamination:** emesis and gastric lavage with weak tannic acid, potassium permanganate, or activated charcoal.
- ▶ Lavage remains useful even up to ~36 hours later, since delayed gastric emptying keeps seeds recoverable.
- ▶ **Supportive care:**
 - Maintain airway and respiration; intubate or ventilate if needed.
 - Nurse in a quiet, dark room and restrain to prevent falls.
 - Catheterise the bladder; tepid sponging for fever; IV fluids.
- ▶ **Antidote of choice: physostigmine**, 1–2 mg slow IV in adults, repeated in 20–60 minutes if needed.
- ▶ Physostigmine crosses the blood–brain barrier and reverses central effects; neostigmine, pyridostigmine, and pilocarpine do not.
- ▶ **Avoid morphine** (depresses respiration) and phenothiazines/antihistamines/tricyclics (add to the anticholinergic load).
- ▶ Agitation is controlled with IV diazepam. Dialysis and haemoperfusion are ineffective, since the alkaloids are lipophilic.

Autopsy findings

- ▶ No characteristic findings; general signs of asphyxia are present, since death is often from respiratory paralysis.
- ▶ Stomach and small intestine mucosa are inflamed and congested.

- ▶ Fragments of crushed seeds and plant material may be recovered.
- ▶ Datura seeds resist putrefaction for a long time, so they can be identified even in a decomposed body.
- ▶ Lungs are oedematous and congested; petechial haemorrhages are seen in the endocardium.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Datura plant, fruit and seed:** label the bell-shaped flower, large leaf, spiny thorn-apple fruit, dried split capsule, and brownish-black seeds.
- ▶ **Datura seed vs chilli seed (longitudinal section):** label the embryo curved outwards at the hilum in Datura versus curved inwards like the numeral "6" in chilli.

Medico-legal significance

- ▶ **The core point — stupefying/"road" poison:** crushed seeds are mixed into food, tea, liquor, *prasad*, or a beedi and given to travellers (especially railway passengers) to stupefy them before robbery, kidnapping, abduction, or rape.
- ▶ This is charged under **Section 328 IPC 1860 (now Section 123 BNS 2023)** — administering a stupefying substance to facilitate an offence.
- ▶ It is read with robbery (**Section 392 IPC → Section 309 BNS 2023**) or rape (**Section 376 IPC → Section 64 BNS 2023**) as applicable.
- ▶ **Criminal responsibility:** a victim drugged with Datura without their knowledge is exempt from responsibility for acts done under its influence, under **Section 85 IPC 1860 (now Section 23 BNS 2023)**.
- ▶ A person who took Datura voluntarily remains responsible for their own acts (**Section 86 IPC → Section 24 BNS 2023**).
- ▶ Datura is grouped with cannabis indica and chloral hydrate as a classic stupefying poison.
- ▶ **Other manners of poisoning:** as a drug of abuse (seeds/leaves smoked with tobacco or ganja, or added to liquor for a stronger "kick").
- ▶ Accidental poisoning occurs in children eating the fruit, and in cornpickers/gardeners exposed to seed dust ("cornpicker's pupil" / "gardener's mydriasis").
- ▶ Also reported from contaminated grain, toxic honey, or adulterated herbal preparations.
- ▶ Folk use includes aphrodisiac and abortifacient purposes; suicide and homicide by Datura are rare.
- ▶ **Doctor's duties:** stabilise and decontaminate the patient; preserve stomach wash, vomitus, urine, blood, and any recovered seeds for chemical analysis.
- ▶ Perform the mydriatic and pilocarpine tests, and document the amnesia and toxidrome.
- ▶ Maintain chain of custody, and report a suspected stupefying-poison crime to the police.
- ▶ In a decomposed body, recover and identify the putrefaction-resistant seeds.

♦ ♦ ♦

Scorpion sting

Asked in: Paper III Oct 2016 — RGUHS MD Forensic Medicine

Definition / Introduction

- ▶ A **scorpion sting** is envenomation by an arachnid that injects venom through a hollow sting (**telson**) at the tip of its tail.
- ▶ The venom is a clear, colourless **toxalbumin** (a protein-based toxin).
- ▶ Only a small quantity is injected, but its **neurotoxin** is, weight-for-weight, more lethal than snake neurotoxin.
- ▶ The sting is a true medical emergency: it triggers an "**autonomic storm**" — a catecholamine-driven overactivity of both the sympathetic and parasympathetic nervous systems.
- ▶ The dominant fatal complications are **acute pulmonary oedema** and **cardiac (myocardial) failure**, especially in children.
- ▶ The medically important species in India is the **Indian red scorpion* (*Mesobuthus tamulus*)*.

Identification of the offending arthropod

- ▶ Scorpions are **eight-legged arachnids** with a five-segmented tail ending in a bulbous, hollow **sting (telson)**.
- ▶ The telson connects to a pair of poison glands; venom is released **reflexly** on stinging.
- ▶ Scorpions **sting, they do not bite** — unlike snakes and spiders.
- ▶ Only about **25 of the ~100 Indian species** are dangerous; all belong to family **Buthidae**.
- ▶ Scorpions with **slender, thin claws are more venomous** than those with thick, powerful claws.
- ▶ They **fluoresce under ultraviolet (UV) light**, allowing detection at night.
- ▶ The local lesion is a **single puncture** at the centre of a reddened area, usually on a limb.

Composition and mode of action of the venom

- ▶ The venom's main active components are **long-chain neurotoxin peptides**.
- ▶ Other constituents include **cardiotoxins**, haemolysins, histamine, **hyaluronidase** (a "spreading factor"), and nephrotoxins.
- ▶ **Phospholipase** in the venom can cause gastrointestinal and pulmonary haemorrhage and disseminated intravascular coagulation.
- ▶ **Core mechanism:** the neurotoxins open voltage-gated **sodium (Na^+) channels** on excitable membranes.
- ▶ This causes repetitive depolarisation of both sympathetic and parasympathetic nerves — the basis of the autonomic storm.
- ▶ The downstream effects act as a potent autonomic stimulator:
 - Massive **catecholamine release** causes hypertension, tachycardia, arrhythmias, and myocardial hypoxia.
 - Increased **renin** secretion produces hyperkalaemia, hyperglycaemia, and suppressed insulin secretion.

- A **direct toxic effect on the myocardium** contributes to myocarditis, pump failure, and pulmonary oedema.

Clinical features

Severe local pain is followed by an autonomic storm; the *Mesobuthus tamulus* sting is the prototype.

Category	Features
Local	Severe radiating pain, erythema, oedema around a single wound; subsides in 1–2 h.
Sympathetic	Hypertension, tachycardia, mydriasis , cardiogenic shock, arrhythmias, pulmonary oedema.
Parasympathetic	Hypotension, bradycardia, profuse sweating, thick hypersalivation, miosis , priapism .
Other systemic	Nausea, vomiting, pancreatitis, coagulopathy, respiratory depression, rare stroke.
Terminal	Convulsions and coma preceding death.

- ▶ Priapism occurs in nearly all children and ~20% of adults.
- ▶ Sympathetic effects are usually **more prolonged** than parasympathetic ones.
- ▶ Mortality is negligible except in children, who remain the high-risk group.

Diagnosis and differential diagnosis

- ▶ History plus the **single central puncture** in a red, oedematous limb is usually diagnostic.
- ▶ ECG findings: peaked T waves (V2–V6), Q waves with ST elevation (leads I and aVL), and **left anterior hemiblock**.
- ▶ A snake bite shows two puncture marks; a scorpion sting shows a single hole.
- ▶ Where doubtful, confirm by ELISA for venom antigen.
- ▶ The syndrome can mimic pheochromocytoma or organophosphate poisoning — the single wound and history clarify the true cause.

Management

- ▶ **First aid:** immobilise the limb; give tetanus toxoid and local wound care.
 - Washing with dilute ammonia, borax, or potassium permanganate is traditional but of **doubtful value**.
- ▶ **Pain control:** ice packs, local anaesthetic infiltration, oral paracetamol; **barbiturates** control both pain and convulsions.
 - **Morphine and related opioids/sedatives are CONTRAINDICATED** — they may enhance venom toxicity.
 - Intravenous **diazepam** is used specifically to control agitation and convulsions.
- ▶ **Prazosin** — **drug of choice** / "**physiological antidote**": a post-synaptic α_1 -adrenergic blocker that counters the catecholamine storm.
 - It is cardioprotective, reduces cardiac preload, and reverses pulmonary oedema.

- Dose: 250–300 µg every 3 h (or ~500 µg every 4–6 h); half the adult dose in children.
- Combined with scorpion antivenom, it shortens recovery time.
- ▶ **Scorpion antivenom (SAV):** species-specific antivenom made by **Haffkine Bio-Pharmaceutical Corporation, Mumbai**.
 - One reconstituted vial is given, repeated after an hour if symptoms persist.
 - Most benefit comes from **early administration combined with prazosin**.
- ▶ **Complications:**
 - **Pulmonary oedema:** furosemide, sodium nitroprusside, prazosin.
 - **Hypertension:** prazosin, sublingual nifedipine.
 - **Hypotension** (parasympathetic predominance): dopamine infusion.
 - **Persistent arrhythmias:** propranolol.
- ▶ **Outmoded measures** — incision-suction, ligature, oral suction of poison — are no longer recommended.

Autopsy / post-mortem appearances

- ▶ **Cause of death:** acute pulmonary oedema and cardiac (myocardial) failure, usually preceded by convulsions and coma.
- ▶ **Fatal period:** usually a few hours.
- ▶ **Local:** the stung limb is reddened and oedematous, with a single hole at the centre.
- ▶ The skin, subcutaneous tissue, and muscle around the hole should be **excised and preserved for chemical analysis**.
- ▶ **Internal:** viscera congested; lungs oedematous.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Diagram 1 — External anatomy of a scorpion:** label the cephalothorax, **pedipalps (claws)**, four pairs of walking legs, segmented abdomen, five-segmented tail, and terminal **sting (telson)** with its poison glands and duct.
- ▶ **Diagram 2 — Local lesion:** a scorpion sting shows a **single central puncture** in a red, oedematous limb; contrast with a snake bite, which shows **two fang punctures**.

Medico-legal significance

- ▶ Scorpion envenomation is almost always **accidental** (occupational/agricultural exposure, footwear, bedding); homicidal or suicidal use is essentially unknown.
- ▶ Indian law has **no scorpion-specific statute** and no accurate statutory definition of "poison."
- ▶ Administering any substance with intent to cause injury or death, which does cause it, is legally sufficient regardless of whether the substance is medically a "poison."
- ▶ The **Poisons Act 1919** does not define poison; it only regulates the import, possession, and sale of poisons.

- ▶ An unnatural or suspicious death may need a **police inquest** under Section 174 CrPC 1973 (now Section 194 BNSS 2023), and sometimes a **magistrate's inquest** under Section 176 CrPC 1973 (now Section 196 BNSS 2023).
- ▶ A victim's **dying declaration** is admissible under Section 32 IEA 1872 (now Section 26 BSA 2023).
- ▶ The treating doctor's **expert opinion** is admissible under Section 45 IEA 1872 (now Section 39 BSA 2023).
- ▶ If venom is deliberately used to cause death, the offence is **culpable homicide/murder** — Sections 299/300 IPC 1860 (now Sections 100/101 BNS 2023), punished under Sections 302/304 IPC (now Sections 103/105 BNS 2023).
- ▶ Administering poison/venom with intent to cause hurt falls under Section 328 IPC 1860 (now Section 123 BNS 2023).
- ▶ At autopsy, document the single sting wound, autonomic-storm features, ECG changes, and cause of death.
- ▶ Prompt recognition, **prazosin ± scorpion antivenom**, avoiding contraindicated morphine, and vigilance in children are the treating doctor's core duty-of-care obligations.

High-yield exam pointers

- ▶ **Indian red scorpion* = *Mesobuthus tamulus**; all **dangerous species belong to family Buthidae****.
- ▶ Venom = **toxalbumin**; neurotoxins **open Na⁺ channels**, triggering an **autonomic storm**.
- ▶ **Prazosin (α₁-blocker)** is the drug of choice / physiological antidote; **morphine** is contraindicated.
- ▶ Cause of death = **pulmonary oedema + cardiac failure**; mortality is **negligible except in children**.
- ▶ SAV is made by **Haffkine Bio-Pharmaceutical Corporation, Mumbai**; SAV + prazosin speeds recovery.



Snake venom

Asked in: Paper III Apr 2018 — RGUHS MD Forensic Medicine

Definition

- ▶ **Snake venom** is modified saliva, made in paired racemose (grape-cluster shaped) glands behind and below the eyes, and injected through hollow or grooved fangs.
- ▶ Chemically it is a mixture of **toxalbumins (toxic proteins)** and **enzymes** — enzymes cause local and systemic effects, toxalbumins give lethality.
- ▶ Poisoning by snake venom is called *ophitoxaemia*.
- ▶ India carries one of the world's heaviest snakebite burdens, and every snakebite death is a medico-legal matter needing inquest and autopsy.

Venomous snakes of forensic importance

- ▶ Only about 250 of the world's 3,500+ snake species are venomous; India has around 216 species, ~52 of them venomous, but only **five are dangerously poisonous to humans** — king cobra, common cobra, common krait, Russell's viper, and saw-scaled viper (commonest: common krait).
- ▶ The "**Big Four**" cause almost all medically important Indian bites:
 - **Common cobra** (*Naja naja*) and **common krait** (*Bungarus caeruleus*) — neurotoxic.
 - **Russell's viper** (*Daboia russelii*) and **saw-scaled viper** (*Echis carinatus*) — vasculotoxic.
- ▶ Elsewhere, **Crotalidae** (pit vipers) are cytotoxic/haemorrhagic, and **Hydrophidae** (sea snakes) are myotoxic.

Venom apparatus and the bite

- ▶ **Venom glands**, modified salivary glands behind the eyes, drain by a duct into the **fangs** — curved maxillary teeth that erect on striking, grooved in the cobra and canalised like a hypodermic needle in the viper.
- ▶ A venomous bite leaves **two deep fang punctures, 8 mm to 4 cm apart**; a non-venomous bite (short, solid teeth) leaves a row of small tooth marks instead.
- ▶ A **dry bite** (no venom injected) occurs in about 20% of viper bites and up to 75% of sea-snake bites, so many victims show no poisoning at all.
- ▶ Venom spreads through the lymphatics and superficial veins; bites are most severe at night or just after hibernation.

Composition and constituents

Venom is essentially toxalbumins plus enzymes.

- ▶ **Proteolytic enzymes**: release histamine and digest tissue, causing swelling, blistering, and necrosis (richest in Crotalidae, scanty in Elapidae/Hydrophidae).
- ▶ **Fibrin ferments**: disturb normal blood clotting.
- ▶ **Neurotoxins**: block the neuromuscular junction like curare, causing flaccid paralysis, especially of the respiratory centre.
- ▶ **Cholinesterase**: rich in cobra/krait venom; impairs nerve-to-muscle transmission.
- ▶ **Haemolysins**: mainly in viper venom; damage vessel lining and lung tissue, causing pulmonary congestion.
- ▶ **Hyaluronidase**: the "spreading factor," present in **every** snake venom.
- ▶ **L-amino acid oxidase**: present in viper/pit-viper venom, **absent** in sea-snake venom.
- ▶ Phospholipase A, thromboplastin, and cardiotoxins add membrane damage, coagulopathy, and cardiac effects.

Types of venom and mechanism of action

- ▶ **Neurotoxic** (cobra, krait): attacks the respiratory and cardiac centres with curare-like flaccid paralysis; the krait's toxin, **beta-bungarotoxin**, makes its venom about 10 times as toxic as cobra venom, with the highest case-fatality. Death is from **respiratory failure**.

- ▶ **Vasculotoxic/haemotoxic** (Russell's viper, saw-scaled viper): causes intravascular haemolysis and depressed clotting — Russell's viper venom activates the clotting cascade, causing consumption coagulopathy. Death is from **circulatory failure/haemorrhagic shock**, mostly via **acute renal failure** (ARF).
- ▶ **Myotoxic** (sea snakes): generalised rhabdomyolysis leading to myoglobinuria, hyperkalaemia, and ARF.
- ▶ One mode of action always dominates over the other in a given species.

Clinical features of envenomation

- ▶ *Fright* is the commonest symptom in every bite — fear of sudden death causes palpitation, cold clammy skin, hypotension, and a feeble pulse; psychological shock alone can kill.
- ▶ **Cobra bite**: local wheal with minimal swelling; systemic signs begin after about 30 minutes — drowsiness and leg weakness, then the classic "six Ds": **ptosis** (earliest sign), diplopia, dysarthria, dysphonia, dyspnoea, and finally dysphagia.
- ▶ **Krait bite**: like cobra but **no swelling or pain** at the site; the victim is often bitten asleep and may die within 4–6 hours.
- ▶ **Russell's/saw-scaled viper bite**: severe pain within 8 minutes, swelling within 15 minutes, and **persistent bleeding from the bite site is a constant feature**.
 - Blisters by 12 hours, possible necrosis or compartment syndrome, and systemic bleeding (nosebleed, gum bleeding, haematuria, bruising, intracranial haemorrhage), with eventual ARF.
- ▶ **Sea-snake bite**: little local reaction; after 30–60 minutes, muscle pain, trismus (lockjaw), and flaccid paralysis from ptosis, plus **myoglobinuria with renal failure**.

Colubrine vs viperine bite — quick differentiation

Feature	Colubrine (elapid) bite	Viperine bite
Venom type	Neurotoxic	Haemotoxic/vasculotoxic
Onset	After 30 min or more	Immediate to 15 min
Local swelling	Minimal or absent	Marked, spreads to trunk
Paralysis	Limbs, then trunk, then head	Absent
Pupils	Normal	Dilated, non-reactive
Bleeding/clotting time	Normal	Prolonged
Cause of death	Respiratory failure	Circulatory failure

Fatal dose, fatal period, and absorption

- ▶ **Fatal dose (dried venom)**: cobra 12 mg; Russell's viper 15 mg; saw-scaled viper 8 mg; krait 6 mg — a single bite delivers many times this amount.
- ▶ **Fatal period**: cobra ½–6 hours; viper 1–2 days.

- ▶ Venom is harmless if swallowed (digested to amino acids in the gut), and is excreted by the kidneys, milk, and probably salivary glands.

Management of snakebite

- ▶ **First aid** — "do it R.I.G.H.T.": Reassurance; Immobilise with a splint; Get to hospital fast (movement speeds venom spread); Tell the doctor what bit the patient.
- ▶ Do **NOT** incise, suck, cauterise, use a tourniquet, or give alcohol.
- ▶ **Hospital care:** support airway, breathing, and circulation; early intubation for neuromuscular paralysis or facial/neck bites.
- ▶ **20-minute whole blood clotting test (20WBCT):** blood failing to clot in a glass tube after 20 minutes indicates a **viper bite with coagulopathy** (normal clots in about 8 minutes); repeat 6-hourly to guide ASV dosing.
- ▶ **Anti-snake venom (ASV)** is **polyvalent**, raised by hyperimmunising horses against the Big Four; each mL neutralises about 0.6 mg cobra, 0.45 mg krait, 0.6 mg Russell's viper, and 0.45 mg saw-scaled viper venom.
- ▶ It neutralises only **circulating, unbound venom** and cannot reverse established necrosis, coagulopathy, or ARF, so give it **early** and strictly **intravenously** — same dose for adults and children (~10 vials over an hour, repeated if needed; ~20 usually suffice), with **no test dose**.
- ▶ For anaphylaxis: stop the infusion, give **adrenaline 0.5 mg (1:1000) IM**, antihistamine, and hydrocortisone; serum sickness at 1–2 weeks needs steroids.
- ▶ **Adjuncts:** neostigmine with atropine for neuromuscular paralysis, tetanus toxoid, paracetamol for pain (avoid NSAIDs/opioids), and haemodialysis or fasciotomy for ARF/compartment syndrome.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Venom apparatus in a snake's head** — label the venom gland, venom duct, erectile fang on the maxilla, fang canal/groove, and two fang-puncture marks on skin (8 mm–4 cm apart).
- ▶ **Venomous vs non-venomous features** — label the pit between eye and nostril (pit viper), hood/shield scales (cobra), and two fang marks vs a row of small tooth marks.

Medico-legal significance

- ▶ **Manner of death is usually accidental;** snakebite is **rarely homicidal** (a venomous snake thrown onto a sleeping victim, or arranged through a snake charmer) and **very rarely suicidal** (classically Queen Cleopatra).
- ▶ A medico-legal autopsy is **mandatory**; never handle a snake presumed dead, since a reflex bite is possible up to about 1 hour after its own death.
- ▶ Snake venom is a listed **arrow/cattle poison** — a venom-killed animal is poisonous only if its blood is re-injected, not if its meat is eaten.
- ▶ **Autopsy findings:** amber fluid dries to yellow crystals, with two (occasionally one) fang marks.
 - Colubrine bites show vessel staining and a congested brain.

- Viperine bites show discolouration, cellulitis, and haemorrhage into mucosa/viscera, with renal tubular necrosis.
- Sea-snake bites show rhabdomyolysis with acute tubular necrosis.
- ▶ **Venom detection:** ELISA detects venom antigen in body fluids; RIA is the most sensitive test; preserve bitten skin/fang tissue in saline, as venom may persist in urine after antivenom.
- ▶ **Relevant law (codes effective 1 July 2024, dual-cited):**
 - Inquest under **Section 174 CrPC 1973 (now Section 194 BNSS 2023)**.
 - The autopsy surgeon testifies as an expert under **Section 45 IEA 1872 (now Section 39 BSA 2023)**.
 - Homicidal bite is prosecuted as murder/culpable homicide under **Sections 300/302 IPC (now 101/103 BNS 2023) and 299/304 IPC (now 100/105 BNS 2023)**.
 - Negligent handling of a venomous animal falls under **Section 289 IPC (now Section 291 BNS 2023)**.



Spurious liquors

Asked in: Paper III Oct 2017 — RGUHS MD Forensic Medicine

Definition

- ▶ **Spurious liquor** (illicit liquor, *hooch*) is alcohol made, distilled or bottled outside the licensed excise system.
- ▶ It is not quality-controlled, and its exact composition is unknown.
- ▶ It is usually run off illegal "country" stills using cheap fermentable material.
- ▶ Two features make it dangerous.
- ▶ **Very high, uncontrolled ethanol content** — up to about 55%.
- ▶ **Adulteration with toxic substances** — chiefly methyl alcohol (methanol), sometimes methylated spirit or lead.
- ▶ A "**hooch tragedy**" is an incident where two or more people from the same locality fall ill or die simultaneously after drinking illicit liquor.
- ▶ Almost all the danger of spurious liquor comes from its **methanol** content — this is what causes the characteristic blindness, severe acidosis and mass deaths.

The alcohols involved

- ▶ **Ethyl alcohol (ethanol)** is the intended intoxicant.
 - Licit strengths: beer ~3–8%, wine ~7–24%, spirits ~40–95%.
 - Illicit hooch can reach an uncontrolled ~55%, itself enough to cause fatal ethanol poisoning.
- ▶ **Methyl alcohol (methanol)** is the dangerous adulterant.
 - Also called wood alcohol or wood naphtha.
 - A colourless, volatile, flammable liquid, faintly sweetish odour, bitter taste.
 - Used industrially in antifreeze, embalming fluid and paint remover.

- It is cheap and tastes and looks like ethanol, so it slips in undetected.
- ▶ **Denatured (methylated) spirit** is ethanol deliberately made undrinkable.
 - Composition: about 90% ethanol + 10% methanol.
 - *Surgical spirit* is similar — 90–95% ethanol + 5–10% methanol, with traces of castor oil and methyl salicylate.
 - Labourers sometimes drink these industrial fuels when liquor is unavailable; bootleggers also dilute hooch with them.
- ▶ **Other reference strengths** worth remembering:
 - *Proof spirit* = 57.06% ethanol by volume.
 - *Rectified spirit* = 95% ethanol.

Why methanol kills — the mechanism

- ▶ Methanol is well absorbed by mouth, by inhalation and parenterally; peak blood level is reached in 30–60 minutes.
- ▶ Methanol itself is only mildly toxic — the danger lies in its breakdown products.
- ▶ **Alcohol dehydrogenase** converts methanol to **formaldehyde**.
- ▶ **Aldehyde dehydrogenase** then converts formaldehyde to **formic acid (formate)**.
- ▶ Formaldehyde is very toxic but short-lived; the steadily accumulating **formic acid** is the real culprit.
- ▶ Formate **inhibits cytochrome-c oxidase** in mitochondria, producing cellular hypoxia.
- ▶ Formate accumulates especially in the **optic nerve and retina**, which explains the blindness.
- ▶ Formic acid, with lactate, produces a **high anion-gap metabolic acidosis**.
- ▶ Methanol is metabolised slowly, so onset is **delayed** and the illness is **prolonged**.
- ▶ Metabolic acidosis typically appears after **18–24 hours**.

Clinical features

- ▶ A **latent period of about 12–24 hours** is typical — deceptively symptom-free at first.
- ▶ **General** — drunkenness is less obvious than with ethanol, but CNS effects are ultimately more severe and prolonged.
- ▶ **Gastrointestinal** — nausea, vomiting, severe abdominal pain; pancreatitis may occur.
- ▶ Visual disturbance plus abdominal pain after a drinking bout should immediately suggest methanol poisoning.
- ▶ **Ocular (the hallmark)** — blurred vision, photophobia, the classic "**snow-field**" (misty) vision.
 - Scotomata (blind spots) and dilated, fixed pupils appear in late stages.
 - Optic neuritis can progress to **optic atrophy** and permanent blindness.
 - As little as **~15 mL (range 10–20 mL)** of methanol can cause blindness.
- ▶ **CNS** — headache, neck stiffness, vertigo, confusion, convulsions, coma.
 - Survivors may be left with a movement disorder from **putaminal/basal-ganglia necrosis**.
- ▶ **Metabolic/systemic** — high anion-gap acidosis, tachycardia, hypertension, renal and multi-organ failure.

- ▶ **Cause of death** — metabolic acidosis and respiratory failure.

Fatal dose and fatal period

Parameter	Methanol
Fatal dose	60–200 mL (some sources give as wide a range as 15–250 mL)
Fatal blood level	About 200 mg%
Dose causing blindness	About 15 mL (range 10–20 mL)
Onset / latent period	Acidosis characteristically delayed 18–24 h

Diagnosis

- ▶ **Blood methanol level** and detectable **formic acid** in blood.
- ▶ **High anion-gap metabolic acidosis** and a **raised osmolal gap** on arterial blood gas/biochemistry.
- ▶ Supportive clues — hypophosphataemia, raised creatine phosphokinase (CPK) and amylase.
- ▶ **Fundoscopy** — optic-disc oedema and hyperaemia; optical coherence tomography shows retinal changes.
- ▶ **CT/MRI brain** — bilateral putaminal/basal-ganglia necrosis.

Management

- ▶ **Resuscitate first** — airway, breathing, circulation; in a mass tragedy, triage and stabilise the largest number of victims.
- ▶ **Gastric decontamination** — lavage with 5% sodium bicarbonate if within about 2 hours; activated charcoal reduces further absorption.
- ▶ **Ethanol is the classic antidote.**
 - It has a higher affinity for alcohol dehydrogenase than methanol, so it blocks conversion of methanol to its toxic metabolites.
 - Target a blood ethanol level of about 100–125 mg%, monitored 1–2 hourly.
 - Give it intravenously (preferred) or orally if intensive-care monitoring is unavailable.
- ▶ **Fomepizole (4-methylpyrazole)** is the preferred antidote where available.
 - A competitive alcohol-dehydrogenase inhibitor, with no inebriation and fewer side effects.
 - Costly and not widely available in India.
- ▶ **Correct acidosis** with IV sodium bicarbonate.
- ▶ **Folinic acid (leucovorin)** speeds conversion of formic acid to carbon dioxide and water.
- ▶ **Haemodialysis** is the most effective way to remove methanol and its metabolites.
 - Indicated for severe acidosis ($\text{pH} < 7.25$), visual symptoms, renal failure, or blood methanol ≥ 20 mg%.
- ▶ **Supportive care** — oxygen, a darkened room to protect the eyes, thiamine, treat seizures.

Autopsy findings

- ▶ Cyanosis is prominent; lungs congested, oedematous and emphysematous.

- ▶ Brain is congested and oedematous, with putaminal necrosis and sometimes subarachnoid haemorrhage.
- ▶ Liver shows fatty change; kidneys show acute tubular degeneration.
- ▶ Preserve viscera (stomach with contents, liver, kidney, blood) in **saturated common-salt solution** and send to the Forensic Science Laboratory (FSL).
- ▶ Avoid anticoagulants such as EDTA and heparin — they can give a false-positive methanol test.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Metabolism of methanol (flowchart).**
 - Methanol → (alcohol dehydrogenase) → Formaldehyde → (aldehyde dehydrogenase) → Formic acid.
 - Side-labels: "competitive block by ethanol/fomepizole at alcohol dehydrogenase", "formate inhibits cytochrome-c oxidase", "high anion-gap metabolic acidosis", "optic nerve & retina → optic neuritis → blindness", "folinic acid → formate → $\text{CO}_2 + \text{H}_2\text{O}$ ".
- ▶ **Optic fundus in methanol toxicity.**
 - Labels: optic disc hyperaemia, retrobulbar oedema, "snow-field (misty) vision", dilated fixed pupils, late optic atrophy → permanent blindness.

Medico-legal significance

- ▶ The manner is usually **accidental** — mass consumption of methanol-adulterated hooch, or drinking methylated/surgical spirit as a cheap substitute.
- ▶ A sudden cluster of patients from one locality with vomiting, abdominal pain, visual loss and acidosis is a hooch tragedy until proved otherwise.
- ▶ The doctor's first duty is **life-saving treatment** of the many victims presenting together.
- ▶ Every victim needs a **medico-legal case (MLC)** report, and police must be informed.
- ▶ Fatal cases require a proper autopsy, with viscera sent to the FSL to confirm methanol as the cause of death.
- ▶ Collect femoral blood, away from the stomach, to avoid falsely high postmortem-diffusion levels.
- ▶ Hooch tragedies rise on "**dry days**" (Republic Day, Independence Day, Gandhi Jayanti, elections, festivals) and in **dry (prohibition) states** such as Bihar, Gujarat and several north-eastern states.
- ▶ They are also frequently reported from states such as Uttar Pradesh, Punjab, Haryana, Madhya Pradesh and Odisha, regardless of prohibition status.
- ▶ **Death of a patient under a doctor's care who had consumed alcohol** is a rash and negligent act, punishable under **Section 304A IPC 1860 (now Section 106 BNS 2023)**.
- ▶ Manufacturing or selling spurious liquor that causes death also attracts homicide provisions once the lethal adulteration was known:
 - **Culpable homicide/murder:** Section 299/300 IPC 1860 (now Section 100/101 BNS 2023).
 - **Punishment:** Section 304/302 IPC 1860 (now Section 105/103 BNS 2023).
- ▶ Adulterating food or drink to make it noxious falls under **Section 272/273 IPC 1860 (now Section 274/275 BNS 2023)**.



Treatment of Acute Ethyl Alcohol Poisoning and Medico-Legal Aspects of Alcoholism

Asked in: Paper III Oct 2021 — RGUHS MD Forensic Medicine

Definition / Introduction

- ▶ Ethyl alcohol (ethanol) is an **inebriant** — a cerebral poison that first excites, then depresses the central nervous system.
- ▶ **Acute poisoning** follows a large dose of ethanol over a short time, causing progressive brain depression, coma, and occasionally death from respiratory failure.
- ▶ **Alcoholism** (chronic alcohol poisoning) is physical and psychological dependence, with tolerance and a withdrawal syndrome on stopping.
- ▶ Both carry major medico-legal significance — drunken driving, certifying drunkenness, examining the accused, hooch tragedies, deaths under medical care, testamentary capacity, and abetment of intoxicated persons.

Toxicokinetics and fatal data (basis of treatment)

- ▶ **Absorption:** 20% from the stomach, up to 80% from the small intestine; 60% absorbs within 30 minutes, 90% within 1 hour.
 - BAC peaks at 45–90 minutes; a 20–30% drink strength gives the fastest absorption and strongest intoxication.
 - Above 40% strength, **pylorospasm** (pyloric spasm) and food both delay absorption.
- ▶ **Distribution:** alcohol spreads through total body water, sparing bone and fat.
 - Women have a lower water-to-fat ratio, giving a higher **blood alcohol concentration (BAC)** for the same dose.
 - The Widmark factor ("R") is **0.68 in males, 0.55 in females**.
- ▶ **Metabolism:** about 90% is oxidised in the liver — alcohol dehydrogenase to acetaldehyde, then aldehyde dehydrogenase to acetate/acetyl-CoA.
 - A minor inducible pathway, the **microsomal ethanol-oxidising system (MEOS/CYP2E1)**, handles the rest at high BAC; 5% is excreted unchanged in urine and 5% in breath.
- ▶ **Elimination is zero-order** — a fixed amount clears per hour, about **18 mg%/hour (12–27)**.
 - Chronic alcoholics clear faster, over 40 mg%/hour; BAC falls about 15% per hour.
- ▶ **Fatal dose:** 5–8 g/kg (6–10 mL/kg absolute alcohol) in adults; 3 g/kg (4 mL/kg) in children.
- ▶ **Fatal BAC and period:** above **500 mg%** is generally fatal; fatal period is **12–24 hours**.
 - Death is from respiratory centre depression or aspiration of vomitus ("café coronary").

Clinical stages of acute intoxication (correlated with BAC)

Stage	BAC (mg%)	Key features
Sobriety	up to 50	Mostly unaffected; mild euphoria possible

Stage	BAC (mg%)	Key features
Euphoria	50–100	Disinhibition, talkativeness, flushed face, red eyes, dilated pupils
Excitement	100–150	Incoordination, slurred speech; gaze nystagmus above 80 mg%
Confusion	150–300	Disorientation, ataxia (unsteady gait), blurred vision, vomiting
Stupor/coma	300–500	Decreased pain response, hypothermia, incontinence; <i>McEwan's sign</i>
Death	>500	Respiratory failure; cold, clammy, cyanotic skin

- ▶ *McEwan's sign*: constricted pupils dilate on a painful stimulus, then slowly re-constrict — suggests alcoholic coma.
- ▶ *Mellanby effect*: impairment at a given BAC is greater while it is rising than while it is falling.
- ▶ **Investigations**: bedside breath analyser, blood BAC, and urine alcohol; CT head excludes head injury, the most important differential for alcoholic coma.

Treatment of acute ethyl alcohol poisoning

Treatment is largely supportive — death is rare with pure ethanol, and most patients recover after prolonged sleep with a hangover.

- ▶ **Airway, breathing, circulation (ABC)**: protect the airway, position to prevent aspiration, and support ventilation if depressed — the single most important step, since death is usually respiratory depression or aspiration.
- ▶ **Gastric lavage with sodium bicarbonate**: useful only if the patient presents early; skip it if late or unconscious (aspiration risk).
- ▶ **Correct hypoglycaemia** (alcohol blocks gluconeogenesis, new glucose production) with 250 mL of 10% glucose plus intravenous fluids.
 - Add 50 mL of 50% dextrose, titrated to blood glucose, if hypoglycaemia persists.
- ▶ **Thiamine (vitamin B1) 100 mg intravenously** (50–100 mg in chronic addicts), given before or with glucose to prevent Wernicke's encephalopathy.
- ▶ **Correct hypotension** with intravenous crystalloids; control vomiting and craving with ondansetron and naltrexone.
- ▶ **Failure to wake after dextrose** points to cerebral oedema, head injury, or poisoning by another drug.
- ▶ **Haemodialysis**: reserved for very high BAC or severe acidosis; clears alcohol 3–4 times faster than the above measures and can be life-saving.
- ▶ **General intensive care**: correct hypothermia, monitor electrolytes and acid-base, watch for aspiration pneumonia.

Treatment of chronic alcoholism, withdrawal and dependence

- ▶ Withdrawal begins 6–8 hours after the last drink: tremor, agitation, insomnia, nausea.
 - It may progress to **alcoholic hallucinosis** (24–48 h), then **withdrawal seizures** ("rum fits", 7–48 h), then **delirium tremens**.
- ▶ **Delirium tremens**: acute confusion with tremor, vivid hallucinations, autonomic overactivity, and risk of suicide or homicide — a medical emergency with 5–15% mortality.
 - Treat with **benzodiazepines** (diazepam, chlordiazepoxide) as drug of choice, plus parenteral thiamine, B-complex, and fluid/electrolyte correction; carbamazepine and clonidine are alternatives.
- ▶ **De-addiction — aversion therapy**: an emetic (e.g. apomorphine) is paired with alcohol to build a conditioned dislike.
- ▶ **Deterrent agents**: disulfiram blocks aldehyde dehydrogenase, causing an unpleasant reaction that discourages drinking; metronidazole, some cephalosporins, and chlorpropamide act similarly.
- ▶ **Anti-craving agents**: naltrexone, acamprosate, fluoxetine.
- ▶ **Psychotherapy** and self-help groups such as Alcoholics Anonymous.
- ▶ **Laboratory markers**: raised gamma-glutamyl transpeptidase (GGT) and raised mean corpuscular volume (MCV) in most dependent drinkers; the AST:ALT ratio is also used.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Graph — blood-alcohol curve and clinical stages**: x-axis time after ingestion (peak 45–90 min), y-axis BAC (mg%), with bands for each clinical stage from sobriety to death.
 - Mark the falling limb "elimination $\approx 18 \text{ mg\%/h}$ (zero-order)" and the rising limb "Mellanby effect — greater impairment while rising."
- ▶ **Flow diagram — ethanol metabolism**: Ethanol $\rightarrow$ (alcohol dehydrogenase) $\rightarrow$ Acetaldehyde $\rightarrow$ (aldehyde dehydrogenase) $\rightarrow$ Acetate/Acetyl-CoA $\rightarrow$ $\text{CO}_2 + \text{H}_2\text{O}$.
 - Side branch: MEOS/CYP2E1 (inducible, $\geq 10\%$ at high BAC); annotate "disulfiram blocks aldehyde dehydrogenase."

Medico-legal significance

- ▶ **Certifying drunkenness**: done at the request of police or an employer.
 - Examine gait, speech, finger-nose test, straight-line walk, gaze nystagmus, pupils, and smell; add BAC if needed.
 - Record one of four opinions — not consumed; consumed but not under influence; consumed and under influence; consumed and intoxicated.
 - Natural disease, head injury, and other poisons can mimic drunkenness, so keep the opinion guarded.
- ▶ **Consent**: collect blood, urine, or breath only with written consent, unless the person is incapable or a police sub-inspector requests it.

- ▶ **Examining the accused:** allowed under **Section 53 CrPC 1973 (now Section 51 BNSS 2023)**, using reasonable force.
 - The rape-accused provision is **Section 53A CrPC (now Section 52 BNSS 2023)**; a rape victim's exam is **Section 164A CrPC (now Section 184 BNSS 2023)**.
- ▶ **Drunken driving:** **Section 185, Motor Vehicles Act 1988 (amended 2019)** penalises driving with BAC over **30 mg/100 mL**, or under a drug that impairs control.
 - Punishment: 6 months or ₹10,000 for a first offence; 2 years or ₹15,000 for a repeat offence within three years.
- ▶ **Other criminal liability:**
 - Public misconduct while drunk — **Section 510 IPC (now Section 355 BNS 2023)**.
 - Rash driving — **Section 279 IPC (now Section 281 BNS 2023)**.
 - Endangering life/safety — **Section 336/337/338 IPC (now Section 125 BNS 2023)**.
 - Abetting an intoxicated person's suicide — **Section 305 IPC (now Section 107 BNS 2023)**.
- ▶ **Death under medical care:** a doctor's alcohol-linked negligence causing a patient's death is **Section 304A IPC 1860 (now Section 106 BNS 2023)** — 5 years for the general public, 2 years for a doctor causing death during a procedure, and "infamous conduct" under National Medical Commission ethics.
- ▶ **Evidence:** a dying declaration by an intoxicated victim is admissible under **Section 32 IEA (now Section 26 BSA 2023)**; expert opinion on intoxication is under **Section 45 IEA (now Section 39 BSA 2023)**.
- ▶ **Civil aspects:** partial drunkenness does not invalidate a contract or will, but a will made during a drink-induced loss of reasoning is invalid (**Section 12, Indian Contract Act 1872**).
- ▶ **Autopsy:** suffused red conjunctivae, signs of asphyxia, a fruity alcoholic odour, and congested gastric mucosa.
- ▶ **Sample collection:** femoral venous blood, not blood near the stomach (post-mortem diffusion falsely raises it), plus bladder urine and vitreous humour, which resist putrefaction and lack glucose.
 - Preserve with sodium fluoride/oxalate, an oil layer, and freezing; analyse within 48 hours — putrefaction itself can generate alcohol up to ~0.2%.
- ▶ **Hooch tragedy:** two or more people in a locality fall ill or die from illicit liquor adulterated with methanol.
 - The doctor treats the casualties, writes medico-legal case reports, and handles autopsy and viscera preservation for the Forensic Science Laboratory.

♦ ♦ ♦

War Gases

Asked in: Paper III Jun 2024 · Paper III Apr 2020 (2×) — RGUHS MD Forensic Medicine

Definition

- ▶ War gases are toxic chemical agents — gases, or solids/liquids that quickly turn into gas or smoke — deployed in warfare to injure or kill the enemy.
- ▶ They act by chemical toxicity, not physical force, once released into air, water, or soil.
- ▶ Riot-control agents are a deliberately less toxic version used by police against civilians to disperse a mob, not to kill.
- ▶ Both groups count as **weapons of mass destruction (WMD)**; their development, production, stockpiling, and use are now banned by international treaty.

Classification

- ▶ War gases are classified two ways — by environmental persistence, or by physiological (medical) action.
- ▶ The medical classification is the high-yield one for exams — memory aid **VALSHoN**.
- ▶ **Non-persistent** agents (gas/vapor clears quickly): good riot-control agents, poor war gases.
- ▶ **Persistent** agents (stay liquid/solid, convert to gas slowly, e.g. mustard gas, lewisite): good war gases, poor riot-control agents, since they harm the releasing side's own citizens for too long.

Class (VALSHoN)	Action	Key agents
V — Vesicants	Blistering; skin/mucosal burns	Sulfur mustard, lewisite, phosgene oxime
A — Asphyxiants	Damages alveoli; pulmonary oedema	Phosgene (most toxic), chlorine (least toxic)
L — Lachrymators	Corneal irritation; tearing	CN, CS, CR, OC (pepper spray)
S — Sternutators	Nasal irritation; sneezing, vomiting	Adamsite (DM), DA, DC
H — Haemolytics	Blocks cellular respiration	Hydrogen cyanide, arsine
N — Nerve gases	Anticholinesterase; paralysis	Sarin, VX, Novichok

Vesicants (blistering agents)

- ▶ **Sulfur mustard** ("king of the battle gases," yellow cross) is an oily liquid that persists 2–4 days after release, and is also mutagenic and carcinogenic.
- ▶ Victims often feel no immediate symptoms, so they may absorb a large dose before they notice anything (delayed action).
- ▶ **Mechanism:** it forms sulfonium ions in the body that bind DNA guanine, damaging bone marrow, hair follicles, and the gut.
- ▶ **Skin:** within about 24 hours — itching, redness, large yellow-fluid blisters, worst on moist skin (armpits, groin, scrotum).
- ▶ **Eyes:** conjunctivitis, lid swelling, temporary blindness, corneal damage.
- ▶ **Lungs:** mucosal damage, bleeding, blistering, and pulmonary oedema.
- ▶ **Lewisite** ("dew of death") is an organic arsenical that acts as both vesicant and asphyxiant, and works faster than mustard gas.

- ▶ It is often mixed with mustard gas because it lowers mustard's freezing point, keeping it effective in cold weather.
- ▶ Its specific antidote is **BAL (British Anti-Lewisite / dimercaprol)**.

Asphyxiants (choking agents)

- ▶ **Phosgene is the most toxic** choking agent (10× chlorine); **chlorine is the least toxic** and easily detected, so it makes a poor war gas.
- ▶ Phosgene is heavier than air and acts slowly; it caused about **85% of chemical-warfare deaths in World War I**.
- ▶ **Mechanism:** in the alveoli it reacts with water to form hydrochloric acid, damaging the blood-air barrier and causing capillary leak, leading to acute pulmonary oedema and low blood oxygen.
- ▶ **Clinical hallmark:** a symptomless latent period before the pulmonary oedema appears, so mild and severe exposures look alike at first.
- ▶ Symptoms: headache, vomiting, cough, cyanosis, breathlessness, and collapse.
- ▶ Death occurs in **24–48 hours** from acute pulmonary oedema or circulatory collapse.

Lachrymators and sternutators

- ▶ **Lachrymators (tear gases)** stimulate corneal nerves, causing tearing, eye pain, transient blindness, cough, and a runny nose.
- ▶ **Riot-control agents:**
 - CN ("Mace").
 - CS — the most popular tear gas; strong effect, low toxicity; first made in 1928 by Corson and Stoughton; washed off with 5% sodium bisulfite.
 - CR — most potent, 6–8× stronger than CS.
 - OC (pepper spray) — active ingredient capsaicin.
- ▶ **Sternutators** cause intense nose-throat pain, sneezing, vomiting, and prostration; short-acting and useless once a mask is on.
- ▶ Inhaling them just before masking makes the mask intolerable, tricking the soldier into removing it and facing deadlier gases.
- ▶ Key agents: **Adamsite (DM)**, DA, DC.

Nerve gases (paralysants)

- ▶ Nerve gases are organophosphorus compounds, classed as weapons of mass destruction by the **United Nations (1991)**.
- ▶ They block **acetylcholinesterase**, so acetylcholine builds up at synapses, causing continuous muscle/gland stimulation — twitching, convulsions, paralysis, and death from respiratory failure (same clinical picture as organophosphorus poisoning).
- ▶ **G-series** (non-persistent): tabun (GA, first made 1936), sarin (GB), soman (GD), ethyl-sarin (GE), cyclosarin (GF) — discovered by **Gerhard Schrader**.
- ▶ **V-series** (persistent, oily, a skin-contact hazard): **VX** is the best known.

- ▶ **Novichok** (4th-generation, Soviet): more toxic than all other nerve agents, designed to evade NATO detection and protective gear.
- ▶ Entry is via the respiratory tract and skin; protection needs a full-body suit plus respirator.

Treatment of chemical-weapon injuries

- ▶ **Nerve agents:** atropine (blocks acetylcholine) plus pralidoxime/PAM (reactivates acetylcholinesterase), with airway support and oxygen.
- ▶ **Vesicants:** immediate decontamination — remove clothing, wipe off the agent, neutralise with bleaching-powder jelly or 0.5% hypochlorite, and irrigate the eyes.
- ▶ **BAL/dimercaprol** is specific for lewisite; there is no specific antidote for mustard, so give supportive care (airway, breathing, circulation), calamine, and watch for marrow depression.
- ▶ **Choking agents:** oxygen and respiratory support, treat pulmonary oedema (steroids, bronchodilators, antibiotics), and wash the eyes with boric acid.
- ▶ **Lachrymators/sternutators:** move to fresh air, irrigate the eyes and nose (sodium carbonate or bicarbonate); wash CS exposure with 5% sodium bisulfite.
- ▶ Rescuers must wear a respirator and protective clothing throughout.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Classification chart (VALSHoN):** "WAR GASES" branching to six boxes — Vesicants, Asphyxiants, Lachrymators, Sternutators, Haemolytics, Nerve gases — each with its key agents and target organ.
- ▶ **Phosgene lung-injury sequence:** inhaled phosgene → reacts with alveolar water to form HCl → damages the blood-air barrier → capillary leak → acute pulmonary oedema → hypoxaemia/death (24–48 h); mark the latent period.

Medico-legal significance

- ▶ Identifying and analysing the agent helps attribute responsibility for an attack, gauge its scale, and explain the mechanism of injury.
- ▶ **Autopsy findings by group:**
 - Nerve agents — congested lungs with petechial haemorrhages, brain oedema, pulmonary oedema.
 - Blister agents — mucosal erosions of the respiratory and GI tract, laryngeal oedema, pulmonary haemorrhages.
 - Choking agents — diffuse pulmonary oedema with frothy fluid in the airway, patchy lung haemorrhages.
 - Incapacitating agents — minimal gross findings; toxicology testing is needed to confirm.
- ▶ Toxicology samples must be collected; deaths may be war-related, terrorist (e.g. the 1995 Tokyo sarin attack — 13 dead, 1000+ injured), or from excessive riot-control use.
- ▶ The use of chemical weapons is banned by the **Geneva Protocol of 1925** and the **Chemical Weapons Convention (1993)**, which entered into force on 29 April 1997 and requires destruction of existing stockpiles.

- ▶ In India, such a death needs an **inquest under Section 174 CrPC 1973 (now Section 194 BNSS 2023)**.
- ▶ If culpable, homicide provisions apply — **Section 300/302 IPC (now Sections 101/103 BNS 2023)** — with the doctor's opinion admissible under **Section 45 IEA 1872 (now Section 39 BSA 2023)**.

High-yield exam pointers

- ▶ Memory aid = **VALSHoN**; nicknames — sulfur mustard "king of the battle gases," lewisite "dew of death."
- ▶ Phosgene's hallmark is the symptomless latent period before pulmonary oedema; nerve-agent antidotes are atropine + PAM.
- ▶ Bhopal (1984) was methyl isocyanate, **not** a war gas, and is not treated with cyanide antidotes (a common distractor).



What are Magic mushrooms? Discuss the medico-legal importance

Asked in: Paper III Oct 2022 — RGUHS MD Forensic Medicine

Definition

- ▶ **Magic mushrooms** are wild or cultivated fungi containing the natural hallucinogen **psilocybin** and its active product **psilocin**.
- ▶ Both are *indole tryptamines*, chemically related to serotonin.
- ▶ They are taken recreationally for a "trip" — altered perception, mood, and thought.
- ▶ They belong to the **psychedelics (hallucinogens)** group, along with LSD, mescaline, and DMT.
- ▶ Psilocybin is a **scheduled psychotropic substance under the NDPS Act, 1985**.
- ▶ A "bad trip" can trigger bizarre behaviour leading to accidental, suicidal, or homicidal death.
- ▶ They must be distinguished from the lethal **non-hallucinogenic poisonous mushrooms** (e.g. *Amanita phalloides*, the death cap).

Botany and active principles

- ▶ **Identity:** the best-known genus is *Psilocybe* ("liberty cap").
- ▶ A mushroom is the **fleshy, spore-bearing fruiting body of a fungus**, arising from an underground mycelium (mass of thread-like hyphae).
- ▶ Less than 5% of mushroom species are poisonous, mainly from two groups — *Basidiomycetes* and *Ascomycetes*.
- ▶ **Psilocybin** is itself inactive; the body dephosphorylates it to **psilocin**, the active hallucinogen.
- ▶ Both act as **serotonin (5-HT) receptor agonists**, mainly at the 5-HT_{2A} receptor — the same receptor through which LSD and mescaline act.
- ▶ **Relative potency:**
 - LSD is the strongest, psilocybin next, mescaline the weakest.

- 1.5 µg/kg LSD ≈ 225 µg/kg psilocybin ≈ 5000 µg/kg mescaline.
- Onset of effect is slowest with mescaline.
- ▶ Usually eaten fresh, dried, or brewed as a "tea", often at rave/nightlife settings.
- ▶ Cross-tolerance develops between LSD, psilocybin, and mescaline, so doses must escalate for the same effect.
- ▶ **Fly agaric* (*Amanita muscaria*, the "*Alice in Wonderland*" mushroom):*
 - A separate hallucinogenic mushroom — bright red/orange cap with white spots.
 - Toxins are **muscimol and ibotenic acid** (ibotenic acid converts to muscimol on ingestion), plus **muscarine**.
 - Effects: nausea, vomiting, confusion, euphoria, visual distortion, and loss of coordination, beginning 30 minutes to 2 hours after ingestion.

Classification of mushrooms

Hallucinogenic ("magic") mushrooms must be told apart from lethal poisonous mushrooms, since the medico-legal handling differs.

Group	Mushroom	Toxin	Effect
Hallucinogenic ("magic")	<i>Psilocybe</i> spp.	Psilocybin → psilocin	Psychedelic "trip"; rarely fatal
Hallucinogenic (deliriant)	<i>Amanita muscaria</i>	Muscimol, ibotenic acid, muscarine	Intoxication, hallucination
Hepatotoxic / lethal	<i>Amanita phalloides</i>	Amatoxins, phallotoxins	Delayed liver/kidney failure

- ▶ The death cap *Amanita phalloides* is the **most lethal mushroom worldwide**, causing about **90% of fatal mushroom poisonings**.
- ▶ Its **amatoxins are thermostable** — cooking does not destroy them.
- ▶ A **single mushroom (~50 g) can be fatal**, causing massive hepatic necrosis after a deceptively symptom-free interval.
- ▶ Magic mushrooms, in contrast, rarely kill through direct toxicity — the danger is behavioural.
- ▶ Rough field pointers for poisonous mushrooms: cut surface turns green/blue/purple/brown, taste is bitter or burning, odour is unpleasant, they stay worm-free, and the cap bears scales.

Clinical features of intoxication

- ▶ **Onset:** fairly rapid, producing illusions and true visual/auditory **hallucinations**.
- ▶ **Perception:** intensified perception and **synaesthesia** (blending of senses, e.g. "hearing" colours).
- ▶ **Sense of self:** distorted sense of time and distance, depersonalisation (feeling detached from one's own body), and derealisation (the outside world seeming unreal).
- ▶ **Autonomic signs:** dilated pupils (mydriasis) with photophobia, tachycardia, hypertension, and tachypnoea.
- ▶ **Other somatic signs:** hyperpyrexia, tremor, nausea, salivation, sweating, and incoordination.
- ▶ **"Bad trip"** — panic attacks or extreme anxiety:

- The person may become violent or panic-stricken.
- May attack others or harm himself from disregard of reality.
- May believe he can fly and jump from a height.
- ▶ **Flashback:** spontaneous re-experiencing of the drug effect in a drug-free state, weeks to months after last use.
 - Can be precipitated by alcohol, marijuana, fatigue, illness, or stress.
- ▶ **Cause of death:** direct fatal toxicity is uncommon; death is usually from bizarre drug-induced behaviour — accident, suicide, or homicide — or a comorbid panic/psychotic reaction.

Management

- ▶ Intoxication is largely self-limiting; treatment is mainly needed for a "bad trip".
- ▶ **Environmental:** remove provoking stimuli (bright light, loud noise); reassure and "talk down" the patient.
- ▶ **Pharmacological:** a benzodiazepine (diazepam 10–20 mg) for severe agitation; chlorpromazine or intramuscular haloperidol to abort acute symptoms.
- ▶ **Supportive:** monitor airway, vital signs, and temperature (treat hyperthermia); protect the patient from self-injury.

Medico-legal significance

- ▶ Psilocybin/psilocin are controlled as a "**psychotropic substance**" under **Section 2(xxiii), NDPS Act 1985**.
- ▶ Their production, possession, sale, transport, import/export, cultivation, and consumption all attract penal consequences.
- ▶ **Cultivation** of psychoactive plants/fungi is barred except for medical or scientific purposes — **Section 8, NDPS Act 1985**.
- ▶ **Consumption** of a psychotropic substance (other than cocaine/morphine/heroin) is punishable with up to 6 months' imprisonment and/or fine — **Section 27, NDPS Act 1985**.
- ▶ Graver offences carry longer imprisonment and fine; repeat conviction for a commercial quantity can even attract capital punishment under Section 31A.
- ▶ The NDPS Act 1985 is a special statute and was **not** replaced on 1 July 2024.
- ▶ **Mode of poisoning:** mushroom poisoning is typically accidental (mistaken foraging) and rarely homicidal.
- ▶ Magic-mushroom incidents in particular are usually misadventure or recreational misuse, not deliberate poisoning of another person.
- ▶ **Death is from behaviour, not toxin:** fatalities usually follow the drug-induced bizarre behaviour — a fall or road accident, suicide during a panic reaction, or assault on others.
- ▶ The manner of death (accident, suicide, homicide, or undetermined) must therefore be reconstructed carefully from scene and circumstantial evidence.
- ▶ **Intoxication as a defence:** where intoxication is pleaded, the relevant provisions are **Section 85 IPC 1860 (now Section 23 BNS 2023)** and **Section 86 IPC 1860 (now Section 24 BNS 2023)**.

- *Involuntary* intoxication (e.g. drugged without knowledge), leaving the person incapable of knowing the nature of the act, may excuse him.
- *Voluntary* intoxication generally does not.
- ▶ **Autopsy and sampling:** preserve viscera, blood, and urine, and — if ingestion is suspected — stomach contents/gastric lavage, for the Forensic Science Laboratory.
- ▶ Urine is a valuable matrix for detecting hallucinogens.
- ▶ **Laboratory test:** the **Van Urk's (Ehrlich's) spot test** — 1% p-dimethylaminobenzaldehyde in 10% hydrochloric acid.
 - Gives blue-grey with psilocin, red-brown with psilocybin, and purple with LSD.
- ▶ **Distinguishing from lethal mushroom poisoning:** death-cap poisoning shows massive centrilobular hepatic necrosis, fatty change, scleral icterus, pulmonary oedema, and congested organs.
 - The **Meixner test** (filtrate + concentrated HCl on newspaper → blue colour) detects amatoxins.
- ▶ **Classic examiner point** — "**recycling of drugs**": Eastern Siberian tribes (Koryaks, Kamchadales) drank their own warm urine after eating fly agaric to renew the drug effect economically, since the active principle is excreted unchanged.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ Labelled mushroom in longitudinal section: cap (pileus), scales on cap, gills (lamellae), ring (annulus) on stalk, stalk (stipe), volva/bulbous base, underground mycelium with hyphae.
- ▶ Mark one specimen "*Psilocybe* — magic (psilocybin)" and another "*Amanita phalloides* — death cap (amatoxin, thermostable)".
- ▶ Flow diagram: Psilocybin (ingested, inactive) → dephosphorylation in body → Psilocin (active) → 5-HT_{2A} serotonin-receptor agonism → altered perception/hallucination ("trip") → possible bad trip → accident/suicide/homicide.



Cyanide poisoning — signs and symptoms, mechanism of action, and treatment

Asked in: Paper III Apr 2018 — RGUHS MD Forensic Medicine

Definition and background

- ▶ Cyanide is a **chemical (histotoxic) asphyxiant** — it blocks the tissues' ability to *use* oxygen, not its delivery.
- ▶ It exists as a gas (**hydrogen cyanide, HCN**), a liquid (**hydrocyanic / prussic acid**), and solid salts (NaCN, KCN).
- ▶ It is one of the **fastest-acting poisons known** — important in jewellery/electroplating work, building fires, and judicial gas-chamber executions.

SOURCE & COVERAGE

- ▶ **Bitter-almond odour** is classic, especially of the gas.
- ▶ 20–40% of people cannot smell it — an inherited **sex-linked recessive** trait, more common in males.
- ▶ **Sources:**
 - **Plants** — cyanogenic glycosides such as **amygdalin** (bitter almonds, stone-fruit kernels) release cyanide on hydrolysis.
 - **Fires** — burning wool, nylon, or polyurethane liberates HCN in building fires.
 - **Occupational** — electroplating, fumigation, and tobacco smoke.
- ▶ **Fatal dose, ingested:**
 - Hydrocyanic acid (HCN) — 50–100 mg.
 - Cyanide salts (NaCN/KCN) — roughly 150–300 mg.
 - Bitter almonds — roughly 50–80 in number.
- ▶ **Fatal dose, inhaled HCN:** 1 part in 2,000 kills almost instantaneously; 1 in 10,000 within minutes.
- ▶ **Fatal period:** inhaled HCN kills within seconds to minutes; ingested salts take about **30 minutes**, the time needed for stomach acid to convert the salt to HCN.

Mechanism of action

- ▶ **Core mechanism:** histotoxic (cytotoxic) anoxia. Cyanide binds ferric (Fe^{3+}) iron of **cytochrome c oxidase** (cytochrome a-a₃) in the mitochondrial electron transport chain, arresting oxidative phosphorylation.
- ▶ The bond is relatively stable but *reversible* — the basis for antidote therapy.
- ▶ Deprived of aerobic ATP, cells switch to **anaerobic glycolysis**, converting pyruvate to **lactic acid**.
- ▶ This produces a **high anion-gap metabolic acidosis** whose severity tracks the severity of poisoning.
- ▶ Because tissues cannot extract oxygen, **venous blood stays bright red** and venous oxygen saturation stays high.
- ▶ **Detoxification pathway (basis of treatment):** the enzyme **rhodanese**, abundant in liver and kidney, converts cyanide to non-toxic **thiocyanate** (excreted in urine) using a sulfur donor — but only ~1 mg/kg/hour, easily overwhelmed in acute poisoning.

Signs and symptoms

- ▶ **Inhaled HCN gas** causes near-instant collapse, throat/chest constriction, giddiness, and death from respiratory failure; **ingested salts** act more slowly, since stomach acid must first liberate HCN.
- ▶ A victim may briefly perform **volitional acts** — corking the bottle, walking a few steps — which can falsely suggest homicide.

- ▶ **Central nervous system:** headache, anxiety, confusion, sweating, progressing to **convulsions** (often with opisthotonus and trismus), stupor, and **coma**. Pupils are **dilated and sluggish/unreactive**.
- ▶ **Cardiovascular:** early hypertension with reflex bradycardia; late hypotension, tachycardia, dysrhythmias, and collapse.
- ▶ **Respiratory:** early tachypnoea and dyspnoea (carotid chemoreceptor stimulation); late respiratory depression and apnoea. **Cyanosis is a LATE and inconsistent sign** — its absence early does NOT exclude cyanide poisoning.
- ▶ **Skin and eyes:** bright "**brick/cherry red**" skin and mucous membranes; bright, glassy, prominent eyes with dilated, equally red-looking retinal vessels.
- ▶ **Metabolic:** lactic acidosis, hyperthermia, salivation, bitter acrid taste; ingested salts cause **corrosive burns** of mouth, throat, and stomach.
- ▶ A blood level above roughly **1 µg/mL is generally regarded as fatal**.
- ▶ **Chronic exposure** (smokers, cassava eaters) can cause optic neuropathy and goitre; acute survivors can later develop **delayed Parkinsonism**.

Diagnosis

- ▶ **Bedside clues:** bitter-almond odour, sudden collapse with bright-red skin, severe lactic acidosis with a narrow arterio-venous oxygen gap.
- ▶ ***Lee–Jones test** — *gastric aspirate with ferrous sulfate and sodium hydroxide, boiled, cooled, then acidified: a greenish-blue (Prussian blue)** colour indicates cyanide.
- ▶ **Confirmatory tests:** whole-blood cyanide level, serum lactate above 7–10 mmol/L, elevated anion gap; ECG may show atrioventricular block progressing to asystole.

Treatment

- ▶ Begin treatment **immediately** — the fatal period is very short. Three priorities: **100% oxygen, antidotes, decontamination**.
- ▶ **Stabilization:** remove from the source, secure the airway, give 100% oxygen, obtain IV access, start cardiac monitoring.
- ▶ Correct acidosis with IV sodium bicarbonate, treat hypotension with vasopressors, and control seizures with diazepam.
- ▶ **Mouth-to-mouth resuscitation must NOT be attempted** — vomitus can itself emit HCN, risking the rescuer.
- ▶ **Antidotal therapy** — the 3-step Eli Lilly cyanide kit — start even before gastric lavage:

Step	Agent	Action
1	Amyl nitrite (inhaled)	Generates methaemoglobin as a temporizing measure
2	Sodium nitrite 3%, 10 mL IV	Generates methaemoglobin (Fe ³⁺), which competes for CN ⁻
3	Sodium thiosulfate 25%, 50 mL IV	Sulfur donor — rhodanese converts CN ⁻ to thiocyanate

- ▶ **How the nitrites work:** they oxidise haemoglobin (Fe^{2+}) to methaemoglobin (Fe^{3+}), which binds cyanide more strongly than cytochrome oxidase and so strips CN^- off it, freeing respiration.
- ▶ **Keep methaemoglobin below 25%** — excess is itself dangerous, and nitrites also cause hypotension.
- ▶ **How thiosulfate works:** it supplies sulfur so rhodanese converts freed cyanide to thiocyanate, irreversibly. Repeat both at **half-dose** after 1 hour if needed.
- ▶ **Hydroxocobalamin (Cyanokit)** binds CN^- directly to form cyanocobalamin, excreted in urine; it is **safer** (no methaemoglobinaemia, no hypotension) and preferred in fire/smoke victims.
- ▶ **Dicobalt edetate (Kelocyanor)** chelates cyanide directly but is reserved for confirmed poisoning because of severe side-effects. **Methylene blue is no longer used.**
- ▶ **Decontamination:** remove clothing and wash skin; gastric lavage with potassium permanganate or sodium thiosulfate, plus activated charcoal if given immediately. **Emesis is contraindicated** (risk of sudden seizures, coma, or apnoea).
- ▶ **Supportive care:** observe for 24–48 hours since toxicity may recur.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Mechanism + antidote loop:** cytochrome c oxidase (Fe^{3+}) blocked by CN^- → no ATP → anaerobic glycolysis → lactic acidosis.
- ▶ **Antidote loop:** nitrites → methaemoglobin → strips CN^- off cytochrome oxidase → cyanmethaemoglobin; thiosulfate + rhodanese → thiocyanate → urine.
- ▶ **Side branch:** hydroxocobalamin + CN^- → cyanocobalamin → urine.
- ▶ **Autopsy schematic:** bitter-almond odour, cherry-red lividity, prominent eyes, blood-stained froth, congested lungs, crimson-red gastric mucosa.

Medico-legal significance

- ▶ **Manner of death** is usually **accidental** (building fires, jewellers using KCN, cassava/almond ingestion) or **suicidal** (ready access in trades). **Homicide is rare.**
- ▶ Rasputin survived KCN cakes because achlorhydria (absence of stomach acid) prevented HCN formation — the salts need gastric acid to work.
- ▶ **Autopsy:** staff must wear masks (gastric salts liberate HCN); **open the cranial cavity first** to catch the bitter-almond odour before other cavities mask it.
- ▶ **Sample preservation:** blood (with sodium fluoride, under liquid paraffin), stomach contents, and **spleen** (best single specimen, richest in cyanide) — in **glass or nylon only, never plastic**, and analysed promptly since cyanide is volatile.
- ▶ **Legal duty:** administering poison with intent to cause hurt is punishable under **Section 328 IPC 1860 (now Section 123 BNS 2023)**; death by poisoning is charged as **murder** (Section 300/302 IPC → now **Sections 101/103 BNS 2023**) or **culpable homicide** (Section 299/304 IPC → now **Sections 100/105 BNS 2023**).
- ▶ Failure to report a known offence is punishable under **Section 176 IPC 1860 (now Section 211 BNS 2023)** and **Section 202 IPC 1860 (now Section 239 BNS 2023)**; giving false information is punishable under **Section 177 IPC 1860 (now Section 212 BNS 2023)**.

- ▶ A doctor summoned for a police inquest (Section 174 CrPC 1973, now Section 194 BNSS 2023) must furnish the information required (Section 175 CrPC 1973, now Section 195 BNSS 2023).
- ▶ **Doctor's duties:** resuscitate first, then preserve and seal evidence (vomitus, lavage fluid, bottle) handed over to police with signature.



What are the characteristics of ideal suicidal and homicidal poisons? Give examples

Asked in: Paper III Apr 2022 — RGUHS MD Forensic Medicine

Definition / Introduction

- ▶ A **poison** is any substance that, in a small quantity, injures or kills the body through its chemical action.
- ▶ An **"ideal" poison** is a teaching concept, not a real substance.
- ▶ It describes the perfect set of properties for one particular manner of poisoning.
- ▶ A killer needs stealth. A suicide just wants an easy death.
- ▶ So the "ideal" profile is **different for homicide and for suicide**.
- ▶ **No real poison meets every criterion** of an ideal homicidal poison.
- ▶ Modern toxicology can detect almost anything.
- ▶ The concept survives only as an exam framework, and as the standard against which poisons like **arsenic** (the *"king of poisons"*) were once judged.

Characteristics of an ideal homicidal poison

Every property below serves one goal: give it without suspicion, and leave a death that cannot be traced back to the killer.

- ▶ **Cheap and easily available:** so it can be bought without leaving a trail.
- ▶ **Colourless, odourless and tasteless:** the single most important property — it must go into food or drink undetected.
- ▶ **Easily soluble in food, drink or medicine:** without changing its colour, smell or taste.
- ▶ **Highly toxic in a small dose:** a tiny, imperceptible amount is enough to kill.
- ▶ **Mimics a natural disease:** or acts slowly enough that the illness looks natural.
- ▶ **Slow, insidious onset:** hard to connect the dose to the illness that follows; the killer can be gone before symptoms appear.
- ▶ **No known antidote:** so treatment, even if tried, fails.
- ▶ **No characteristic postmortem changes:** nothing for the autopsy surgeon to find.
- ▶ **Not detectable by chemical tests:** escapes the forensic laboratory.
- ▶ **Rapidly destroyed or metabolised after death:** no residue left, even if the body is exhumed.

Examples — no poison satisfies every point:

- ▶ **Arsenic:** the classic *"king of poisons."*

- Cheap, colourless, odourless, tasteless.
- Lethal in a small dose and mixes easily with food.
- Onset is gradual, and symptoms mimic cholera.
- **Disadvantage:** it delays putrefaction and stays detectable in hair, nails and bone for years, even in charred or exhumed remains — so it fails the modern test.
- ▶ **Thallium:** a tasteless rodenticide, once hard to detect (used in the 1971 Graham Young case); still detectable in the ashes of a cremated body.
- ▶ **Aconite:** a cardiotoxic plant alkaloid traditionally hidden in betel leaf; destroyed quickly by putrefaction.
- ▶ **Closest to ideal today — natural body constituents**, because they raise no suspicion and may not even be looked for at autopsy:
 - **Insulin:** death looks entirely natural, with no autopsy findings.
 - **Potassium chloride (KCl)** and **sodium nitrate:** the latter tastes like ordinary table salt.

Characteristics of an ideal suicidal poison

The requirements are almost the opposite. The suicide is not hiding from anyone — he just wants death to be easy, certain and within reach.

- ▶ **Produces an easy, painless, quick death:** the single most important criterion; opium and barbiturates fulfil it well.
- ▶ **Easily available:** organophosphorus compounds and aluminium phosphide are common in agrarian India.
- ▶ **Easily taken in food or drink**, or simply swallowed without difficulty.
- ▶ **Highly toxic with a short fatal period:** for a quick, certain end.

Several properties that matter for homicide are simply **irrelevant** here:

- ▶ **Cost does not matter** — "a dying man would not worry about the cost."
- ▶ **Colour, odour and taste do not matter** — there is no one left to deceive.
- ▶ **Antidote, detectability, disappearance from the body, and postmortem changes do not matter** — concealment is not the goal.

Examples: opium and barbiturates (painless death); **aluminium phosphide** (trade name Celphos) — the commonest suicidal poison in North India (Haryana, Punjab, Rajasthan); organophosphorus compounds; **morphine**, valued because death is painless (also used in euthanasia).

Comparison: ideal homicidal vs ideal suicidal poison

Feature	Ideal homicidal poison	Ideal suicidal poison
Colour, odour, taste	Colourless, odourless, tasteless	Immaterial
Cost	Cheap	Immaterial
Signs/symptoms	Mimic a natural disease	Should be painless
Onset	Very slow	Quick

Feature	Ideal homicidal poison	Ideal suicidal poison
Fatal period	Short enough to defeat treatment	Very short, for a quick end
Antidote	Must be absent	Immaterial
Detectability	Must be undetectable	Immaterial
Postmortem changes	None	Immaterial
Examples	Arsenic, thallium, aconite, insulin, KCl	Opium/morphine, barbiturates, aluminium phosphide, organophosphates

Related poison categories (briefly)

Examiners often pair "ideal poisons" with the wider classification of poisoning by intent.

- ▶ **Stupefying poisons:** make a victim helpless before robbery, kidnap or rape, usually slipped into food or drink.
 - **Datura** — about 50–60 seeds stupefy; 100–125 seeds are fatal.
 - **Chloral hydrate** in alcohol — the "*knock-out drops*" or "*Mickey Finn*."
- ▶ **Cattle poisons:** used to destroy an enemy's cattle — *Abrus precatorius*, oleander, *Calotropis*, aconite, strychnine, organophosphates.
- ▶ **Arrow poisons:** curare, aconite, strychnine, *Abrus precatorius*, snake venom.
- ▶ **Ordeal poisons:** historically given to "prove" guilt or innocence — the Calabar bean, *Cerbera odollam*, croton seeds.
- ▶ **Aphrodisiacs:** cantharides, cocaine, cannabis. **Abortifacients:** ergot, lead, *Calotropis*.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ Two-column comparison chart titled "**Ideal homicidal vs ideal suicidal poison.**"
- ▶ **Left column ("IDEAL HOMICIDAL POISON"):** colourless-odourless-tasteless, cheap, soluble in food/drink, highly toxic, mimics natural disease, slow onset, no antidote, undetectable, no postmortem changes, disappears after death.
- ▶ **Right column ("IDEAL SUICIDAL POISON"):** painless and easy death (most important), easily available, easily taken in food/drink, highly toxic with a short fatal period, colour/odour/taste/cost all immaterial.
- ▶ **Foot boxes with examples:** homicidal — arsenic ("king of poisons"), thallium, aconite, insulin, KCl; suicidal — opium/morphine, barbiturates, aluminium phosphide, organophosphates.

Medico-legal significance

- ▶ **No poison is truly an ideal homicidal poison today.** Atomic absorption spectroscopy, neutron activation analysis and chromatography can detect even trace residues, so modern forensic toxicology has abolished the "perfect" homicidal poison.
- ▶ **Autopsy with viscera preservation**, plus chemical analysis at the **Forensic Science Laboratory**, are the main defences against a would-be ideal homicidal poison.

- ▶ A death that mimics natural disease (e.g. insulin) needs a **high index of suspicion**: look for injection/needle marks, excise needle tracks with surrounding tissue, and check **vitreous humour glucose**.
- ▶ In suspected **arsenic** poisoning, remember it delays putrefaction and stays detectable in hair, nails, bone, and even exhumed or charred remains for years — so exhumation toxicology is worthwhile, but watch for postmortem imbibition and soil contamination.
- ▶ A doctor must **inform the police in every case of suspected poisoning** — homicidal, suicidal or accidental — because deciding the manner of poisoning is not the doctor's role. This duty comes from **Section 39 CrPC 1973 (now Section 33 BNSS 2023)**. Suspected food, stomach wash and viscera must be preserved, never concealed.
- ▶ Criminal administration of poison is punishable under **Section 328 IPC (now Section 123 BNS 2023)** — up to 10 years' imprisonment and fine.
- ▶ Death by poisoning is prosecuted as **murder** under **Section 302 IPC (now Section 103 BNS 2023)**, or as **culpable homicide not amounting to murder** under **Section 304 IPC (now Section 105 BNS 2023)**, depending on intent.
- ▶ Throwing or administering acid to cause serious injury falls under **Section 326A/326B IPC (now Section 124 BNS 2023)**.



What are the differences between poisonous and non-poisonous snakes? Post mortem findings in case of snake bite

Asked in: Paper III Oct 2019 — RGUHS MD Forensic Medicine

Definition

- ▶ A **venomous snake** has a venom apparatus — paired glands joined by ducts to grooved or hollow fangs — and injects venom when it bites.
- ▶ A **non-venomous snake** lacks functional venom glands and fangs, and can only inflict a mechanical bite.
- ▶ Worldwide, only about 250 of roughly 3,500 snake species are venomous.
- ▶ India has about 216 species, of which 52 are venomous, but only **five** are dangerously poisonous to humans.
- ▶ **The dangerous five**: king cobra, common cobra, common krait, Russell's viper, saw-scaled viper.
- ▶ The **common krait** is the most frequently encountered venomous snake.
- ▶ Poisoning by snake venom is called **ophitoxaemia**.
- ▶ Correct identification decides treatment, so the distinction is medico-legally important.

Classification of venomous snakes

- ▶ **Viperidae** (Russell's viper, saw-scaled viper) and **Elapidae** (cobra, krait) cause almost all serious bites in India.

- ▶ Elsewhere, **Crotalidae** (pit vipers), **Hydrophidae** (sea snakes) and a few **Colubridae** are also venomous.
- ▶ **Proteroglyphous fangs** — fixed, front fangs (Elapidae).
- ▶ **Solenoglyphous fangs** — folding, hollow, needle-like front fangs (Viperidae).
- ▶ Pit vipers sense heat through a **pit** between the eye and nostril; true vipers (Russell's, saw-scaled) lack it.
- ▶ Some harmless colubrids (e.g. rat snake) carry a primitive **Duvernoy's gland**, so even a "non-venomous" bite can rarely cause mild poisoning.

Differences between venomous and non-venomous snakes

Feature	Venomous snakes	Non-venomous snakes
Head scales	Pit between eye and nostril (pit viper); third supralabial touching eye and nasal shield (cobra); enlarged hexagonal central scale (krait)	Large, without these special markers
Belly scales	Large, cover the entire breadth of the belly	Small, do not cover the entire breadth
Fangs	Two long fangs, hollow (canalised) or grooved	Short, solid, no canal or groove
Subcaudal scales	Single row	Double row
Tail	Compressed	Tapers gradually, not compressed
Bite mark	Two fang punctures (occasionally one)	Semicircular row of small tooth marks, no puncture

- ▶ **Cobra (Elapidae)**: cylindrical body, small head with large shields, round pupil, short fixed grooved fangs; venom is **neurotoxic**.
- ▶ **Viper (Viperidae)**: short body with a narrow neck, broad triangular head with small scales, vertical slit pupil, long movable canalised fangs; venom is **haemotoxic (vasculotoxic)**.

Snake venom and its toxic actions

- ▶ Venom is modified saliva secreted by glands behind the eyes — a mixture of toxalbumins and enzymes.
- ▶ It is harmless if swallowed (digested in the gut) and toxic only when **injected**.
- ▶ **Proteolytic enzymes** cause tissue digestion, oedema, blistering and necrosis.
- ▶ **Neurotoxins** cause a curare-like, non-depolarising neuromuscular block.
- ▶ **Cholinesterase** is rich in cobra and krait venom; **haemolysins** are found mainly in viper venom.
- ▶ **Hyaluronidase** ("spreading factor") is present in every snake venom.
- ▶ **Neurotoxic (colubrine) venom** — cobra, krait — causes descending flaccid paralysis, chiefly threatening breathing and the heart.
- ▶ **Vasculotoxic (viperine) venom** — Russell's viper, saw-scaled viper — causes haemolysis and deranges clotting, producing a bleeding tendency (consumption coagulopathy).

- ▶ **Sea-snake venom is myotoxic**, causing muscle breakdown (rhabdomyolysis) and myoglobin in the urine.

Fatal dose, fatal period and clinical features

- ▶ **Fatal dose (dried venom)**: cobra 12 mg, Russell's viper 15 mg, saw-scaled viper 8 mg, common krait 6 mg.
- ▶ A single bite can deliver many times the fatal dose, yet about **20% of bites show no envenomation** at all (a "dry bite").
- ▶ **Fatal period**: cobra half an hour to six hours; viper one to two days.
- ▶ Death may occur immediately from neurogenic shock (fright) — the commonest symptom after any bite.
- ▶ **Neurotoxic bite (cobra, krait)**: local wheal with little pain or swelling; systemic effects begin after ~30 minutes.
- ▶ **Ptosis** (drooping eyelid) is the earliest neuromuscular sign, followed by ophthalmoplegia and descending flaccid paralysis — legs, then trunk, then head.
- ▶ Speech and swallowing become difficult, and salivation is present; pupils, blood pressure and clotting time stay normal.
- ▶ Death is from **respiratory failure**.
- ▶ **Krait bite** is characteristically **painless with no local swelling**, with intense drowsiness; it often occurs during sleep.
- ▶ **Vasculotoxic bite (Russell's viper, saw-scaled viper)**: severe local pain, swelling and blood-stained oozing spreading from limb to trunk.
- ▶ Systemic effects begin almost immediately, within 15 minutes; pupils dilate and stop reacting, and blood pressure falls.
- ▶ Persistent bleeding from the bite site occurs, with blistering and bruising.
- ▶ Epistaxis (nosebleed), blood in the urine and gum bleeding may follow, with prolonged clotting time (disseminated intravascular coagulation).
- ▶ **Acute renal failure** is the leading cause of death in viper bite; overall death is from **circulatory failure** (haemolysis and haemorrhage).

Post-mortem findings in snake bite

- ▶ Clothing or skin may show dried venom as **yellow crystals**.
- ▶ **Fang marks**: a venomous bite shows two (occasionally one) fang punctures; a non-venomous bite shows only a semicircular row of tooth marks, with no puncture.
- ▶ **Colubrine bite**: local fluid and haemolysed blood staining nearby vessels, little tissue destruction; death findings are those of asphyxia (visceral congestion, petechiae).
- ▶ **Viperine bite**: discoloration, swelling and cellulitis around the mark.
- ▶ Haemorrhage from the puncture, mucous membranes and bowel, with purpuric spots on the pericardium.
- ▶ **Kidneys** show subcapsular pinpoint haemorrhages, tubular and cortical necrosis, and interstitial nephritis — acute renal failure is the leading cause of death.

- **Confirmation:** bite-site washings may show cholinesterase and thromboplastin; ELISA/RIA detect venom antigens in body fluids (RIA is most sensitive, about 0.4 microgram/L).

Medico-legal significance

- Manner of death is **almost always accidental**.
- Rarely it is homicidal (a venomous snake deliberately introduced onto a sleeping victim), and very rarely suicidal.
- Police inquest into an unnatural/suspicious death is under **Section 174 CrPC 1973 (now Section 194 BNSS 2023)**; magistrate inquest is under **Section 176 CrPC 1973 (now Section 196 BNSS 2023)**.
- Deliberate homicidal envenomation may amount to murder under **Section 302 IPC 1860 (now Section 103 BNS 2023)**, murder being defined in **Section 300 IPC 1860 (now Section 101 BNS 2023)**.
- The autopsy report is opinion evidence, admissible under **Section 45 of the Indian Evidence Act 1872 (now Section 39 of the Bharatiya Sakshya Adhiniyam, BSA, 2023)**.
- True antemortem fang marks show local haemorrhage and tissue reaction, distinguishing them from post-mortem animal or insect damage.
- **Doctor's duties:** resuscitate and treat first, then preserve bitten skin and fang-mark tissue.
- Document the bite pattern and identify the snake if brought in.
- Use the **20-minute whole-blood clotting test** — non-clotting blood indicates viper envenomation.
- **Treatment:** give **polyvalent antivenom**, the specific antidote; avoid incision, suction or cautery of the bite.
- An animal killed by snakebite may be safely eaten, but its **blood remains poisonous** if injected.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- **Venomous vs non-venomous snake (head and belly views).** Labels: pit between eye and nostril (pit viper); third supralabial touching eye and nasal shield (cobra); enlarged hexagonal central scale (krait); belly scales covering the entire breadth (venomous) versus small belly scales (non-venomous); single row of subcaudal scales (venomous) versus double row (non-venomous); compressed tail (venomous).
- **Fang and bite-mark diagram.** Labels: venom gland; duct; canalised/grooved hollow fang (venomous); solid fang (non-venomous); two fang punctures (venomous bite); semicircular row of tooth marks (non-venomous bite).

♦ ♦ ♦

What are the features of cocaine poisoning? Give its uses and Medico Legal aspects

Asked in: Paper III Oct 2019 — RGUHS MD Forensic Medicine

Definition / Introduction

- ▶ Cocaine is an alkaloid **deliriant (neurotic) poison** and a powerful CNS stimulant.
- ▶ It comes from the dried leaves of *Erythroxylum coca*, a shrub native to South America.
- ▶ Chemically it is **benzoylecgonine**.
- ▶ It is unique: a **CNS stimulant**, a **local anaesthetic** (the first ever discovered), and a strong **vasoconstrictor**, all at once.
- ▶ It blocks reuptake of biogenic amines (noradrenaline, adrenaline, dopamine, serotonin) at nerve endings, producing a **hyperadrenergic state** — excess adrenaline-like sympathetic activity.
- ▶ It is a controlled "narcotic drug" under the **NDPS Act, 1985**.

Pharmacology, forms and routes

- ▶ **Physical nature:** white crystalline powder, bitter taste; freely soluble in alcohol.
- ▶ **Street names:** crack, coke, snow, snuff, pasta, bazooka. Coca leaves themselves contain only 0.5–2% cocaine.
- ▶ **Hydrochloride salt** is snorted or injected — it cannot be smoked.
- ▶ **Freebase ("crack")** is made by heating the hydrochloride with baking soda and water; smoking it makes a cracking sound, hence the name. Smoking purified freebase is called "free basing."
- ▶ **Cutting agents:** baking soda, talcum, lactose, dextrose, mannitol, plus local anaesthetics (lignocaine, benzocaine, procaine).
- ▶ **Speedball** is cocaine mixed with an opiate (heroin), usually injected IV for a "double" euphoric effect.
- ▶ **Onset by route:**
 - Smoking and IV — within seconds.
 - Inhalation — 1–3 minutes.
 - Oral (chewing leaves) — slowest, least effective.
- ▶ Peak effect is at 20–30 minutes; plasma half-life is only **30–90 minutes**, so users must redose every ¼–1 hour.
- ▶ Blocked amine reuptake raises adrenaline (tachycardia), noradrenaline (hypertension), and dopamine/serotonin (euphoria, psychosis).
- ▶ **Metabolism:** broken down by plasma pseudocholinesterase and liver enzymes to inactive benzoylecgonine and ecgonine methyl ester; only 1–5% is excreted unchanged.
- ▶ With alcohol, it forms **cocaethylene** — an active, heart-toxic metabolite.
- ▶ Metabolites are detectable in urine for 2–3 days after brief use, longer in chronic users.

Uses of cocaine

- ▶ **Topical anaesthetic:** a 4–10% solution used in eye, nose, throat and ear surgery, giving both numbing and a bloodless field (vasoconstriction).
- ▶ **Brompton's cocktail:** a historical mixture of cocaine, an opiate, chlorpromazine and alcohol, once used for intractable cancer pain.

- ▶ **Aphrodisiac/abuse:** applied to the glans penis, it prolongs intercourse by numbing sensory nerves; also abused recreationally for euphoria and alertness.

Features of acute cocaine poisoning

- ▶ Acute poisoning runs in two phases: an initial **stage of excitement** followed by a **stage of depression (collapse)**.
- ▶ The hallmark is a **sympathomimetic toxidrome** — raised pulse, blood pressure, respiration and temperature.

System	Excitement phase	Depression phase
CNS	Euphoria, restlessness, hallucinations, tremors, seizures	Coma, areflexia, fixed dilated pupils
CVS	Tachycardia, hypertension, arrhythmia	Weak irregular pulse, hypotension, cardiac arrest
Respiratory	Tachypnoea, dyspnoea	Cheyne–Stokes breathing, apnoea, pulmonary oedema
Eye/temperature	Mydriasis, hyperthermia	Pupils fixed and dilated

- ▶ **Cause of death:** overdose, sudden cardiac arrest, vasomotor/respiratory failure, hyperthermia.
- ▶ **Fatal dose:** 20 mg IV; 500 mg–1.2 g orally (lethal blood level ≈ 0.2 mg%).
- ▶ Tolerant chronic addicts can survive doses up to 10 g/day.
- ▶ **Fatal period:** a few minutes to 1–2 hours.

Complications and chronic poisoning

- ▶ **Acute complications:** stroke (a frequent cause under age 45), cerebral haemorrhage, myocardial/bowel/renal infarction, aortic dissection.
- ▶ **Rhabdomyolysis** (skeletal muscle breakdown) raises CPK and causes tea-coloured urine and acute renal failure.
- ▶ Lung complications include pneumothorax and "**crack lung**" — a hypersensitivity reaction appearing within 48 hours of smoking.
- ▶ **Chronic use (cocainomania)** causes an irresistible craving and a cycle of **euphoria ("rush")** followed by **rebound depression ("crash")**.
- ▶ **Nasal septum perforation** is the *characteristic* chronic lesion, from ischaemic necrosis of local vasoconstriction.
- ▶ **Palatal perforation** (commoner in females) causes hypernasal speech and difficulty eating.
- ▶ **Magnan's symptom ("cocaine bugs")** — a tactile hallucination (formication) of insects crawling under the skin, causing skin excoriation; distinguish from **Ekbom syndrome (delusional parasitosis)**.
- ▶ Other chronic features: black teeth/tongue, bruxism, gastric ulceration, impotence/gynaecomastia in males, amenorrhoea/infertility in females.
- ▶ **Withdrawal — three phases:**
 - Phase I "**Crash**" — severe depression, craving, hypersomnia.

- Phase II — normalised mood, intermittent anxiety.
- Phase III "Extinction" — high relapse risk.

Diagnosis, autopsy and treatment

- ▶ **Diagnosis:** clinical sympathomimetic picture, confirmed by urine immunoassay and by HPLC or GC-MS on blood and urine.
- ▶ **Presumptive colour tests:** *Mandelin test* (turns orange) and *Scott/cobalt-thiocyanate test* (blue precipitate).
- ▶ **Autopsy findings are largely non-specific** in acute death — diagnosis rests on chemical analysis.
- ▶ Look for crack-pipe burns of fingers and face, and injection marks at unusual sites (e.g., under the tongue).
- ▶ In chronic users, look for healed injection scars and foreign-body granulomas in the lungs.
- ▶ **Preserve blood with sodium fluoride** to stop cocaine hydrolysing in the sample.
- ▶ **Treatment is purely supportive — there is no specific antidote.**
- ▶ Treat hyperthermia with cooling/ice baths; avoid antipyretics.
- ▶ Treat seizures/agitation with IV diazepam or lorazepam; avoid physical restraint (risk of rhabdomyolysis and hyperthermia).
- ▶ Treat hypertension with nitroglycerine, nitroprusside or phentolamine.
- ▶ Treat ventricular arrhythmia with propranolol.
- ▶ For swallowed packets, do gastric lavage with activated charcoal.
- ▶ In **body packers**, surgically remove any ruptured drug packet.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Two-phase clinical course:** a flow chart from *Entry* (snort/smoke/IV/oral) → **Stage 1 – Excitement** (euphoria, seizures, tachycardia, hypertension, mydriasis, hyperthermia) → **Stage 2 – Depression** (coma, fixed dilated pupils, hypotension, Cheyne–Stokes breathing, apnoea) → **Death** (cardiac arrest / respiratory failure / hyperthermia).
- ▶ *****Erythroxylum coca* plant:**** a labelled sketch of the shrub (source of the alkaloid, 0.5–2% content) with an inset of the perforated nasal septum, the characteristic lesion of chronic snorting.

Medico-legal significance

- ▶ **Manner of poisoning** is chiefly accidental (recreational or therapeutic overdose) or abuse/dependence; suicide and homicide are rare.
- ▶ **Body packers and body stuffers** conceal drug packets in the gut, rectum or vagina for smuggling; a ruptured packet causes a lethal overdose.
- ▶ Packets are radio-opaque and detectable on plain X-ray or CT.
- ▶ Under the NDPS Act, 1985 (**Section 2(xiv)**), "narcotic drug" legally includes coca leaf and all manufactured drugs from it, and cultivating the coca plant needs a licence.

- ▶ Possession is graded into **small quantity** (2 g) and **commercial quantity** (100 g), with punishment scaled to the quantity.
- ▶ Administering poison/a stupefying drug to commit an offence is punishable under **Section 328 IPC 1860 (now Section 123 BNS 2023)**.
- ▶ Negligent conduct with a poisonous substance falls under **Section 284 IPC 1860 (now Section 286 BNS 2023)**.
- ▶ Adulteration of drugs is punishable under **Section 274 IPC 1860 (now Section 276 BNS 2023)**.
- ▶ Criminal responsibility of an intoxicated person is governed by **Sections 85/86 IPC 1860 (now Sections 23/24 BNS 2023)**.
- ▶ Driving under the influence of cocaine can be prosecuted under **Section 185(b), Motor Vehicles Act, 1988**.
- ▶ **Doctor's duties:** recognise the toxidrome, preserve viscera/blood/urine/stomach contents for analysis, and maintain chain of custody.
- ▶ In a suspected death, refer for medico-legal autopsy and inquest under **Section 174 CrPC 1973 (now Section 194 BNSS 2023)**.
- ▶ The analyst's report and the doctor's expert opinion are admissible under **Section 45 IEA 1872 (now Section 39 BSA 2023)**.



General lines of treatment of a case of poisoning

Asked in: Paper III Apr 2020 — RGUHS MD Forensic Medicine

Definition:

- ▶ A **poison** is any solid, liquid or gaseous substance that harms health or causes death when it enters or contacts the living body.
- ▶ It acts by a local effect, a systemic (constitutional) effect, or both.
- ▶ Management is largely **supportive and symptomatic** — most patients, conscious or unconscious, recover with good supportive care alone.
- ▶ Care is supplemented by **decontamination, enhanced elimination, and specific antidotes** where one exists.
- ▶ The classical sequence is: resuscitation → remove unabsorbed poison → give antidote → remove absorbed poison → symptomatic treatment → follow-up.
- ▶ The treating doctor also carries **medico-legal duties** — preserving samples, notifying police, and recording a dying declaration.

1. Immediate resuscitative measures — the ABCDE

- ▶ Resuscitation always comes **before** diagnosis or decontamination.
- ▶ Comatose patients are stabilised first, ideally in an intensive-care unit.
- ▶ This supportive approach is called the "**Scandinavian method**" (first used for barbiturate poisoning in the 1940s).

- ▶ **A — Airway:** clear secretions, vomit or foreign body. Secure it with **endotracheal intubation** (or tracheostomy) if protective reflexes are lost.
- ▶ **B — Breathing:** give supplemental oxygen if blood gases stay poor despite a clear airway. Capnography (end-tidal carbon-dioxide monitoring) helps track this.
- ▶ **C — Circulation:** secure IV access and give IV fluids. Monitor the heart continuously (ECG); treat shock and dysrhythmias.
- ▶ **D — CNS depression / Decontamination:** place the unconscious patient in the **recovery (lateral) position** so the tongue does not block the airway.
 - Grade coma with the **Glasgow Coma Scale** or the **Matthew-Lawson scale** (Grade 0 = fully conscious, up to Grade 4 = no response to pain, all reflexes lost).
 - "D" also reminds you to check **Dextrose** — never miss hypoglycaemia.
- ▶ **E — Exposure/Evaluation:** once stable, examine fully — temperature, breath odour, pupils, bowel sounds.

2. Removal of unabsorbed poison (decontamination)

By route of exposure:

- ▶ **Inhaled** (carbon monoxide, hydrogen sulphide, chlorine): move to fresh air, clear the airway, give oxygen 6–8 L/min, treat bronchospasm.
- ▶ **Injected** (snake/insect bite): treat shock and anaphylaxis. Apply cold packs (~10 °C) and local adrenaline for vasoconstriction.
 - Tight ligature, wound excision and oral suction of the poison are **no longer recommended**.
- ▶ **Contact — eye:** irrigate with copious water for at least 15 minutes.
- ▶ **Contact — skin:** remove contaminated clothing and wash with soap and water for about 30 minutes.
- ▶ **Ingested:** needs gastro-intestinal decontamination (below).

Gastro-intestinal decontamination:

- ▶ **Emesis is now obsolete.** Syrup of ipecac was once standard but is abandoned — no proven benefit, unpredictable poison recovery, interferes with charcoal, and risks aspiration.
- ▶ **Gastric lavage (stomach wash):** done with an *Ewald's* or *Boas* tube, patient positioned **left-lateral, head-down (Trendelenburg)** so fluid cannot enter the larynx.
 - The **first aspirate is always preserved for chemical analysis** and handed to police.
 - Most useful within about 1 hour of ingestion.
 - **Absolute contraindication:** corrosive poisons (risk of perforation) — except carbolic acid, and oxalic/acetic acid seen early. Also avoid in sharp-object ingestion.
 - **Relative contraindications:** convulsant poisons (control fits first), coma (use a cuffed endotracheal tube), volatile/hydrocarbon poisons, oesophageal varices.
- ▶ **Activated charcoal is the single most useful "antidote."** Given as a slurry — 50–100 g in adults, 1 g/kg in children — usually after lavage.
 - It adsorbs barbiturates, salicylates, opioids, tricyclic antidepressants and many alkaloids.

- It does **not** work for corrosives, lithium, iron, metals/methanol, ethanol/ethylene-glycol — mnemonic **CLIME**.
- ▶ **Whole-bowel irrigation** (polyethylene-glycol solution) is reserved for iron, lithium, sustained-release drugs, and body-packers (people who have swallowed drug packets to smuggle them).

3. Antidotes

- ▶ An antidote counteracts or neutralises the poison.
- ▶ **Mechanical:** activated charcoal, demulcents (milk, egg-white), diluents (water/milk).
- ▶ **Chemical:** potassium permanganate and tincture iodine precipitate alkaloids.
 - Weak alkali neutralises acid burns; weak acid (vinegar, lemon juice) neutralises alkali burns.
 - **Never give bicarbonate for acid burns** — the carbon dioxide produced can rupture the stomach.
- ▶ **Chelating agents** (for heavy metals):
 - **BAL/dimercaprol** — arsenic, mercury, lead.
 - **Calcium-disodium-EDTA** — mainly lead.
 - **D-penicillamine** — copper, lead, mercury.
 - **DMSA (succimer)** — lead, arsenic, mercury; safer than EDTA, no brain redistribution.
 - **Desferrioxamine** — acute iron poisoning.
- ▶ **Specific antidote pairings:**

Poison	Antidote
Opioids	Naloxone
Organophosphates / carbamates	Atropine + pralidoxime
Paracetamol	N-acetylcysteine
Methanol / ethylene glycol	Ethanol or fomepizole
Cyanide	Sodium thiosulphate, dicobalt edetate, 100% oxygen
Methaemoglobinaemia	Methylene blue
Iron	Desferrioxamine

4. Removal of absorbed poison (enhanced elimination)

Used in severe poisoning, worsening despite full support, or poisons with delayed toxicity.

- ▶ **Forced alkaline diuresis** (urine pH 7.5–9): for weak acids — salicylates, phenobarbitone.
- ▶ **Haemodialysis:** methanol, ethylene glycol, lithium, salicylates.
- ▶ **Haemoperfusion:** barbiturates, paraquat, theophylline, paracetamol.
- ▶ **Multiple-dose activated charcoal** ("gut dialysis"): theophylline, phenobarbitone, carbamazepine.
- ▶ **Exchange transfusion** (in children): barbiturate, carbon monoxide, salicylate poisoning.

5. Symptomatic treatment and follow-up

- ▶ Control **convulsions** with benzodiazepines.
- ▶ Correct hypotension, arrhythmias, acid–base and electrolyte disturbance, hyper/hypothermia, hypoglycaemia and renal failure.
- ▶ Manage pulmonary oedema and aspiration pneumonia.
- ▶ Recognise the **toxidrome** — the characteristic cluster of signs for a poison class (anticholinergic, cholinergic, opioid, sympathomimetic, sedative-hypnotic) — to guide therapy.
- ▶ Every deliberate self-harm case needs early **psychiatric assessment** and support.

Medico-legal significance

- ▶ The treating doctor has **dual duties** — medical (treat the patient) and legal (help police determine the manner of death).
- ▶ **Preserve and label** the entire stomach wash, about 10 mL blood (with sodium fluoride as preservative), urine, and the poison container for forensic comparison.
 - Destroying such evidence is punishable under **Section 238 BNS 2023 (formerly Section 201 IPC 1860)**.
- ▶ Every suspected poisoning (accidental, suicidal or homicidal) must be **reported to police**.
 - A doctor who fails to report it is liable under **Section 211 BNS 2023 (formerly Section 176 IPC 1860)**.
- ▶ If the patient's condition is serious, **record a dying declaration** — no oath administered, ideally before a magistrate, else two witnesses.
 - Admissible under **Section 26 BSA 2023 (formerly Section 32 IEA 1872)**.
- ▶ If the patient dies, **do not issue a death certificate** — inform the police.
 - It becomes a medico-legal autopsy under inquest, **Section 194 BNSS 2023 (formerly Section 174 CrPC 1973)**.
 - In food poisoning, also notify the public health authorities.
- ▶ Negligent handling of poison endangering life is punishable under **Section 286 BNS 2023 (formerly Section 284 IPC 1860)**.
- ▶ Expert medical opinion is admissible in court under **Section 39 BSA 2023 (formerly Section 45 IEA 1872)**.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Stepwise flowchart:** *Resuscitation (ABCDE) → Decontamination by route → Antidote → Enhanced elimination → Symptomatic care + psychiatric follow-up*. Label the recovery position and the "preserve first lavage sample for chemical analysis" step.
- ▶ **Gastric lavage set-up:** labelled *Ewald's/Boas tube* (funnel end, distal lateral openings, suction bulb, mouth-gag) with the patient in the left-lateral, head-down Trendelenburg position.



What are the preparations of cannabis? Which one most potent intoxicant? Give its characteristic features of acute and chronic poisoning

Asked in: Paper III Oct 2021 — RGUHS MD Forensic Medicine

- ▶ Cannabis (Indian hemp) is the dried flowering tops, leaves, stems and resin of *Cannabis sativa* and its relatives *C. indica* and *C. ruderalis*.
- ▶ It is classed as a **deliriant** (a poison causing acute confusion, delusions and hallucinations) and is the world's oldest, most commonly abused illicit drug.
- ▶ Its psychoactive principle is **delta-9-tetrahydrocannabinol (THC)**.
- ▶ Several preparations exist, differing in source and THC content; among the traditional Indian ones, **charas (hashish) is the most potent intoxicant** (~25–40% active principle) and *bhang* the mildest.

Botanical source and active principle

- ▶ Cannabis is a *dioecious* annual herb — male and female flowers grow on separate plants, and female plants are richer in cannabinoids.
- ▶ **Three species:** *Cannabis sativa* (fibre-type), *Cannabis indica* (favoured for recreational/medicinal use), *Cannabis ruderalis* (low cannabinoid content).
- ▶ **Delta-9-THC** is the chief psychoactive principle; CBN and CBD are non-intoxicating.
- ▶ THC exists in the plant mainly as **THCA**, *decarboxylated* to active THC by heating — why smoking or cooking cannabis produces the "high".

Preparations of cannabis and the most potent intoxicant

Preparation	Source	THC (approx.)
Bhang	Dried mature leaves and stems	~15% (mildest)
Ganja (marijuana)	Flowering tops of the female plant	~15–25%
Charas (hashish)	Dried resin, pressed into bricks	~25–40% (most potent traditional form)
Hash oil	Solvent extract of cannabis	~70–90% (most concentrated overall)

- ▶ Bhang is drunk as a beverage (*bhang ki thandai*, festive use at Holi and Janmashtami); ganja and charas are smoked, usually mixed with tobacco.
- ▶ If extracted forms are counted, **hash oil is the most concentrated cannabis preparation of all** — so charas is the most potent *traditional* form, hash oil the most potent *overall*.

Fatal dose and fatal period

- ▶ No scientifically authenticated human fatal dose of cannabis or pure THC exists — death from cannabis alone is exceptional because the effective dose is so high.
- ▶ **Estimated fatal doses:** bhang ~10 g/kg (~650–700 g in an adult), ganja ~8 g/kg, charas ~2 g/kg.
- ▶ When death does occur, it may take **several days**, usually from **respiratory failure**.

- ▶ Most recorded "cannabis deaths" actually involved multiple-drug intoxication or pre-existing heart/lung disease.

Acute poisoning — characteristic features

- ▶ Smoking acts within seconds to minutes and lasts 1–2 hours; oral ingestion is slower (~30 minutes) and less predictable.
- ▶ **Stage 1 — excitement:** euphoria, talkativeness, heightened self-confidence, sharpened perception of colour and sound, an altered sense of time and space, and illusions or visual hallucinations (often erotic).
- ▶ **Physical signs:** increased appetite and thirst ("the munchies"), red/suffused eyes, dry mouth, fast heartbeat.
- ▶ **Stage 2 — narcosis:** giddiness, incoordination and confusion, followed by deep sleep.
- ▶ The person wakes from this sleep **without any hangover or depression** — a characteristic feature.
- ▶ **In sensitive individuals or high doses:** depersonalisation, sensory distortion, an acute psychotic reaction, and dangerous delusions of being superhuman (e.g. trying to fly).
- ▶ **Cardiopulmonary:** cough, sore throat, palpitations, low blood pressure; rarely convulsions and cardiac arrest.
- ▶ ***Intravenous marijuana syndrome*** follows injecting boiled, strained marijuana — within an hour: nausea, vomiting, fever, low blood pressure and a very high white cell count.

Chronic poisoning — characteristic features

- ▶ **General appearance:** sleepy, vacant expression, suffused eyes, tremors, wasting and weakness.
- ▶ ***Amotivational syndrome*** (a must-write point): apathy, lethargy, loss of drive, poor concentration and inability to plan long-term.
- ▶ ***Cannabinoid hyperemesis syndrome (CHS)** follows years of heavy use — recurrent cyclical vomiting, characteristically relieved by hot baths or showers*.
- ▶ This is paradoxical, since THC is normally an antiemetic; **the only effective treatment is stopping cannabis.**
- ▶ **Psychiatric — "hashish/charas insanity":** cannabis can worsen or unmask schizophrenia, causing persecutory delusions and hallucinations.
- ▶ ***Run-amok** is an acute psychotic state from continued or sudden heavy cannabis use, beginning with depression that turns into sudden homicidal mania*.
- ▶ He attacks those with real or imagined grudges, then anyone in his path, then a final phase of depression ends in suicide or surrender.
- ▶ **Other effects:** cancers of mouth and lung, chronic bronchitis, digital clubbing.
- ▶ **In men:** reduced fertility, low testosterone and impotence.
- ▶ **Dependence:** psychic dependence is moderate, but physical dependence and tolerance are slight or absent; withdrawal is mild (insomnia, irritability, agitation, nausea).

Diagnosis

- ▶ **Clinically:** the stages above, red/suffused eyes, and the odour of burnt rope on smoking.

- ▶ ***Cystolith test*** (microscopy): "bear's claw" hairs with a basal calcium-carbonate cluster that fizzes on adding hydrochloric acid.
- ▶ ***Duquenois–Levine test:** *reagent plus hydrochloric acid plus chloroform gives a purple chloroform layer — a presumptive (screening) test** only.
- ▶ **Confirmatory:** THC and its metabolites in urine/blood by GC-MS, the most specific method.
- ▶ THC is fat-stored, detectable for days to weeks (longer in chronic users); watch for false positives (e.g. ibuprofen) and passive smoke.

Treatment

- ▶ **Acute:** reassurance ("talking down"), monitoring, and gastric lavage with activated charcoal if recently swallowed.
- ▶ **IV diazepam or lorazepam** for agitation; **haloperidol** for uncontrolled psychotic features.
- ▶ Intravenous marijuana syndrome needs fluids, mannitol and drugs to raise blood pressure.
- ▶ **Chronic:** abstinence is the mainstay, supported by psychotherapy and counselling.
- ▶ Drug treatment can help withdrawal (an SSRI, or carbamazepine for craving); CHS resolves only with cessation.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Cannabis plant (labelled):** digitate leaf with serrated leaflets, male and female plants shown separately, flowering top of the female plant with resin-secreting trichomes.
- ▶ Alongside, show the three preparations: bhang (leaves/stems), ganja (female flowering tops), charas (resin).
- ▶ **Cystolith hair under the microscope:** label the "bear-claw" hair and basal calcium-carbonate cluster, noting it fizzes on adding hydrochloric acid.

Medico-legal significance

- ▶ Cannabis is a scheduled narcotic under the **Narcotic Drugs and Psychotropic Substances (NDPS) Act, 1985**.
- ▶ The NDPS Act's definition of "cannabis (hemp)" (Section 2(iii)) covers **charas and ganja but excludes leaves and seeds — that is, bhang** — giving bhang a looser legal status.
- ▶ **Indicative NDPS quantity thresholds:** charas — small 100 g, commercial 1 kg; ganja — small 1 kg, commercial 20 kg.
- ▶ Punishment ranges from up to 1 year for a small quantity to 10–20 years for a commercial quantity.
- ▶ **Manner of poisoning is mostly accidental** (over-indulgence, or ingestion by children); suicide and homicide are rare because the fatal dose is so high.
- ▶ **Stupefying "road poison":** *majun* and *charas* are mixed into sweets or food to stupefy travellers before robbery, rape or kidnapping.
- ▶ Cannabis is the second commonest drug found in drivers after alcohol — an offence under the **Motor Vehicles Act 1988, Section 185(b)**.

- ▶ **Run-amok and criminal responsibility:** the person is usually **not held responsible**, since run-amok is treated as a disorder of mind — unless he purposely took cannabis to embolden himself first.
- ▶ Voluntary versus involuntary intoxication is governed by **Section 23 BNS 2023 (formerly Section 85 IPC 1860)** and **Section 24 BNS 2023 (formerly Section 86 IPC 1860)**.
- ▶ Negligent handling of this poisonous substance is punishable under **Section 286 BNS 2023 (formerly Section 284 IPC 1860)**.
- ▶ **Autopsy findings are non-specific** — usually only signs of asphyxia; unabsorbed bhang may be found in the stomach.
- ▶ Preserve viscera, blood and urine for THC analysis, and always inform the police.



What is "Mickey Finn"? Give its poisoning features and Medico-Legal aspects

Asked in: Paper III Oct 2019 — RGUHS MD Forensic Medicine

Definition

- ▶ **Mickey Finn:** slang for an alcoholic drink secretly laced with chloral hydrate.
- ▶ It makes the victim suddenly helpless or unconscious, without any warning.
- ▶ The chloral-hydrate solution added to a drink is called "**knockout drops**."
- ▶ Chloral hydrate is the prototype **stupefying poison** — it stuns a victim into confusion or unconsciousness so that a crime can be committed.
- ▶ The name is said to come from a Chicago bartender who used it to drug and rob his patrons.

Chloral hydrate — nature and pharmacology

- ▶ **Physical nature:** colourless crystals, pungent pear-like odour, bitter taste.
- ▶ **Soluble** in both water and alcohol.
- ▶ **Why it is mixed with alcohol:** alcohol masks the bitter taste.
- ▶ Alcohol also adds a synergistic central-nervous-system depressant effect — the "Mickey Finn effect."
- ▶ **Metabolism:** liver alcohol dehydrogenase converts it to **trichloroethanol**, the active hypnotic metabolite.
- ▶ Trichloroethanol is then oxidised to inactive trichloroacetic acid and excreted in urine.
- ▶ **Absorption:** well absorbed from the whole gastrointestinal tract, including the rectum.
- ▶ **Therapeutic dose:** 0.5–2.0 g orally as a sedative-hypnotic.
- ▶ Other agents in the **stupefying poisons** group: *Datura* (dhatura) and *Cannabis indica*.
- ▶ Modern "date-rape drugs" used the same way: benzodiazepines, gamma-hydroxybutyrate (GHB), and *Datura*.

Poisoning features

- ▶ Acute poisoning resembles acute **barbiturate poisoning** — both are CNS depressants.

- ▶ **Onset:** the victim becomes helpless almost immediately after the drink.
- ▶ Deep coma may follow within 1–2 hours.
- ▶ **Odour:** a characteristic pear-like smell on the breath.
- ▶ **Gastrointestinal:** nausea, vomiting, burning behind the breastbone, haemorrhagic gastritis.
- ▶ Rarely, gastric or intestinal perforation, or oesophageal stricture.
- ▶ **Pupils:** miotic (constricted) at first, then dilate as coma deepens.
- ▶ **Skin:** scarlatiniform or urticarial rash from idiosyncrasy.
- ▶ **CNS:** ataxia and lethargy, progressing to deep coma.
- ▶ **Cardiovascular hallmark:** arrhythmias — atrial fibrillation, ventricular tachycardia, multifocal ventricular ectopics.
- ▶ Also **torsade de pointes**, ventricular fibrillation, and asystole.
- ▶ Hypotension is also seen.
- ▶ Deep coma together with arrhythmias in a patient who is NOT short of oxygen is typical of chloral-hydrate poisoning.
- ▶ **Liver and kidney:** jaundice and albuminuria.
- ▶ **Death** results from cardiac failure and/or respiratory paralysis.
- ▶ **Chronic use/dependence:** skin eruptions, gastric irritation, tremors, liver damage, a dependence syndrome.
- ▶ Abrupt withdrawal can cause delirium tremens, seizures, and psychosis.

Fatal dose, fatal period, post-mortem findings

Item	Value
Fatal dose	5–10 g
Fatal period	8–12 hours
Cause of death	Cardiovascular failure / respiratory paralysis

- ▶ **Post-mortem:** stomach mucosa congested, eroded, softened, smelling of chloral hydrate.
- ▶ Congestion of all internal organs, including the brain and lungs.
- ▶ Necrosis of the liver and kidney.

Diagnosis

- ▶ **Fujiwara test:** the sample (urine, etc.) is heated with sodium hydroxide and pyridine in a boiling water bath for 2 minutes.
- ▶ An intense red/purple colour indicates a trichloro-compound (chloral hydrate, chloroform, or trichloroethylene).
- ▶ Chemical analysis of blood, urine, stomach contents and viscera confirms chloral hydrate/trichloroethanol.
- ▶ In suspected drug-facilitated crime, collect blood and urine early — the drug is rapidly metabolised and eliminated.

Treatment

- ▶ Gastric lavage with an alkaline solution if the patient is seen early.
- ▶ Treating arrhythmias is the priority — beta-blockers such as propranolol, or esmolol (preferred for rapid action).
- ▶ Bretylium is used for refractory arrhythmias.
- ▶ Hypotension: isotonic fluids, 10–20 mL/kg.
- ▶ Avoid catecholamine vasopressors — they can precipitate ventricular arrhythmias.
- ▶ Flumazenil has been used, since chloral hydrate has a benzodiazepine-like action.
- ▶ Enhanced elimination: haemodialysis, haemoperfusion, or peritoneal dialysis.
- ▶ General supportive care: airway protection, assisted ventilation, ECG monitoring.

Manner of poisoning

- ▶ Criminal/homicidal: given covertly in drink or food to enable robbery, kidnapping, or rape.
- ▶ Commonly reported on trains, buses, at railway stations, and near festivals.
- ▶ Mixed into food (chaat, laddoo, prasad) or drink (sattu, fruit juice, tea, coffee).
- ▶ Accidental: overdose during legitimate sedative use, or a combined-drug overdose.
- ▶ Suicidal: deliberate self-poisoning (e.g., the Anna Nicole Smith case, 2007 — chloral hydrate with benzodiazepines, ruled accidental).

Medico-legal significance

- ▶ Recognise drug-facilitated crime when a robbery or assault victim reports sudden helplessness after a drink or food from another person.
- ▶ Preserve blood, urine, stomach contents and viscera early, since the agent is rapidly eliminated.
- ▶ Maintain chain of custody for chemical analysis (Fujiwara test, trichloroethanol assay).
- ▶ In suspected sexual assault, examine the victim and document the level of consciousness and any amnesia.
- ▶ Consent obtained after a stupefying substance is no consent in law.
- ▶ At autopsy, correlate the pear-like odour, eroded stomach mucosa, organ congestion, and hepatorenal necrosis with cardiac dysrhythmia as the cause of death.
- ▶ Causing hurt by poison to commit an offence: Section 123 BNS 2023 (formerly Section 328 IPC 1860) — up to 10 years' imprisonment plus fine.
- ▶ This is the main section invoked when a Mickey Finn is used for robbery or assault.
- ▶ Rape where consent is vitiated by a stupefying substance: Section 63 BNS 2023 defines the offence (formerly Section 375 IPC 1860).
- ▶ Punishment is under Section 64 BNS 2023 (formerly Section 376 IPC 1860).
- ▶ Causing hurt by dangerous means: Section 118 BNS 2023 (formerly Sections 324/326 IPC 1860).
- ▶ Selling adulterated drink: Section 274 BNS 2023 (formerly Section 272 IPC 1860) and Section 275 BNS 2023 (formerly Section 273 IPC 1860).
- ▶ The medical witness gives expert opinion under Section 39 BSA 2023 (formerly Section 45 IEA 1872).

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Metabolic pathway of chloral hydrate:** chloral hydrate (ingested in drink) → liver alcohol dehydrogenase → trichloroethanol (active hypnotic metabolite) → aldehyde dehydrogenase → trichloroacetic acid (inactive) → excreted in urine.
- ▶ Side-label: "+ alcohol = synergistic CNS depression."
- ▶ **Labelled box "Mickey Finn / Knockout drops":** alcohol + chloral hydrate; bitter taste masked by alcohol; soluble in water and alcohol; rapid stupefaction leading to helplessness; used for robbery, rape, kidnapping.



What is sweet poison (to taste)? Give its clinical features, post-mortem appearance and medico-legal importance

Asked in: Paper III Oct 2021 — RGUHS MD Forensic Medicine

Definition / Introduction

- ▶ "Sweet poison to taste" is **lead acetate**, old apothecary name *sugar of lead* (also *salt of Saturn*, *Goulard's powder*).
- ▶ It earns this name from its **sweet taste**, which historically caused accidental and deliberate sweetening of food and wine.
- ▶ Lead (Pb) is a heavy grey metal; the pure metal is essentially non-toxic, but **all its salts are poisonous**.
- ▶ Lead is the **commonest heavy metal** causing toxicity, and behaves as a **cumulative poison** stored chiefly in bone.
- ▶ Ethylene glycol is loosely called "sweet" too, but its taste is only bitter-sweet — the true "sweet poison" is lead acetate.

Identity and important lead compounds

- ▶ **Sugar of lead = lead acetate** $[\text{Pb}(\text{C}_2\text{H}_3\text{O}_2)_2]$: white crystals with a sweet taste, once used medicinally as an astringent.
- ▶ **Lead carbonate** (*safeda*, white lead): white powder used in paints.
- ▶ **Lead chromate**: bright yellow powder ("chrome yellow").
- ▶ **Lead monoxide** (*litharge*): pale brick-red/orange masses.
- ▶ **Lead tetroxide** (*red lead*, *sindoor*): scarlet powder.
- ▶ **Lead sulphide** (*galena*, *surma*): the **least toxic** lead salt (insoluble at blood pH).
- ▶ **Tetraethyl lead (TEL)**: organic lead, former petrol antiknock additive; lipid-soluble, skin-absorbed, and more neurotoxic than inorganic lead.
- ▶ *Historical note:* Romans sweetened wine with **sapa** (a lead-acetate syrup); the resulting plumbism is thought to have hastened Rome's decline.

Toxicokinetics and mechanism of action

- ▶ Inorganic lead is absorbed slowly from the gut — about 10% in adults, but 33–50% in children, which is why children are at greater risk.
- ▶ Absorption is **faster and greater by inhalation**; skin absorbs inorganic lead poorly, but TEL crosses intact skin easily and lead crosses the placenta.
- ▶ Lead is a true cumulative poison: about 95% of adult body lead (70% in children) is stored in bone.
- ▶ High calcium intake favours bone storage; calcium deficiency mobilises lead back into blood.
- ▶ Excretion is mainly in **urine** and bile; loss through sweat, hair and nails is negligible.
- ▶ The biological half-life is very long — about **32 years in bone** and **7 years in kidney**.
- ▶ **Mechanism:** lead inhibits the haem-synthesis enzymes ALA dehydratase, coproporphyrinogen oxidase and ferrochelatase, causing anaemia and a build-up of porphyrin precursors.
- ▶ It also binds **sulphydryl groups** on enzymes and proteins, disrupting mitochondrial function and triggering apoptosis and haemolysis.
- ▶ Lead mimics **calcium**, deranging smooth-muscle contraction — producing colic, vasospasm/facial pallor, hypertension and abortion.
- ▶ It is also directly toxic to the central nervous system.

Clinical features — Acute poisoning

- ▶ **Fatal dose:** about 20 g lead acetate or 40 g lead carbonate (TEL ~100 mg/kg); **fatal period** about 1–2 days.
- ▶ Early symptoms: an astringent metallic taste, dry throat, thirst.
- ▶ Burning abdominal pain, nausea, vomiting, sometimes diarrhoea.
- ▶ **Peripheral circulatory collapse** from gastrointestinal fluid loss.
- ▶ Headache, insomnia, paraesthesias, depression, then coma and death.
- ▶ **Cerebellar ataxia** is common in children with acute lead poisoning.
- ▶ **Cause of death:** hypovolaemic shock secondary to gastroenteritis.

Clinical features — Chronic poisoning (plumbism / saturnism)

- ▶ Chronic poisoning follows a small daily intake of only about 1–2 mg of lead.
- ▶ Mnemonic for the cardinal features — **FLARE**: Facial pallor, Lead line, Anaemia, palsy/colic, Reproductive/Renal effects, Encephalopathy.

Feature	Key points
Facial pallor	Earliest, most consistent sign; caused by vasospasm, not just anaemia.
Lead (Burtonian) line	Blue gum line in 50–70%, commoner on the upper jaw; absent if edentulous, fades in ~3 weeks off exposure.
Anaemia	Microcytic hypochromic, later normocytic; RBCs show basophilic stippling .

Feature	Key points
Lead colic	Nocturnal peri-umbilical pain, relieved by firm pressure; constipation is usual.
Lead palsy	Wrist drop and foot drop; late finding, <10% of cases, commoner in men.
Lead encephalopathy	Commonest in children and with TEL; ~85% permanent brain damage, ~25% die.

- ▶ **Lead osteopathy:** lead deposited at the metaphyses of long bones gives radio-opaque "lead lines" on X-ray in children, with bone pain.
- ▶ **Reproductive/renal/cardiovascular effects:** sterility, impotence, menstrual disorders, abortion (3–6 months), fetal abnormality, nephritis, albuminuria, **saturnine (lead) gout**, and hypertension.

Laboratory diagnosis:

- ▶ Blood lead over 20 µg/dL is toxic; symptoms usually appear above 40–60 µg/dL (normal is under 10 µg/dL).
- ▶ Urinary lead exceeds 150 µg/L; erythrocyte/zinc protoporphyrin, δ-ALA and coproporphyrin are all raised, with basophilic stippling of RBCs on smear.
- ▶ X-ray shows dense metaphyseal lead lines after ≥4 weeks of heavy exposure, and radio-opaque material in the gut if lead was recently swallowed.

Post-mortem (autopsy) appearances

- ▶ **Acute poisoning:** signs of acute gastroenteritis — gastric mucosa thickened and softened, with eroded patches and a greyish-white deposit; intestines congested and eroded.
- ▶ **Chronic poisoning:**
 - Burtonian (lead) line visible on the gums.
 - Brain pale, swollen, with PAS-positive material around blood vessels.
 - Stomach and intestines ulcerated/haemorrhagic, contracted and thickened.
 - Liver and kidneys contracted with intranuclear inclusions; heart may be hypertrophied with aortic atheroma.
 - Paralysed muscles show fatty degeneration; peripheral nerves show segmental demyelination.
- ▶ **Chemical test:** add hydrochloric acid to the suspected material.
- ▶ A white **lead chloride** precipitate forms, dissolves in boiling water, and crystallises again on cooling.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **The lead-poisoned patient:** label facial (circumoral) pallor, Burtonian gum line, wrist drop, foot drop, peri-umbilical colic, encephalopathy (brain), and basophilic stippling of RBCs.
- ▶ **Haem-synthesis block flow diagram:** Glycine + Succinyl-CoA → δ -ALA (ALA dehydratase — inhibited) → ... → Coproporphyrinogen (coproporphyrinogen oxidase — inhibited) → Protoporphyrin IX (ferrochelatase — inhibited) → Haem; mark the resulting rise in δ -ALA/porphyrins and the anaemia this produces.

Medico-legal significance

- ▶ The sweet taste makes lead acetate easy to give covertly, explaining classic **accidental** poisonings — lead-glazed cooking vessels, ghee/oil stored in tinned brass or copper vessels, and lead pipes contaminating drinking water.
- ▶ Most lead poisoning is **chronic and occupational/accidental**.
- ▶ **Acute poisoning is rare, suicidal use is not practised, and homicide is rare** — the fatal dose is large and the action is slow.
- ▶ **Occupational disease:** plumbism in painters, plumbers, potters, printers, smelters, and battery/glass workers is compensable under **Section 3, Employees' Compensation Act, 1923**.
- ▶ **Abortifacient use:** diachylon paste (lead oleate) and red lead are applied locally to procure criminal abortion, an offence under **Section 312 IPC 1860 (now Section 88 BNS 2023)**.
- ▶ A death caused this way engages the homicide provisions — **Section 300/302 IPC 1860 (now Section 101/103 BNS 2023)** for murder, or **Section 299/304 IPC 1860 (now Section 100/105 BNS 2023)** for culpable homicide.
- ▶ A suspicious or custodial death from lead needs a police **inquest** under **Section 174 CrPC 1973 (now Section 194 BNSS 2023)**, with expert toxicological opinion admissible under **Section 45 Indian Evidence Act 1872 (now Section 39 BSA 2023)**.
- ▶ **Souvenir bullets:** retained lead bullets/pellets can slowly dissolve in synovial fluid, causing delayed plumbism 12–48 days after the injury.
- ▶ **Paternal toxicity:** a man with chronic lead poisoning has raised seminal lead and reduced fertility; a healthy woman impregnated by him is liable to abort.
- ▶ **Cosmetic/cultural exposure:** *sindoor* (red lead) on the scalp and *surma* (lead sulphide) on the eyes are recognised child-safety hazards.
- ▶ **Differential of a gum line:** similar blue lines occur with mercury, copper, bismuth, silver and iron — the line must not be attributed to lead automatically.

♦ ♦ ♦

Why Methyl alcohol consumption is more dangerous than Ethyl alcohol – Justify, give its clinical features?

Asked in: Paper III Apr 2022 — RGUHS MD Forensic Medicine

Definition / Introduction

- ▶ *Methyl alcohol* (methanol, wood alcohol; CH_3OH) and *ethyl alcohol* (ethanol; $\text{C}_2\text{H}_5\text{OH}$) are both **inebriant poisons** — they first cause euphoria by depressing the brain's higher centres, then generalised cerebral depression.
- ▶ The two taste alike, but **methanol is far more dangerous**: ethanol itself is the toxin and is largely self-limiting.
- ▶ Methanol is a *protoxin* — "**lethal synthesis**" turns it into toxic metabolites (formaldehyde, formic acid) that cause delayed metabolic acidosis, irreversible blindness and death.
- ▶ In India the danger is magnified by criminal adulteration of country liquor, causing mass-casualty "**hooch tragedies**."

Why methanol is more dangerous than ethanol

- ▶ **Lethal synthesis**: both alcohols are oxidised in the liver by **alcohol dehydrogenase (ADH)**.
- ▶ Ethanol's metabolites (acetaldehyde, then acetate) feed harmlessly into metabolism, but methanol is oxidised to **formaldehyde** (~33× more toxic) and then **formic acid** (~6× more toxic).
- ▶ **Slow metabolism**: methanol persists in blood up to **one week**; its metabolites build up, giving a deceptive **latent period of 12–24 hours** before serious features appear, so the patient often presents late, already acidotic.
- ▶ Ethanol clears steadily (~15 mg% per hour), and the drunken patient usually just recovers after sleep.
- ▶ **Severe acidosis**: accumulating formic acid causes a **high-anion-gap, high-osmolal-gap metabolic acidosis** and inhibits **cytochrome oxidase** — a histotoxic effect like cyanide or carbon monoxide poisoning.
- ▶ Death from methanol is essentially due to this acidosis with respiratory failure — acute ethanol poisoning rarely causes such acidosis, and pure-ethanol deaths are uncommon.
- ▶ **Eye and brain toxicity**: formic acid in the optic nerve and vitreous causes optic neuritis → atrophy → **permanent blindness**; as little as **15 mL** can blind.
- ▶ Severe survivors may develop an **extrapyramidal disorder** from **putaminal necrosis** — ethanol causes no comparable damage.
- ▶ **Lower fatal dose**: methanol's fatal dose is small (~15–250 mL, easily reached in one bout) versus ethanol's much higher 5–8 g/kg (fatal blood level above 500 mg%).
- ▶ **Public-health impact**: cheap, legal methanol (denatured/methylated spirit) adulterates illicit country liquor ("**hooch**") — one contaminated batch can sicken or kill many at once.

Methanol vs ethanol at a glance

Feature	Methanol	Ethanol
Toxic principle	Toxic metabolites (formaldehyde, formic acid)	Parent compound itself
Metabolism	ADH → formaldehyde → formic acid; slow	ADH → acetaldehyde → acetate; ~15 mg%/h
Latent period	12–24 h (deceptively well)	Rapid (minutes)
Acidosis	Severe high-anion-gap	Usually absent
Eye	Optic atrophy → permanent blindness	No specific lesion
Fatal dose	~15–250 mL	5–8 g/kg
Fatal blood level	~70–200 mg%	>500 mg%
Antidote	Ethanol or fomepizole + folinic acid + dialysis	None specific

Clinical features of methanol poisoning

- ▶ After a latent period of about 12–24 hours, toxicity evolves as a triad: **CNS depression, ocular toxicity and metabolic acidosis**.
- ▶ **General:** mild but prolonged drunkenness, malaise, dizziness, weakness.
- ▶ **Gastrointestinal:** nausea, vomiting, severe abdominal/epigastric cramps, pancreatitis.
- ▶ Suspect methanol whenever **abdominal pain occurs with visual disturbance** after drinking.
- ▶ **CNS:** headache, neck stiffness, vertigo, confusion, delirium, convulsions, and finally coma.
- ▶ **Ocular features (the hallmark, caused by formic acid):**
 - Early photophobia, blurred "**snowfield / misty vision**," scotoma and nystagmus.
 - Fundus: retinal/retrobulbar oedema and hyperaemia of the optic disc.
 - Pupils are reactive at first, later **dilated and fixed**.
 - Progression from optic neuritis to optic atrophy to complete, permanent blindness.
- ▶ **Metabolic:** high-anion-gap acidosis with elevated osmolal gap, Kussmaul breathing (deep sighing breaths), hypophosphataemia, raised CPK and amylase.
- ▶ **Other:** tachycardia, hypertension, and in severe cases renal and multi-organ failure.
- ▶ **Cause of death:** metabolic acidosis with respiratory failure.
- ▶ Ethanol poisoning, by contrast, passes through three stages by blood alcohol concentration (BAC):
 - **Excitement:** BAC 50–150 mg%.
 - **Incoordination/stupor:** BAC 150–300 mg%.
 - **Coma:** BAC >300 mg%, pupils dilating on pain (*McEwan's sign*); death needs BAC above ~500 mg%.

Diagnosis

- ▶ Blood methanol level, detectable formic acid (formate), and high anion/osmolal gap on blood-gas analysis.
- ▶ CT/MRI brain: bilateral putaminal necrosis.
- ▶ Fundoscopy, or optical coherence tomography (OCT), for retinal/retrobulbar changes.

Management

- ▶ Principle: **block ADH**, correct acidosis, enhance elimination, and protect the eyes.
- ▶ **Decontamination**: gastric lavage with 5% sodium bicarbonate if presenting early (within ~2 h); activated charcoal.
- ▶ **Ethanol (specific antidote)**: has much higher ADH affinity than methanol, so it blocks formaldehyde/formic acid formation — given IV (preferred) or orally, to keep blood ethanol at ~100–125 mg%.
- ▶ **Fomepizole (4-methylpyrazole)**: a competitive ADH inhibitor and the preferred modern antidote — no inebriation, faster, fewer side effects, no intensive care unit (ICU) admission, but costly and poorly available in India.
- ▶ **Folinic acid (leucovorin)**: 1–2 mg/kg IV, converts formic acid to CO₂ and water; needed in almost all cases.
- ▶ **Haemodialysis**: the most effective way to remove methanol and its metabolites — indicated for severe acidosis (pH <7.25), visual symptoms, renal failure, or high methanol levels.
- ▶ **Supportive care**: IV sodium bicarbonate, eye protection in a dark room, oxygen, thiamine, respiratory support.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ Comparative metabolism flowchart on one ADH pathway.
- ▶ Methanol → ADH → formaldehyde (33× toxic) → aldehyde dehydrogenase → formic acid (6× toxic).
- ▶ Branch A: cytochrome-oxidase inhibition → optic nerve → optic neuritis/atrophy → blindness.
- ▶ Branch B: high-anion-gap metabolic acidosis → death.
- ▶ Branch C: folinic acid → CO₂ + H₂O (detoxification).
- ▶ Parallel line: ethanol → ADH (higher affinity, competitive block — the antidote point) → acetaldehyde → acetate/acetyl-CoA (harmless).
- ▶ Second diagram — eye/fundus in methanol toxicity: optic disc hyperaemia, retrobulbar/retinal oedema, optic nerve site of neuritis, dilated fixed pupil.

Medico-legal significance

- ▶ The manner of poisoning is usually accidental — adulterated illicit liquor (hooch), or methylated/denatured spirit abused by labourers lacking ethanol.
- ▶ Deliberate adulteration causes mass-fatality **liquor tragedies**: a **hooch tragedy** is two or more persons of one locality falling ill or dying together after illicit liquor.

- ▶ The doctor's duties are life-saving triage, a **medico-legal case (MLC)** report per casualty, and in the mortuary — identification, autopsy and viscera preservation for the Forensic Science Laboratory (FSL).
- ▶ **Viscera preservation:**
 - Routine viscera: saturated common salt (sodium chloride) solution.
 - Blood-alcohol sample: sodium fluoride + potassium oxalate, paraffin overlay, frozen, analysed early.
 - Avoid EDTA/heparin (interfere with testing); methenamine/formalin can give a false-positive methanol result.
- ▶ **Autopsy findings:**
 - Cyanosis, congested/oedematous emphysematous lungs, fatty liver, acute tubular degeneration of kidneys.
 - Congested oedematous brain with subarachnoid haemorrhage and putaminal necrosis.
- ▶ Drink-driving with blood alcohol above **30 mg per 100 mL** on a breath analyser or other test is punishable under **Section 185, Motor Vehicles Act 1988** (as amended 2019).
- ▶ A doctor may examine an arrested drunken driver, using reasonable force if necessary, under **Section 53 CrPC 1973 (now Section 51 BNSS 2023)**.
- ▶ Every methanol-poisoning death is an unnatural death requiring police inquest under **Section 174 CrPC 1973 (now Section 194 BNSS 2023)** and a medico-legal autopsy.
- ▶ Mass deaths from methanol-adulterated liquor are prosecuted as culpable homicide or murder of the manufacturers under **Sections 299/300, 304/302 IPC 1860 (now Sections 100/101, 105/103 BNS 2023)**.



Write in detail the post mortem findings and treatment of Cyanide poisoning

Asked in: Paper III Oct 2022 — RGUHS MD Forensic Medicine

Definition

- ▶ Cyanide is a **systemic (histotoxic) asphyxiant** — it kills not by blocking oxygen delivery but by stopping the tissues from using the oxygen already present in the blood.
- ▶ It exists as the gas **hydrogen cyanide (HCN)**, the liquid **hydrocyanic acid (prussic acid)**, and solid **cyanide salts (KCN, NaCN)**.
- ▶ HCN is one of the fastest-acting poisons known.
- ▶ The toxic action is **inhibition of cytochrome oxidase**, causing histotoxic anoxia, lactic acidosis, and death from central respiratory arrest.

Mechanism (basis of the autopsy picture and the antidotes)

- ▶ Cyanide ion binds strongly to **ferric (Fe^{3+}) iron in cytochrome a-a₃ (cytochrome oxidase)**, the terminal enzyme of the mitochondrial electron-transport chain.
- ▶ This halts aerobic ATP production; cells switch to anaerobic glycolysis, producing **lactic acidosis**.

- ▶ Oxygen still reaches the tissues but cannot be used, so **venous blood stays oxygenated**.
- ▶ This is why the blood, skin, lividity and retinal vessels look bright pink/cherry-red at autopsy.
- ▶ **Rhodanese** (a liver/kidney enzyme) normally converts cyanide to harmless **thiocyanate** using a sulfur donor — this is the basis for sulfur-donor antidotes.
- ▶ A little cyanide is exhaled (the bitter-almond smell) and a little converts to vitamin B₁₂ — the basis for hydroxocobalamin therapy.

Fatal dose and fatal period

- ▶ **HCN gas**: almost instantaneous at high concentration; a few minutes at lower concentration.
- ▶ **Hydrocyanic acid (ingested)**: fatal dose about 50–100 mg; death in 2–10 minutes.
- ▶ **Cyanide salts (KCN/NaCN)**: fatal dose about 200–300 mg; death takes roughly 30 minutes.
- ▶ Salts act slower because **gastric hydrochloric acid must first liberate HCN** from the salt.
- ▶ Death is from **central respiratory arrest**.
- ▶ People with **achlorhydria** (no gastric acid) may resist an otherwise fatal dose of salt — the basis of the *Rasputin* case.

Post-mortem findings

Precautions for the autopsy surgeon:

- ▶ Risk of **secondary poisoning** — gastric contents keep releasing HCN gas, so wear a mask, gloves and eye protection.
- ▶ Perform the autopsy in the open or under an exhaust.
- ▶ **Open the skull first** — the bitter-almond smell is best appreciated in the brain, before other cavities are opened.
- ▶ **Do not embalm** the body — formaldehyde destroys cyanide.

External findings:

- ▶ **Bitter-almond odour** from the mouth and nostrils.
- ▶ 20–40% of people (mostly males) genetically cannot smell this odour, so its absence does not rule out cyanide.
- ▶ **Bright/cherry-pink lividity** from retained oxyhaemoglobin (also seen in carbon monoxide poisoning and hypothermia).
- ▶ Eyes bright and prominent; **pupils dilated and unreactive**; retinal vessels equally red.
- ▶ **Jaws clenched (trismus)**; blood-stained froth at the mouth and nostrils.
- ▶ **Corrosion of the lips and mouth angle**, especially with the alkaline salts.
- ▶ Fingernails may look blue; skin bullae and other asphyxial signs may be present.

Internal findings:

- ▶ **Stomach**: hemorrhagic gastritis; mucosa crimson to blackened, from potassium carbonate impurity in the salt and formation of **cyanhemochromogen**.
- ▶ Stomach contents may show almond or cherry-kernel fragments.
- ▶ **Lungs**: oedematous and congested.

- ▶ **Brain:** cerebral oedema; survivors of a sub-lethal dose may later develop basal-ganglia damage (delayed parkinsonism).
- ▶ **Petechial haemorrhages** in brain, meninges, pleura, lungs and pericardium.
- ▶ **All viscera congested;** blood stays bright cherry-red because even venous blood remains oxygenated.
- ▶ Cause of death is recorded as **respiratory failure from histotoxic anoxia**.

Specimens for chemical analysis:

- ▶ Preserve **blood, stomach and contents, lung (sealed in a nylon bag, not plastic), liver, kidney, brain and heart**.
- ▶ **Spleen is the best routine sample** — it carries the highest cyanide concentration.
- ▶ Preserve blood with **sodium fluoride**; analyse immediately, since up to ~70% of cyanide can be lost within weeks.
- ▶ **Lee-Jones test** screens gastric aspirate — a **greenish-blue colour** indicates cyanide.
- ▶ Confirm with a **blood cyanide assay** (fatal level roughly $\geq 1 \mu\text{g/mL}$).
- ▶ Cyanide can also form in a decomposing body from microbial action — interpret quantitative results in putrefied cases with caution.

Treatment

- ▶ Cyanide poisoning is a **medical emergency** — start treatment immediately, since the fatal period is very short.
- ▶ The three priorities are **100% oxygen, the antidotes, and gastric decontamination**.
- ▶ Antidotes are given even **before** gastric lavage.
- ▶ **Do not attempt mouth-to-mouth resuscitation** (risk to the rescuer).

Removal and stabilisation:

- ▶ Remove the victim from the source and remove contaminated clothing; wash skin with soap and water.
- ▶ Secure the airway; give **100% oxygen**; obtain IV access; start cardiac monitoring.
- ▶ Correct the **lactic acidosis** with IV sodium bicarbonate; treat hypotension with vasopressors.

Antidotes — the Eli Lilly cyanide kit, given in sequence:

- ▶ **Amyl nitrite** — a crushed ampoule is inhaled while IV access is being obtained.
- ▶ **Sodium nitrite 3%, 10 mL slow IV** — converts haemoglobin to **methaemoglobin**, which pulls cyanide off cytochrome oxidase.
- ▶ **Sodium thiosulfate 25%, 50 mL slow IV** — a sulfur donor; lets rhodanese convert the freed cyanide to harmless thiocyanate.
- ▶ Keep **methaemoglobin below 25%** — over-treatment is itself fatal (the patient turns chocolate-brown).
- ▶ Both nitrite and thiosulfate may be repeated at half-dose after one hour if symptoms persist.

Newer / alternative antidotes:

- ▶ **Hydroxocobalamin ("Cyanokit") 5 g IV** — binds cyanide directly to form vitamin B₁₂.

- ▶ It is safe, does not cause methaemoglobinaemia, and is preferred in **fire/smoke-inhalation** victims.
- ▶ **Dicobalt edetate ("Kelocyanor") 300 mg IV** — a direct chelator, reserved for **confirmed** poisoning because of serious side effects.
- ▶ **Methylene blue is no longer used.**

Decontamination and supportive care:

- ▶ **Gastric lavage** with sodium thiosulfate or potassium permanganate, followed by activated charcoal.
- ▶ **Emesis is contraindicated** — risk of sudden seizures or apnoea.
- ▶ Treat seizures with diazepam; manage pulmonary oedema and arrhythmias.
- ▶ Observe for 24–48 hours, since toxicity can recur.

Medico-legal significance

- ▶ Manner of death is usually **accidental** (fire fumes; jewellers/electroplaters using KCN) or **suicidal** (jewellers, chemists, concealed pellets used by spies).
- ▶ **Homicide is rare** (historic examples: Rasputin, Nazi gas chambers).
- ▶ **Purposeful movements are possible** even after a fatal dose is taken — the victim may cork the bottle or walk a short distance, which can wrongly suggest homicide.
- ▶ In fire deaths, always test for **both carbon monoxide and cyanide together** — a raised blood cyanide shows the victim inhaled combustion gases while alive.
- ▶ Causing hurt by poison with intent is punishable under **Section 123 BNS 2023** (re-enacting **Section 328 IPC 1860**).
- ▶ Death from cyanide amounts to murder/culpable homicide under **Section 101/103 BNS 2023** (**Section 300/302 IPC 1860**) or **Section 100/105 BNS 2023** (**Section 299/304 IPC 1860**).
- ▶ A cyanide death is an **unnatural/suspicious death**, requiring a police inquest under **Section 194 BNSS 2023** (**Section 174 CrPC 1973**), or a magistrate's inquest under **Section 196 BNSS 2023** (**Section 176 CrPC 1973**) where indicated.
- ▶ The doctor's duties: preserve viscera with the correct preservative, maintain chain of custody, and report the case.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Mechanism + antidote flow.** Cyanide (CN^-) → binds Fe^{3+} of cytochrome oxidase → blocks the electron-transport chain → no ATP / anaerobic glycolysis → lactic acidosis + histotoxic anoxia. Antidote arms: nitrites → methaemoglobin → cyanmethaemoglobin (frees the enzyme); thiosulfate + rhodanese → thiocyanate → urine; hydroxocobalamin → cyanocobalamin (B_{12}) → urine.
- ▶ **Autopsy schematic.** Bitter-almond odour (open cranium first); bright-pink lividity; dilated pupils; blood-stained froth; clenched jaws; blackened gastric mucosa; oedematous lungs; cerebral oedema; serosal petechiae; spleen as the best specimen.

◆ ◆ ◆

Write on a) Phossy jaw b) Aldrich mee's lines

Asked in: Paper III Oct 2021 — RGUHS MD Forensic Medicine

- ▶ **Phossy jaw** and **Aldrich-Mees lines** are classic eponymous signs of chronic poisoning by inorganic irritant poisons.
- ▶ Phossy jaw (also called *glass jaw* or *Lucifer's jaw*) is osteomyelitis and necrosis of the mandible caused by chronic **phosphorus** poisoning.
- ▶ It classically occurred in match-factory workers.
- ▶ Aldrich-Mees lines are transverse white bands across the nails, the hallmark of chronic **arsenic** poisoning.
- ▶ Their position on the nail can be used to time the poison exposure.
- ▶ Both signs reflect the affinity of these poisons for slow-growing hard tissue — bone and keratin.

a) Phossy jaw

Background

- ▶ Only **white (yellow) phosphorus** is toxic.
- ▶ **Red phosphorus**, used on matchbox striking strips, is non-toxic.
- ▶ White phosphorus is a **protoplasmic poison** — toxic to cell protoplasm generally, not to one specific organ.
- ▶ It was historically used in fertilizers, vermin-killers, rodenticides, fireworks, gunpowder and incendiary bombs.
- ▶ Phossy jaw follows **chronic occupational exposure** — years of inhaling phosphorus fumes (phosphorus pentoxide).
- ▶ It was classic among workers in the old lucifer-match industry.
- ▶ This is a true chronic disease, distinct from acute phosphorus poisoning (which is corrosive and liver-damaging).

Pathogenesis

- ▶ Phosphorus vapour enters the jaw through a **carious (decayed) tooth**, or through the gap left by a missing tooth.
- ▶ Pus-forming micro-organisms are already present at that site.
- ▶ It characteristically affects the **lower jaw (mandible)** near the decayed tooth.
- ▶ The result is **osteomyelitis** (infective bone inflammation) followed by **necrosis** (bone death), with **sequestrum** (dead bone) formation.
- ▶ Modern mechanistic parallel: yellow phosphorus is converted in the body into bisphosphonate-like compounds.
- ▶ These inhibit an enzyme that osteoblasts (bone-forming cells) need to survive, causing osteoblast death and osteonecrosis.

- ▶ This is the same pathway by which the modern drugs **alendronate** and **pamidronate** (used for osteoporosis) cause bisphosphonate-related osteonecrosis of the jaw (BRONJ).

Clinical features — stepwise destruction of the jaw

Stage	Feature
Early	Toothache
Progressive	Swelling of the jaw; loosening of teeth
Established	Necrosis of the gums; sequestration of mandibular bone
Discharging	Multiple sinuses discharging foul-smelling pus
Advanced	Teeth fall out and bone is exposed; complete mandibular sloughing with facial disfigurement

- ▶ Systemic features accompany the local disease: nausea, vomiting, anorexia, abdominal pain, joint pain, weakness, loss of weight.
- ▶ Severe cases also show bronchitis, cirrhosis, jaundice, ascites and anaemia.
- ▶ The course is one of slow, progressive bone destruction with a strong tendency to secondary infection.

b) Aldrich-Mees lines (Mees' lines)

Definition and appearance

- ▶ Transverse (horizontal) white lines across the fingernails.
- ▶ The classic nail sign of **chronic arsenic poisoning**.
- ▶ Described as white bands of opacity, 1–2 mm broad, running completely across the nail in all fingers.
- ▶ They appear as part of the **dermatological stage** of chronic arsenicosis.
- ▶ Named after **C.J. Aldrich**, who first described them — hence the name *Aldrich-Mees lines*.
- ▶ Actually uncommon — seen in only about 5% of cases.
- ▶ The nails may become deformed or fall out within 2–3 weeks of exposure.

Pathogenesis

- ▶ The line represents an **arrest of nail growth** — a band of damaged keratin laid down by the nail matrix.
- ▶ Arsenic combines with sulfhydryl (–SH) groups of enzymes.
- ▶ It is deposited in keratin-rich tissue (hair, nails, skin), where it can remain for years.
- ▶ It also replaces phosphorus in bone.
- ▶ As the nail continues to grow, the damaged band moves outward, marking the time of exposure.

Medico-legal significance — the "biological calendar"

- ▶ The nail grows at a roughly constant rate.
- ▶ The distance of the Mees' line from the nail base (lunula/cuticle) can estimate the time elapsed since exposure.
- ▶ A single line suggests a single, short exposure.
- ▶ Multiple parallel lines suggest repeated dosing, pointing towards **homicidal administration**.
- ▶ Their presence corroborates chronic arsenic poisoning — relevant in suspected homicide.
- ▶ Arsenic has historically been a favoured homicidal poison because it is tasteless and odourless and mimics natural disease such as gastroenteritis.
- ▶ Arsenic appears in hair and nails within hours of ingestion and persists there for years.
- ▶ Segmental analysis of hair and nails, together with the position of the lines, can reconstruct the pattern and timing of dosing.
- ▶ Hair and nails can be preserved for analysis without any preservative.
- ▶ Mees' lines are **not exclusive to arsenic** — the other classic cause is **thallium** poisoning.
- ▶ A Mees' line therefore only supports, and does not prove, arsenic poisoning; chemical analysis of hair, nail, urine or viscera is needed for confirmation.

Associated signs of chronic arsenicosis

- ▶ **Raindrop pigmentation** — mottled brown pigmentation on flexures, temples, eyelids, neck, nipples, lower abdomen.
- ▶ **Hyperkeratosis** of the palms and soles, which may progress to skin cancer.
- ▶ **Leucomelanosis** — depigmentation, classically of the malar area; said to be the earliest sign of chronic arsenicosis.
- ▶ **Alopecia** (hair loss) and peripheral neuritis.
- ▶ **Blackfoot disease** — peripheral vascular gangrene of the lower limbs, seen in endemic arsenic-contaminated water areas.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Phossy jaw**: a frontal/oblique view of the mandible.
 - Label the carious tooth (fume entry point), loosened teeth, jaw swelling, necrosed gum, sequestrum, discharging sinuses, and exposed bone.
- ▶ **Aldrich-Mees lines**: a fingernail in top view.
 - Label the nail plate, lunula/base (matrix), cuticle, and a transverse white line.
 - Add an arrow: "distance from base $\propto$ time since exposure."
 - Show a single line (single exposure) alongside multiple parallel lines (repeated, homicidal dosing).

Medico-legal significance

- ▶ Phossy jaw is diagnostic of **chronic occupational phosphorus poisoning**.

- ▶ Poisoning by phosphorus contracted as a disease peculiar to employment is **deemed an injury by accident** under **Section 3 of the Employees' Compensation Act, 1923** (formerly the Workmen's Compensation Act) — the employer is liable to compensate the worker.
- ▶ Teeth and jawbone resist putrefaction, so phosphorus deposition and phossy-jaw changes can be detected long after death, even in skeletal remains.
- ▶ Phosphorus itself is detectable in a putrefied body.
- ▶ Mees' lines are a diagnostic clue to chronic arsenic (or thallium) poisoning.
- ▶ Their distance from the nail base dates the exposure; multiple lines indicate repeated, likely homicidal, dosing.
- ▶ Arsenic persists in keratin (hair, nails) and bone for years, so it remains detectable long after death.
- ▶ Correct sampling matters: for arsenic, collect hair and nails (no preservative needed) plus viscera, urine and blood.
- ▶ For phosphorus, tie the stomach and intestine at both ends and preserve viscera in saturated saline — not spirit, which destroys the phosphorus's luminosity — opened under nitrogen before analysis.



Carbon monoxide (CO) poisoning — clinical features, treatment, post-mortem appearance and medico-legal aspects

Asked in: Paper III Oct 2021 — RGUHS MD Forensic Medicine

Definition and mechanism

- ▶ Carbon monoxide (CO) is a colourless, odourless, tasteless gas, lighter than air and insoluble in water.
- ▶ It is produced whenever a carbon-containing fuel burns incompletely.
- ▶ CO is the classic **chemical (systemic) asphyxiant** — it kills by blocking oxygen transport in the blood, not by excluding oxygen from the air.
- ▶ Because it gives no warning to the senses, it is the commonest cause of fatal accidental gas poisoning worldwide.

SOURCE & COVERAGE

- ▶ **Common sources:** vehicle/generator exhaust, smoke in building fires, a charcoal brazier (*angeethi*) in a closed room, defective kerosene/gas heaters, coke and lime kilns, mine blasting fumes, tobacco smoke, and methylene chloride (a paint-remover metabolised in the body to CO).
- ▶ Domestic LPG/piped gas itself has almost no CO, but incomplete combustion in a closed room still generates it.
- ▶ **Endogenous CO** is made normally during breakdown of haem; normal COHb is up to about 1% in non-smokers and 4–8% in smokers.

Mechanism of toxicity

- ▶ CO binds haemoglobin about 200–250 times more strongly than oxygen, forming **carboxyhaemoglobin (COHb)**, cutting blood's oxygen-carrying capacity despite a normal blood oxygen tension.
- ▶ CO also shifts the oxyhaemoglobin dissociation curve to the left, so the oxygen still bound to haemoglobin is released poorly to the tissues — a "double" insult.
- ▶ CO binds myoglobin too, impairing heart-muscle function, and inactivates mitochondrial cytochrome oxidase, blocking cellular respiration directly (a histotoxic effect).
- ▶ It displaces nitric oxide (NO) from platelets and vessel walls, causing oxidative stress, hypotension, and demyelination of the basal ganglia/white matter — the basis of the delayed neuropsychiatric syndrome below.
- ▶ The net effect is a mixed anaemic-plus-histotoxic hypoxia, hitting the brain and heart hardest.

Clinical features

- ▶ Symptoms track the rising COHb level. CO poisoning is called "the great mimic" — it resembles alcohol intoxication, migraine, meningitis/encephalitis, food poisoning, influenza, or a heart attack.
- ▶ The elderly, anaemic, pregnant, and cardio-respiratory-diseased are most vulnerable; the fetus and newborn are especially susceptible, since fetal haemoglobin binds CO even more avidly.

COHb level	Clinical picture
10–20%	Mild throbbing headache, breathlessness on exertion
30–40%	Severe headache, confusion, nausea, dim vision; cherry-red skin may begin to appear
50–60%	Deep pink/red colour, coma with intermittent convulsions, tachycardia
60–80%	Deepening coma, hypotension, arrhythmias, incontinence
>80%	Rapid death from respiratory arrest

- ▶ **Cardiovascular:** chest pain, arrhythmias, myocardial ischaemia/infarction, hypotension, pulmonary oedema.
- ▶ **Nervous system:** headache, confusion, disorientation, seizures, coma; retinal haemorrhages and optic-disc oedema on fundoscopy.
- ▶ **Skin:** cherry-red discoloration of skin and mucous membranes — classically described, but actually uncommon in life, and needs a COHb above 40%. Blisters may form over pressure areas.
- ▶ **Delayed neuropsychiatric syndrome:** occurs in roughly 30% of survivors, 2–40 days after apparent recovery. Features include parkinsonism, dystonia, memory and cognitive deficits, dementia, psychosis, and personality change.

Investigations

- ▶ **COHb estimation by co-oximeter,** on arterial or venous blood, is the single most useful test. COHb above 2% in a non-smoker, or above 10% in a smoker, confirms exposure.
- ▶ Routine pulse oximetry and blood-gas oxygen readings are falsely normal — a dedicated co-oximeter is required.
- ▶ Arterial blood gas usually shows metabolic (lactic) acidosis; a raised lactate reflects severity. ECG may show ischaemia, arrhythmias, and a raised troponin.
- ▶ CT/MRI show symmetrical lesions of the globus pallidus, putamen, and caudate within about 12 hours.
- ▶ **Bedside test:** dilute blood with water and sodium hydroxide — CO-laden blood turns straw-yellow or pink, normal blood turns brown.

Treatment

- ▶ Remove the victim from the contaminated area at once; secure the airway and ensure ventilation.
- ▶ **100% oxygen,** by tight-fitting non-rebreather mask or endotracheal tube, is the specific antidote — continue until COHb falls to about 15–20%.
- ▶ CO's elimination half-life falls from 4–5 hours in room air to about 40 minutes on 100% oxygen, and to about 20 minutes on hyperbaric oxygen at 2.5 atmospheres.
- ▶ **Give HBO** in severe poisoning: loss of consciousness, coma, seizures, focal neurological deficit, metabolic acidosis, COHb above 25% (above 15% in pregnancy), or age above 50.
- ▶ HBO also prevents lipid peroxidation and reduces delayed neurological injury.
- ▶ Admit for cardiac/respiratory monitoring if there are neurological signs, chest pain, an abnormal ECG, acidosis, or COHb above 20%.
- ▶ Correct severe acidosis (pH below 7.15) cautiously with intravenous sodium bicarbonate.
- ▶ Watch for cerebral oedema and give anticonvulsants for seizures; arrange close follow-up for delayed neuropsychiatric sequelae.

Post-mortem appearance

- ▶ **Cherry-red (pink) coloration** of the skin, lividity, mucous membranes, and internal organs/blood is the hallmark, seen when COHb is roughly above 40%.
- ▶ In dark-skinned persons, look for it in the inner lips, tongue, nail beds, palms, and soles. Putrefaction changes this colour to dark green/brown.

- ▶ **Blood stays bright cherry-pink and remains fluid.**
- ▶ Cutaneous blisters may appear over pressure areas — wrists, knees, calves.
- ▶ Serous effusions in body cavities; generalised visceral congestion.
- ▶ **Lungs:** congestion, pulmonary oedema, pleural haemorrhages; soot in the airways if death occurred in a fire.
- ▶ **Heart:** pericardial haemorrhages, focal myocardial necrosis, frank infarction if pre-existing coronary disease.
- ▶ **Brain:** firmer than normal and retains its shape after removal; meningeal haemorrhages.
- ▶ In delayed deaths, bilateral necrosis/cavitation of the **globus pallidus and putamen** is the most characteristic lesion, with punctiform and ring-shaped white-matter haemorrhages.
- ▶ **Always collect blood for COHb analysis**, in any suspected case and in every fire death.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ Oxyhaemoglobin dissociation curve: plot the normal sigmoid curve and a leftward-shifted curve for the CO effect. Label "P50 reduced" and "impaired oxygen release to tissues".
- ▶ A coronal brain section showing bilateral symmetrical necrosis/cavitation of the globus pallidus and putamen (delayed CO encephalopathy), with white-matter haemorrhages marked.

Medico-legal significance

- ▶ **Manner of death** is mostly accidental — winter brazier deaths, defective heaters, exhaust fumes in a closed garage, building fires, occupational exposure.
- ▶ Suicide by coal gas was common historically in the West but is now rare since the switch to natural gas/LPG; homicide is rare, since CO is hard to administer covertly.
- ▶ **Antemortem versus post-mortem burns:** significant COHb in a charred body proves the victim was breathing during the fire, so the burns are antemortem. Its absence suggests the body was burnt after death, and soot in the airways supports the antemortem finding.
- ▶ Bruises sustained during or after CO poisoning keep a cherry-red colour.
- ▶ **Scene clues:** a closed room with a lit fire or brazier; in vehicle deaths, check the exhaust system for defects.
- ▶ **Pitfall:** decomposition can artefactually raise COHb up to about 20%, so interpret results against the state of decomposition. Cyanide poisoning and hypothermia can also produce a cherry-red/pink colour, a key differential.
- ▶ An unnatural or suspicious death needs a police inquest under **Section 174 CrPC 1973 (now Section 194 BNSS 2023)**, or a magistrate inquest in custodial/other suspicious deaths under **Section 176 CrPC 1973 (now Section 196 BNSS 2023)**.
- ▶ The doctor preserves blood for COHb estimation, assists the inquest and autopsy, and gives expert opinion on cause and manner of death under **Section 45 Indian Evidence Act 1872 (now Section 39 Bharatiya Sakshya Adhiniyam, BSA 2023)**.

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Write the clinical features, uses and Medico Legal aspects of Datura poisoning

Asked in: Paper III Oct 2021 — RGUHS MD Forensic Medicine

Definition / Introduction

- ▶ *Datura* (Datura) — thorn apple, Jimson weed, devil's trumpet; Sanskrit *Dhurta* means cheat.
- ▶ A vespertine (evening-flowering) wild weed of family **Solanaceae**, common on wasteland and roadsides across India.
- ▶ India's classic **deliriant poison** — causes an acute confusional state with delirium, hallucinations and stupor.
- ▶ All parts are poisonous; the **seeds** hold the highest concentration of the anticholinergic (belladonna) tropane alkaloids.
- ▶ Dried seeds resemble chilli seeds and can be slipped unnoticed into food or drink, making Datura India's classic stupefying "**road poison**" used before robbery, kidnapping and rape.

Botany, active principles & mechanism

- ▶ **Species** — *Datura metel* (white-flowered *D. alba* / purple-flowered *D. niger*) and *D. stramonium*; all equally toxic.
- ▶ **Plant** — a leafy herb up to ~5 feet, bell-shaped flowers opening after dusk, fruit a spiny spherical "thorn apple" holding up to ~500 seeds.
- ▶ **Active alkaloids** (about 0.2–1.4% of the plant) — hyoscine (scopolamine), hyoscyamine and atropine, all tropane (belladonna) alkaloids.
- ▶ Atropine and hyoscyamine are isomers; hyoscyamine can convert to atropine during extraction.
- ▶ **Mechanism** — the alkaloids competitively block muscarinic acetylcholine receptors, producing the anticholinergic toxidrome.
- ▶ Scopolamine crosses the blood–brain barrier (BBB) readily, so it gives the most prominent central effects — delirium and hallucinations.

Clinical features

- ▶ Onset is fast — about 30 minutes after seeds, 5 minutes after a decoction, seconds after pure alkaloid.
- ▶ The picture is the classic **anticholinergic toxidrome**.
- ▶ **Memory aid** — "hot as a hare" (hyperpyrexia), "blind as a bat" (mydriasis, lost accommodation), "red as a beet" (flushed skin), "dry as a bone" (dry skin and mucosae), "mad as a hatter" (delirium).
- ▶ **The 15 D's** — dryness of mouth/throat, dysphagia, dysarthria, dilated pupils, diplopia, dry hot skin, drunken (ataxic) gait, delirium, delusions, dreadful hallucinations, drowsiness, dermatitis, dysuria, decreased coordination, death from respiratory failure.

System	Key features
Mouth / gut	Dry mouth, dysphagia, dysarthria, decreased bowel sounds

System	Key features
Eye	Dilated pupils, loss of accommodation, photophobia, diplopia
Skin	Dry, hot, flushed skin (no sweating)
CNS / psychiatric	Ataxic gait, delirium, hallucinations, amnesia, later coma
Cardiovascular	Tachycardia 120–150/min
Genitourinary	Dysuria progressing to urinary retention
General	Hyperpyrexia (rise of 3–4 °C)

- ▶ **Signs to name** — *carphologia/floccillation* (aimless picking at bedclothes) and the **pill-rolling movement** (thumb and finger circling).
- ▶ The patient is excited and noisy, tries to run away from bed, then passes into deep sleep.

Fatal dose, fatal period & diagnosis

- ▶ **Fatal dose (seeds)** — about 50–125 crushed seeds.
- ▶ **Fatal dose (pure alkaloid)** — atropine/hyoscyamine ~120 mg; scopolamine ~30 mg.
- ▶ Poisoning needs the seeds to be chewed and swallowed — intact seeds pass unabsorbed.
- ▶ **Fatal period** — about 24 hours (up to 1–2 days if untreated).
- ▶ **Mydriatic (animal) test** — instil the patient's urine, or suspect seed extract, into a cat's/rabbit's eye; the pupil dilates immediately.
- ▶ **Pilocarpine test** — instil 1% pilocarpine into the patient's eye; no constriction within 30 minutes confirms anticholinergic poisoning.
- ▶ Blood shows neutrophil leucocytosis.
- ▶ Alkaloids are detected in blood, urine and hair (up to ~3 weeks, by GC-MS/LC-MS); most is excreted unchanged in urine in the first 10–12 hours, so urine must be preserved.

Management

- ▶ **Decontamination** — emetics, gastric lavage with weak tannic acid or potassium permanganate, or activated charcoal.
- ▶ Lavage helps even late, because reduced gut motility means seeds can be recovered from the stomach up to 36 hours after ingestion.
- ▶ Purgatives are continued for 3–4 days to clear remaining seeds.
- ▶ **Antidote of choice** — **physostigmine salicylate**, a reversible acetylcholinesterase inhibitor.
- ▶ Physostigmine is a tertiary amine, so it crosses the BBB and reverses the central (delirium) effects.
- ▶ Adult dose: 2 mg slow IV over ~5 minutes with ECG monitoring, repeated in 20–60 minutes if needed.
- ▶ Neostigmine, pyridostigmine and pilocarpine are quaternary amines — they do NOT cross the BBB and cannot reverse the central effects.

- ▶ **Supportive care** — maintain the airway, give oxygen/ventilation for respiratory failure, catheterise for retention, and give IV fluids.
- ▶ Give diazepam IV for agitation or seizures; cool the patient by tepid sponging for hyperthermia.
- ▶ Avoid morphine, phenothiazines and antihistamines, since they add to the anticholinergic effect.
- ▶ Dialysis and haemoperfusion are ineffective, because the alkaloids are lipophilic.

Uses

- ▶ **Therapeutic** — atropine and scopolamine are used as antispasmodics, mydriatics, antisecretory and pre-anaesthetic agents, and as the antidote for organophosphate (cholinergic) poisoning.
- ▶ Dhatura is also used in Ayurvedic/folk medicine; smoked leaves were once used to relieve asthma.
- ▶ **Criminal use (dominant forensic point)** — crushed seeds are mixed into sweets, *prasad*, chapatti, curry, tea or liquor to stupefy victims before robbery, kidnapping or rape.
- ▶ Robbers posing as *sadhus* who offer adulterated *prasad* gave Dhatura its name "road/rail-road poison."
- ▶ **Other uses:**
 - Believed to be an aphrodisiac / love philtre, and used as an abortifacient.
 - Smoked with tobacco/*ganja*, or added to liquor, as a drug of abuse.
 - Mixed with *Abrus precatorius* as cattle poison.
 - Scopolamine has been used in narco-analysis (drug-assisted interrogation).

Medico-legal significance

- ▶ **Road poison** — Dhatura is India's classic agent of drug-facilitated crime (robbery, kidnapping, rape); administering it to stupefy a victim is punishable under **Section 328 IPC 1860 (now Section 123 BNS 2023)**.
- ▶ A victim who commits a criminal act while stupefied without his knowledge is not held criminally responsible — **Section 85 IPC (now Section 23 BNS 2023)**.
- ▶ Someone who takes Dhatura voluntarily (for example, as a drug of abuse) remains responsible — **Section 86 IPC (now Section 24 BNS 2023)**.
- ▶ Consent given while intoxicated is not valid consent — **Section 90 IPC (now Section 28 BNS 2023)**.
- ▶ Mixing the seeds into food or drink can also attract **Sections 272/273 IPC (now Sections 274/275 BNS 2023)** for adulteration, and **Section 284 IPC (now Section 286 BNS 2023)** for negligent handling.
- ▶ **Manner of death** — homicide and suicide are rare; accidental poisoning is the usual manner.
- ▶ Accidents happen when seeds are mistaken for chilli, when children eat the fruit, from overuse as eye-drops, or from contaminated honey or fodder.
- ▶ **Cornpicker's/gardener's pupil** — an occupational persistent mydriasis from Dhatura dust; always ask about occupation in an unexplained dilated pupil.
- ▶ **Autopsy** — there are no characteristic post-mortem findings; look for signs of asphyxia and an inflamed stomach/intestinal mucosa with seeds or seed fragments.

- ▶ Seeds resist putrefaction, so they can still be identified even in a decomposed body.
- ▶ Preserve stomach contents, seeds, blood and urine (viscera in saturated salt) for chemical analysis, and identify recovered seeds botanically.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Datura plant and fruit** — bell-shaped flower opening after dusk, spiny thorn-apple fruit, broad leaves, numerous brown seeds inside.
- ▶ **Datura seed vs capsicum (chilli) seed, longitudinal section:**
 - **Datura seed** — large, thick, kidney-shaped, dark/yellow-brown, odourless, bitter, double-edged convex border with small surface pits, embryo curves OUTWARDS at the hilum.
 - **Capsicum seed** — small, thin, rounded, pale yellow, pungent, single sharp edge, smooth, embryo curves INWARDS like the numeral "6".



Forensic psychiatry



"Clinical proof of insanity is not the legal proof for acquittal". Justify with the modern concepts of mental illness and its forensic aspects

Asked in: Paper III Apr 2019 — RGUHS MD Forensic Medicine

Definition

- ▶ **Clinical (medical) insanity** is any diagnosable mental disorder — a substantial disturbance of thinking, mood, perception, orientation or memory — recognised by a psychiatrist.
- ▶ **Legal insanity** is a much narrower, court-defined idea.
- ▶ It exists only if, **at the moment of the criminal act**, the mental abnormality made the accused unable to know the **nature of the act**, or that it was **wrong or contrary to law**.
- ▶ Criminal law exempts **only legal insanity** — enacted as **Section 22, Bharatiya Nyaya Sanhita (BNS) 2023** (formerly **Section 84, Indian Penal Code 1860**), the **McNaughten right-or-wrong test** — so a firm clinical diagnosis alone does **not** secure acquittal.
- ▶ The law's "disease of the mind" is a **legal, not psychiatric, concept** — it looks at the **mind** (reason, memory, understanding), not the brain.

Why clinical proof is not legal proof

- ▶ **Timing:** the law judges the mental state **only at the moment of the offence**, not generally; a person insane for years may still be responsible if lucid at that instant — a **lucid interval**, and acts done in one are punishable.
- ▶ **Cognition only:** exemption needs loss of **cognition** — not knowing the nature of the act, or that it was wrong; if only **emotion or will** is affected, the person remains responsible.

- ▶ **Causation:** the unsoundness must be clearly proved as the direct cause of the offence.
- ▶ **Consequence:** many patients are **clinically insane but legally sane** — psychopaths, neurotics, personality disorders, impulse-control disorders (kleptomania, pyromania), many depressives — genuine illness, but intact cognition.
- ▶ **Presumption of sanity:** the law presumes every person sane; the **defence must prove** the unsoundness, not the prosecution disprove it.
- ▶ A doctor's certificate proves only that disease **exists** — the **court alone** decides whether it meets the legal test.
- ▶ The insanity plea works only by **negating mens rea**** (guilty mind), not by proving a diagnosis — many mentally ill people retain full intent.
- ▶ **All-or-none law:** Section 22 BNS gives either full responsibility or none — there is **no statutory middle path** in India.
- ▶ **Psychiatric opinion is least reliable about the past** — most reliable for the present state, less so for the moment of the crime, least of all for the future — so courts weigh it as evidence, not binding proof.
- ▶ **Illness can be feigned** to escape punishment, so true illness must be ruled out before legal insanity is even considered.

Legal tests of criminal responsibility

- ▶ **McNaughten's Rule (1843) — the Right-or-Wrong Test, India's law:** from the trial of *Daniel McNaughten*, who shot Edward Drummond believing him to be the Prime Minister.
 - Not responsible if disease of mind meant he did not know the **nature and quality** of the act, or that it was **wrong** — looks only at **cognition**, ignoring emotion, will and delusional drive.
- ▶ **Irresistible Impulse Test (*Parsons v State*, 1887):** adds a **volitional** element — not responsible if he knew the act was wrong but could not control himself. **Not followed in India.**
- ▶ **Durham Rule (1954):** excused if the act was "the product of mental disease or defect"; abandoned around 1961 as too vague.
- ▶ **Curren's Rule (1961):** not responsible if illness destroyed the capacity to regulate conduct to the law.
- ▶ **ALI / Substantial-Capacity Test (1962):** not responsible if illness caused a **substantial** (not total) loss of capacity to appreciate wrongfulness or to conform to law — the most liberal test.

Diminished responsibility

- ▶ Recognises **degrees** of mental disorder — a state bordering on, but not amounting to, legal insanity (organic states, depression, obsessional/paranoid states, psychopathy, head injury).
- ▶ Such a person is legally responsible yet medically of unsound mind, and may be convicted of **culpable homicide not amounting to murder** rather than murder.
- ▶ Recognised in **England** (Section 2, Homicide Act 1957), reducing murder to manslaughter; also in France, Germany, Scotland and the USA.
- ▶ **India has no general doctrine of diminished responsibility** — Section 22 BNS saves only severe illness that destroys cognition.

- ▶ Only a faint reflection survives in **Exceptions 1 and 4 to Section 101 BNS** (formerly Section 300 IPC).

Other conditions affecting responsibility

- ▶ **Delusion:** the accused is judged as though the delusional belief were real — a delusion of self-defence exempts, but one that only justifies revenge does **not**.
- ▶ **Automatism:** purposeful behaviour without conscious control, followed by amnesia — **insane** (epilepsy, cerebral disease) versus **non-insane** (hypoglycaemia, sleepwalking).
- ▶ **Somnambulism and delirium:** acts in sleepwalking or delirious hallucination are not wilful — **not responsible**.
- ▶ **Impulse** (sudden anger, loss of self-control): the person remains **responsible**, unless true unsoundness of mind is also present.
- ▶ **Intoxication:** involuntary intoxication exempts (**Section 23 BNS**, formerly Section 85 IPC); voluntary intoxication does **not**, where intent or knowledge existed (**Section 24 BNS**, formerly Section 86 IPC).

True versus feigned mental illness

Feature	True illness	Feigned illness
Onset	Gradual	Sudden
Motive	Absent	Present (e.g., to escape conviction)
Signs/symptoms	Fit a recognised disease; present even when unobserved	Exaggerated, fit no disease; present only when watched
Insomnia/exertion	Insomnia present; withstands fatigue and hunger	Sleeps soundly after a day or two; breaks down within days
Repeated examination	Does not mind	Resents it, fearing detection

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ Two overlapping circles (Venn diagram).
 - Left circle: "Medical / Clinical insanity (all diagnosable mental illness)."
 - Right circle: "Legal insanity (Section 22 BNS / McNaughten)."
 - Overlap: "Cognitive impairment at the time of the act → ACQUIT TAL."
 - Left-only zone: "Clinically ill but legally sane → convicted (psychopath, neurosis, impulse, lucid interval)."
 - Margin note: "Diminished responsibility — borderline band, no general statutory recognition in India."
- ▶ Flowchart of the insanity plea: *Crime → Plea of unsoundness (presumption of sanity) → Psychiatric exam: true vs feigned → if true, did illness abolish cognition at the time of the act?*
 - Yes → legal insanity → not guilty by reason of unsoundness, safe custody (Sections 367/369 BNSS).
 - No → clinically ill but responsible → **convicted** (possibly a lesser charge where exceptions apply).

Medico-legal significance

- ▶ The psychiatrist's role is to certify **compos mentis** ("of sound mind") through a **mental status examination** that separates true from feigned illness — the psychiatrist does not decide guilt; the **court alone** decides legal insanity.
- ▶ The accused may be kept for **observation** up to **10 days**, extendable by the Magistrate in blocks of 10 days to a **maximum of 30 days**.
- ▶ Fitness to stand trial is governed by **Sections 367–378, BNSS 2023** (formerly **Sections 328–339, CrPC 1973**); a mentally ill prisoner may be admitted under **Section 369 or 374 BNSS** (formerly **Section 330 or 335 CrPC**).
- ▶ Three procedural pleas of unsoundness exist: **in bar of conviction** (Section 22 BNS), **in bar of trial** (Section 368 BNSS), and **in bar of execution** (a condemned prisoner).
- ▶ Expert psychiatric opinion is admitted under **Section 39, BSA 2023** (formerly **Section 45, Indian Evidence Act 1872**), but the court is **not bound** by it.
- ▶ The **Mental Healthcare Act 2017** defines mental illness as a substantial disorder of thinking, mood, perception or memory that grossly impairs judgment (mental retardation excluded); its **Section 115** bars punishment for attempted suicide, presuming severe stress.
- ▶ Civil law applies the same logic — testamentary and contractual capacity, and witness competence, depend on **capacity at that moment**, not a diagnosis; a will made in a **lucid interval** is valid.

♦ ♦ ♦

Classify mental and behavioral disorder and discuss about various types of delusion with medical importance

Asked in: Paper III Oct 2017 — RGUHS MD Forensic Medicine

Definition / Introduction

- ▶ A **mental (psychiatric) disorder** is a disease of the mind in which mental and emotional processes are deranged.
- ▶ Behaviour control is impaired, so intelligence is weakened or perverted even though the body is physically well.
- ▶ **Forensic psychiatry** applies psychiatry to the administration of justice.
- ▶ It decides criminal and civil responsibility, fitness to stand trial, testamentary capacity, and validity of consent.
- ▶ A **delusion** is a cardinal symptom of psychosis and a recurring exam topic because of its heavy medico-legal weight.

Classification of mental and behavioural disorders

- ▶ **Psychosis**: severe, reality-contact lost, insight absent, delusions/hallucinations present, high self-harm risk — treated with antipsychotics.
- ▶ **Neurosis**: minor, a reaction to stress, insight retained, behaviour within social norms — treated mainly with psychological therapy.
- ▶ Psychoses split further into **organic** and **functional** types.
- ▶ **Organic psychoses**: structural brain damage — dementia, delirium, head injury, tumour, drug/toxic psychosis, epileptic insanity.
- ▶ **Functional psychoses**: no demonstrable neurological lesion.
 - **Schizophrenic** psychoses — thought disorder dominates.
 - **Affective** psychoses — mood disturbance dominates (e.g. bipolar/manic-depressive psychosis).

WHO ICD classification:

- ▶ Organic mental disorders — dementia, organic amnesic syndrome, delirium.
- ▶ Mental and behavioural disorders due to psychoactive substance use.
- ▶ Schizophrenia, schizotypal and delusional disorders.
- ▶ Mood (affective) disorders.
- ▶ Neurotic, stress-related and somatoform disorders — anxiety, OCD, PTSD, dissociative disorders.
- ▶ Mental retardation, graded by IQ: mild 50–70, moderate 35–55, severe 20–40, profound below 25.
- ▶ **ICD-11** (since 1 January 2022) and **DSM-5** are the two current systems; both abolished the classical schizophrenia subtypes, regrouping them as "schizophrenia spectrum" disorders, and ICD-11 renamed mental retardation as **intellectual disability**.
- ▶ **Personality disorders**: the **psychopath** has normal intelligence and no abnormality of thought or mood, but is persistently antisocial with a complete lack of conscience.

- ▶ Psychopathy is not an insanity defence in India, though it may support diminished responsibility.
- ▶ Other category: **automatism** (insane vs sane).

Schizophrenia and mood disorders

- ▶ **Schizophrenia** is a "splitting" of thought, perception, and emotion from reality, classically in young adults (historically *dementia praecox*; renamed by Bleuler, 1910).
- ▶ **Positive symptoms**: delusions, hallucinations (mostly auditory), thought and speech disorder.
- ▶ **Negative symptoms** (the "6 A's"): avolition, anhedonia, apathy, alogia, attention deficit, asociality.
- ▶ **Paranoid schizophrenia** (persecutory delusions + auditory hallucinations) is most often linked to homicide of strangers.
- ▶ **Bipolar (manic-depressive) psychosis** swings between **mania** (euphoria, grandiosity, reckless acts) and **depression** (guilt, risk of suicide or homicide toward dependents).
- ▶ A gap between manic attacks may act as a **lucid interval**.

Delusion — definition, types and medical importance

- ▶ A delusion is a **false, firm belief** not based on fact, that persists even after its falsity is clearly demonstrated.
- ▶ It is not ordinarily shared by others in the patient's socio-cultural group.
- ▶ A sane person can briefly hold a delusion but can **correct** it by reasoning or persuasion.
- ▶ An insane person **cannot** correct it.
- ▶ A **primary** delusion arises directly from psychosis.
- ▶ A **secondary** delusion arises from another morbid experience, e.g. a hallucination.
- ▶ Delusions occur in epileptic, affective and schizophrenic psychoses, but **never** in anxiety neurosis.

Type of delusion	Belief held	Seen in / eponym
Persecution (commonest)	Others are conspiring to poison, harm, or kill him	Paranoid schizophrenia, dementia, depression, mania — <i>McNaughten</i>
Grandeur	Believes he is a king, god, or very rich/powerful person	Delirium tremens, paranoid schizophrenia, mania
Reference	Strangers, radio, TV, newspapers are referring to him	Schizophrenia
Influence/control	Thoughts, feelings, actions are controlled by an outside agency	Schizophrenia
Infidelity (jealousy)	A husband believes his chaste wife is unfaithful	<i>Othello syndrome</i> — uxoricide, mariticide
Love (erotomania)	Believes a higher-status person is in love with her	<i>Clérambault's syndrome</i>

Type of delusion	Belief held	Seen in / eponym
Nihilistic	Believes he/the world doesn't exist, or he is dead/putrefying	<i>Cotard's syndrome</i> ("walking corpse")
Hypochondriacal	Believes his body is diseased though healthy	Depression, schizophrenia
Self-reproach/guilt	Blames himself for an imaginary misdeed; may lead to suicide	Depression
Misidentification	<i>Capgras</i> (imposter), <i>Fregoli</i> (disguise), <i>folie à deux</i> (shared delusion)	Dementia, schizophrenia
Poverty	Believes he has nothing left	Depression

Medical / medico-legal importance:

- ▶ A delusion is **never isolated** — it signals a deep-seated mental disorder, so the sufferer cannot be held fully responsible for antisocial acts.
- ▶ **Suicide and homicide** are major risks — murder followed by suicide can occur, e.g. a depressive who kills dependent children, then himself.
- ▶ Under the M'Naughten rule, a person acting on a delusion is judged **as if the delusional facts were real** — the *content* of the delusion decides criminal responsibility.
- ▶ A delusion about property or heirs can **invalidate a will**; an unrelated delusion does not.
- ▶ **Diminished responsibility** (recognised abroad, not in India) may be argued when the delusional state falls short of full insanity.

Medico-legal significance

- ▶ Law presumes every person sane; the defence must prove unsoundness of mind.
- ▶ Only disorders impairing **cognition** — knowing the act's nature or that it is wrong — excuse responsibility.
- ▶ This is codified in **Section 84 IPC 1860 (now Section 22 BNS 2023)**, the M'Naughten rule — from *Daniel M'Naughten* (1843), who shot Edward Drummond mistaking him for PM Robert Peel.
- ▶ Disorders affecting only **emotion or volition** (irresistible impulse) do **not** excuse in India.
- ▶ The doctor must distinguish real illness from **feigned (malingered)** illness — sudden onset, a clear motive, symptoms present only when observed.
- ▶ A suspected malingerer is observed for **10 days under a Magistrate's authorization**, extendable to **30 days total**.
- ▶ **Fitness to stand trial** is governed by Sections 367–378 BNSS 2023 (old Sections 328–339 CrPC 1973).
- ▶ Mental state is judged **at the time of offence** for responsibility, and **at the time of trial** for fitness to plead.
- ▶ A person with delusions can still be a **competent witness**, especially in a lucid interval, if he can relate facts and understands the oath — Section 124 BSA 2023 (old Section 118 IEA 1872).

- ▶ Consent, contracts, marriage, or a will may be voided if the person cannot understand the act.
- ▶ The **Mental Healthcare Act 2017**, Section 2(1)(s), defines mental illness as a disorder of thinking, mood, perception, orientation, or memory that grossly impairs judgment or behaviour; it excludes mental retardation.
- ▶ Under **Section 115, MHCA 2017**, a person who attempts suicide is presumed to be under severe stress and is given care, not tried or punished.
- ▶ **Section 309 IPC** has no general BNS successor; only **Section 226 BNS** survives, for attempted suicide to compel a public servant.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Flowchart** — classification of mental disorders. Top box splits into **Psychoses** vs **Neuroses**.
- ▶ **Psychoses** branch into **Organic** (dementia, delirium, drug-induced, head injury, epilepsy) and **Functional** (schizophrenic vs affective).
- ▶ **Side boxes**: personality disorders/psychopath, mental retardation grades, automatism (insane/sane).
- ▶ **Neuroses** branch: anxiety, OCD, phobic, hysterical, PTSD, hypochondriasis.
- ▶ **Spider diagram** — types of delusion. Central node **DELUSION**; one spoke per type from the table above, each labelled with its disease/eponym.



Criminal responsibility of a mentally ill person

Asked in: Paper III Oct 2018 — RGUHS MD Forensic Medicine

Definition

- ▶ **Criminal responsibility** is the legal liability of a sane person to be punished for a crime.
- ▶ The law presumes every person sane and responsible until proved otherwise.
- ▶ Every crime needs a guilty act (**actus reus**) plus a guilty mind (**mens rea**).
- ▶ A **person with mental illness (PMI)** may be exempted if unsoundness of mind stopped him forming mens rea.
- ▶ Governing law: **Section 22, BNS 2023** (formerly **Section 84, IPC 1860**) — India's version of the English **McNaughten Rule**, the "right or wrong" test of insanity.

The two essential elements of a crime

- ▶ **Actus reus**: the forbidden physical act itself, e.g. the act causing death.
- ▶ **Mens rea**: the guilty intent or knowledge accompanying it; both must coexist for most crimes.
- ▶ The **burden of proving insanity lies on the defence**, on balance of probabilities.
- ▶ The law looks only at the **state of mind at the time of the offence**, not at trial.
- ▶ Proven unsoundness of mind gives the verdict "**not guilty by reason of unsoundness of mind**" — safe custody, not release.

Tests for determining criminal responsibility

Only M'Naughten (BNS S.22) is law in India; the rest are academic/comparative.

Test (year)	Faculty assessed	Core idea
McNaughten Rule (1843) — law in India (BNS S.22)	Cognition only	Not responsible if disease of mind stopped him knowing the act's nature, or that it was wrong.
Irresistible Impulse Test (1887)	Volition (will)	Not responsible if mental disease destroyed his power to control himself, even knowing it was wrong.
ALI Test (1962)	Cognition + volition	Not responsible if he lacked substantial capacity to appreciate the wrongfulness of his act, or to conform to the law.

- ▶ **McNaughten's case (1843):** Daniel McNaughten, a paranoid schizophrenic with a persecutory delusion, meant to kill Prime Minister Sir Robert Peel but shot Peel's secretary **Edward Drummond** by mistake; found of unsound mind, he was detained for life.
- ▶ The resulting outcry led 14 judges to answer five questions; their 1843 answers became the **McNaughten Rules**, still the basis of Indian law today.

Section 22, BNS 2023 — explained

- ▶ India's legal test of insanity, taken directly from the M'Naughten Rule.
- ▶ A person escapes responsibility only if, at the time of the act, unsoundness of mind made him **incapable of knowing the nature of the act, or that it was wrong/contrary to law**.
- ▶ The unsoundness of mind must have **directly caused** the offence; "disease of the mind" is a **legal, not psychiatric, concept** — usually a major psychosis.
- ▶ Dysfunction from **voluntary alcohol or drug use is not "disease of the mind."**
- ▶ **Delusion rule:** if the act follows an insane delusion, judge the accused as if the delusional facts were real.
 - Thinks a man is attacking him and kills in "self-defence" — **not responsible**.
 - Thinks the victim is a wild animal and kills him — **not responsible**.
 - Believes he is the State Executioner doing his duty — **exempt**.
 - Kills for a delusional grievance over honour/property — **still responsible**.
- ▶ **All-or-none:** S.22 gives no middle path — no "diminished responsibility" in India.
- ▶ **Cognition only:** it ignores emotion and volition.
- ▶ **Severe illness only:** mild or borderline illness gets no protection.

Doctrine of diminished responsibility

- ▶ A partial defence recognising degrees of mental disorder short of full unsoundness of mind.
- ▶ Where accepted, murder is reduced to culpable homicide not amounting to murder.
- ▶ **Not available in India** — BNS S.22 is all-or-none.

- ▶ Recognised in **England** (Section 2, Homicide Act 1957, *R v Byrne* 1959–60), Scotland, France, Germany and the USA (as "diminished capacity").
- ▶ A faint Indian analogue exists in the Exceptions to **Section 101, BNS**.
- ▶ Not available for simulated illness, bad temper, jealousy, voluntary drug use, or low intelligence.

Special states affecting responsibility

- ▶ **Automatism** is purposeful-looking behaviour without conscious control, followed by amnesia.
 - **Insane automatism** (disease of mind, e.g. epilepsy) — **not responsible**; **sane automatism** (external causes — sleep-walking, head injury, hypoglycaemia, drugs) gets the benefit of S.22 if unawareness is proved.
- ▶ **Somnambulism** (sleep-walking, deep NREM sleep) — no memory of the act, **not responsible**.
- ▶ **Delirium, hypnotism and fugue states** — generally negate responsibility too.
- ▶ **Impulse** is a sudden urge without forethought, e.g. kleptomania, pyromania.
 - A **sane** person controls it and stays responsible; an **insane** person who genuinely cannot is not.
 - A **psychopath's** impulsive crime remains fully punishable — psychopathy is not a defence.
- ▶ **Involuntary intoxication** (drugged without knowledge/consent) — **not an offence** (Section 23 BNS 2023, formerly Section 85, IPC).
- ▶ **Voluntary intoxication** with intention/knowledge — the person remains **responsible** (Section 24 BNS 2023, formerly Section 86, IPC).
- ▶ **Delirium tremens** or a genuine drug-induced disorder frees the person of responsibility.

Criminal responsibility vs fitness to stand trial

- ▶ **Criminal responsibility** is judged at the **time of the offence**; **fitness to stand trial** at the **time of trial** — can the accused understand proceedings and instruct counsel.
- ▶ Procedure for an accused of unsound mind: **Chapter XXVII (Sections 367–378), BNSS 2023** (formerly **Section 328, CrPC 1973**) — the Magistrate arranges psychiatric examination and postpones trial until recovery.
- ▶ A plea of unsoundness of mind can bar **conviction**, bar **trial**, or bar **execution** of a condemned prisoner who has since become of unsound mind.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Flowchart — "Is the accused criminally responsible?"**
 - Presumption of sanity → actus reus + mens rea present? → plea of unsoundness raised (burden on defence).
 - Decision: incapable of knowing the act's nature, or that it was wrong (S.22 BNS/McNaughten)?
 - YES → not guilty by reason of unsoundness of mind → safe custody. NO → responsible → punishable.
 - Side branches: voluntary intoxication → responsible (S.24 BNS); involuntary intoxication/automatism/somnambulism/delirium → not responsible.
- ▶ **Triangle diagram:** vertices Cognition (intellect), Conation (volition), Affect (emotion) — McNaughten/S.22 tests cognition only, Irresistible Impulse adds conation, ALI covers both.

Medico-legal significance

- ▶ The forensic doctor certifies **soundness of mind (compos mentis)** through a mental status examination.
- ▶ Must distinguish **true insanity** (gradual onset, prior history) from **feigned/malingered insanity** (sudden, overacted, motive-linked), using tools like M-FAST, SIRS, SIMS and TOMM.
- ▶ Features of a genuinely mentally ill offender: no motive, no premeditation, no accomplices, no attempt to hide evidence or escape; he may notify the police himself, or kill friends and relatives.
- ▶ The opinion covers mental state **at the time of the offence**; reliability falls as the interval grows.
- ▶ Acquittal verdict: "**not guilty by reason of unsoundness of mind**" — detention for treatment, not freedom.
- ▶ **Mental illness (Section 2(1)(s), MHCA 2017):** a substantial disorder of thinking, mood, perception, orientation or memory that grossly impairs judgment and daily functioning; includes alcohol/drug-related conditions, excludes mental retardation.
- ▶ **Section 115, MHCA 2017:** attempted suicide is presumed to reflect severe stress and must not be tried or punished — this decriminalises the old **Section 309, IPC** (BNS has no general re-enactment; **Section 226, BNS** covers only attempts to compel/restrain a public servant).
- ▶ Also relevant: **BNS S.28** (consent of a person of unsound mind is invalid) and **BNS S.36** (right of private defence against his act).

♦ ♦ ♦

Describe Civil and Criminal responsibilities of an insane person

Asked in: Paper III Oct 2019 — RGUHS MD Forensic Medicine

Core concepts

- ▶ **Insanity**, now called **person with mental illness (PMI)** in statute (**Mental Healthcare Act 2017 §2(1)(s)**), is a disorder of thinking, mood, perception, or memory that grossly impairs judgment and the ability to recognise reality.
- ▶ The law presumes **every person is sane and responsible** until the contrary is proved, and the burden of proving unsoundness lies on the party who alleges it.
- ▶ **Civil responsibility** (capacity for legal transactions) and **criminal responsibility** (answerability for an offence) are judged by **different standards**.
- ▶ A crime needs both ***actus reus** (*the guilty act*) and **mens rea** (*the guilty mind*); *an insane person cannot form mens rea**, so is not criminally responsible.
- ▶ ***Compos mentis** means of sound mind; **non compos mentis*** means not of sound mind, and such a person cannot make a valid will or contract, or give valid consent.
- ▶ A ***lucid interval** is the gap between two episodes of illness when symptoms fully disappear and the person can judge and foresee consequences normally — classic in bipolar disorder*, where the depressive phase is the lucid interval between manic attacks.
- ▶ A will, contract, or testimony made during a genuine lucid interval is **valid**.

A. Civil responsibility of an insane person

- ▶ The general rule: a transaction is valid only if the person could **understand its nature and foresee its consequences** at the time.
- ▶ **Property management:**
 - On a relative's application, the Court can order a **judicial inquisition** into the person's capacity to manage property, and if incapable, appoints a **manager** for the property and a **guardian** for the person.
 - A second inquiry may follow if the unsoundness later ceases; in doubt, it is safer to favour sanity.
- ▶ **Contracts:**
 - A contract is invalid if a party could not understand it or judge its effect on his interests, unless the other party did not know of the illness and the contract was fair.
 - Illness after the contract does not invalidate it unless it makes performance impossible; a contract made in a lucid interval is valid, and a PMI still owes payment for **necessaries of life** supplied to him.
- ▶ **Wills (testamentary capacity):**
 - Regulated by the **Indian Succession Act, 1925**; the testator must be an adult of **sound disposing mind**, free of force or undue influence.
 - **Valid:** made during a lucid interval.
 - **Valid:** made by an aged or feeble person, unless too impaired to understand.

- **Valid:** made by a person whose delusion is unrelated to the property disposed of.
 - **Invalid:** made in delirium, or in a delusion related to the disposal.
 - **Invalid:** made under temporary loss of reason from drunkenness.
 - A will made just before death (*in extremis*) is viewed with suspicion.
- ▶ **Witness competence:** a PMI is not automatically incompetent to testify — he may do so if he understands the questions, gives rational answers, and understands the oath, and this is expressly recognised during a **lucid interval** (BSA §124, formerly IEA §118).
 - ▶ **Consent:** consent given by a PMI for surgery, sexual intercourse, hurt, medical termination of pregnancy, or organ donation is **invalid**, because he cannot understand what he is consenting to (BNS §28, formerly IPC §90).
 - ▶ **Marriage:** a PMI cannot validly marry — unsoundness at the time makes the marriage voidable or void; illness arising afterward is a divorce ground only if incurable despite continuous treatment for **more than 3 years**.
 - ▶ **Other disabilities:** a PMI cannot hold government service or adopt a child, and a partner's illness alone does not dissolve a partnership until the court acts.

B. Criminal responsibility of an insane person

- ▶ Sanity is presumed; the **defence must prove** unsoundness of mind.
- ▶ Only illness that destroys the **cognitive faculty** — the capacity to know the act's nature or that it is wrong — gives exemption; if only emotion or will is affected, the person remains responsible.
- ▶ Insanity can be pleaded at three stages:
 - **Bar of conviction** — unsound mind at the time of the act (BNS §22, formerly IPC §84).
 - **Bar of trial** — unsound mind now, so unfit to plead or instruct counsel (BNSS §367–378, formerly CrPC §328–339).
 - **Bar of capital punishment** — a condemned prisoner becomes insane before execution.
- ▶ If unsoundness is proved, the verdict is NGRI ("**not guilty by reason of insanity**"), and the accused is sent to a psychiatric hospital or safe custody, not released.
- ▶ India's legal test is the **McNaughten rule**, codified as BNS §22 (formerly IPC §84): an act is not an offence if, from unsoundness of mind, the accused could not know the nature of the act, or that it was wrong or contrary to law.

Legal tests of insanity (mnemonic MIDCA)

Test (year)	Status	Core principle
McNaughten rule (1843)	England; adopted in India as BNS §22	Didn't know the act's nature, or that it was wrong — cognition only .
Irresistible impulse test (1887)	USA; not followed in India	Knew it was wrong but could not restrain himself — adds a volitional factor.
Durham rule (1954)	USA; abandoned 1961	Act was the product of mental disease or defect .

Test (year)	Status	Core principle
Curren's rule (1961)	USA	Lacked capacity to regulate his conduct to the law.
ALI / substantial-capacity test (1962)	USA	Lacked capacity to appreciate criminality or to conform to law — combines both factors.

- ▶ **Criticism:** the M'Naughten rule is "**all-or-none**" — a person is either fully responsible or not at all — and it weighs only intellect, ignoring emotion, volition, delusion, and impulse control.
- ▶ **Diminished responsibility** is a middle path recognised in England (reduces murder to manslaughter) but is **not accepted in India**, though a flavour survives in **Exceptions 1 and 4 of BNS §101 (murder)**.

Special states and criminal responsibility

- ▶ **Delusion:** judged as if the delusional facts were real — not responsible if the imagined facts, were they true, would justify the act; responsible if they would not.
- ▶ **Delirium / delirium tremens:** acts done under delirium are not responsible.
- ▶ **Somnambulism (sleepwalking):** a dissociative state with amnesia; since the act is not wilful, the person is not responsible.
- ▶ **Automatism:** complex behaviour without conscious control followed by amnesia, as in epilepsy, concussion, or hypoglycaemia; not responsible.
- ▶ **Ordinary impulse:** sudden anger or loss of self-control does not excuse — India does not accept "irresistible impulse" as a defence.
- ▶ **Drunkenness:** involuntary intoxication is not an offence (**BNS §23**, formerly IPC §85); voluntary intoxication is punishable if intent or knowledge of the act was present (**BNS §24**, formerly IPC §86).
- ▶ **Hypnotism:** acts under hypnotic suggestion are not remembered, but a person usually cannot be made to act against his own morals.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Two-branch flowchart "Responsibilities of an insane person":** top node *PMI*, with "Law presumes sanity → burden on defence."
 - **Civil branch:** *Will · Contract · Marriage · Consent · Witness · Property management* — each valid only if the person could understand the act or acted during a lucid interval.
 - **Criminal branch:** *Bar of conviction (BNS §22) · Bar of trial (BNSS §367–378) · Bar of capital punishment* → outcome "NGRI → safe custody."
- ▶ **Lucid-interval graph:** a wavy symptom line dipping to a flat baseline labelled "**lucid interval — valid will/contract/evidence**", then rising again, with *manic* and *depressive* (= *lucid interval in bipolar*) phases marked.

Medico-legal significance

- ▶ The examiner's task is to certify **responsibility for the act** and **competency** for a will, consent, testimony, marriage, or trial — whether the person is *compos* or *non compos mentis*.
- ▶ The opinion must relate to the mental state **at the relevant time**: the time of the act for criminal responsibility, the time of the transaction for civil capacity.
- ▶ **Feigned insanity** must be excluded: true insanity usually shows no motive, no preparation, and no attempt to conceal evidence or escape, while a malingerer over-acts and is inconsistent under repeated questioning.
- ▶ The **Mental Healthcare Act 2017** governs definitions and, under §115, presumes a person who attempts suicide to be under severe stress and shall **not be tried or punished**.

♦ ♦ ♦

Describe procedures of restraining an insane person and his/her release from mental asylum*Asked in: Paper III Apr 2022 — RGUHS MD Forensic Medicine***Definition / Introduction**

- ▶ **Restraint** means lawfully controlling and admitting a person with mental illness (PMI) who is a danger to himself, others, or property.
- ▶ **Release/discharge** means lawfully ending that custody once the danger passes or the legal conditions are met.
- ▶ Current law: the **Mental Healthcare Act (MHCA) 2017** (in force 7 July 2018), which repealed **MHA 1987**, which had repealed the **Indian Lunacy Act 1912**.
- ▶ Old terms like "asylum" and "lunatic" are now **mental health establishment (MHE)** and **person with mental illness (PMI)**; the scheme is rights-based, built on **least restrictive environment**.
- ▶ RGUHS still uses the old "asylum / reception order" wording — both schemes are covered below, current law given priority; restraint itself has two heads, **immediate (emergency) restraint** and **institutional restraint** (formal admission to an MHE).

A. Immediate / emergency restraint

- **Indications:** acute illness where the person is dangerous to himself, dangerous to others, or likely to wastefully spend his own or others' property.
- **Typical causes:** **delirium tremens** (alcohol-withdrawal delirium), **acute mania**, and **organic delirium** (from an underlying physical disease).
- **Consent:** the guardian's informed consent should be obtained if possible; if not, the person may still be restrained, but only as long as the danger lasts.
- **Method:** secure the person in a room under an attendant's care, using the least restrictive means.
- **Emergency treatment (Section 94, MHCA 2017):** a registered medical practitioner may treat without consent, including transport to an MHE, for up to **72 hours** when there is immediate risk of harm; excludes ECT.
- **Safeguards:** MHCA 2017 bans seclusion, solitary confinement, chaining, and unmodified ECT (needs anaesthesia and muscle relaxants); cruelty to a PMI is itself an offence.

B. Institutional restraint — admission under MHCA 2017 (current law)

- Admissions must be **independent (voluntary)** wherever possible; **supported (involuntary)** admission is the exception, at a registered MHE.
- Admission, treatment, and discharge are governed by **Sections 85–99**.

Route	Who applies	Examination requirement	Duration
Independent (S.86)	The person himself	Medical Officer In-Charge satisfied of benefit and free will	Up to 30 days, extendable; self-discharge allowed
Minor's admission	Nominated representative (NR)	NR consent needed	Reclassified independent at 18
Supported ≤30 d (S.89)	NR	1 psychiatrist + 1 mental health professional/doctor agree, both examined within 7 days	Limited to 30 days
Supported >30 d (S.90)	NR	2 psychiatrists independently agree, both examined within 7 days	90 days first, then 120, then 180 each time, via the Board
Emergency treatment (S.94)	Registered medical practitioner	Immediate risk of harm to self/others	Up to 72 hours

- **Supported admission** needs recent or threatened harm to self or others, or endangering behaviour, plus a need for high support.
- **Police/Magistrate route:** a person who appears mentally ill and cannot self-care, or is a risk to others, is taken by police to the **nearest MHE for assessment**; if ill-treated at home, the Magistrate may instead order admission for assessment for **up to 10 days**.

- ▶ **Physical restraint (Section 97):** no seclusion or solitary confinement; used only to prevent imminent harm, for the shortest time, **psychiatrist-authorised**, with the NR informed within 24 hours, never as punishment.

B (historical) — admission under the Mental Health Act, 1987 ("asylum / reception order")

- ▶ **Voluntary admission (S.15–17):** an adult, or a minor through his guardian, requests the medical officer in-charge, who inquires within 24 hours and admits if satisfied.
- ▶ **By request (S.19):** a relative or friend applies with two medical certificates (one government doctor) from an exam within 10 days; limited to 90 days.
- ▶ **Reception order on application (S.20–22):** a Magistrate's order, applied for by the medical officer or a relative, with two medical certificates; the Magistrate decides **in camera**.
- ▶ **Reception order on production (S.23–25):** a **wandering or dangerous** PMI is produced by police within 24 hours, observed up to 10 days (max 30), then a reception order or release on bond; a **cruelly-treated** PMI can instead be reported to the Magistrate, who may fine up to ₹2,000 or pass a reception order.
- ▶ **Other admissions:** after judicial inquisition for a PMI owning property (S.26), or of a mentally ill prisoner (S.27).

Release / discharge from the MHE

Under MHCA 2017:

- ▶ An **independent patient** may discharge himself without the medical officer's consent; a **minor** is discharged if the NR requests it.
- ▶ A **supported patient** is discharged once the psychiatrist, after consulting the PMI, NR, and family, finds admission no longer needed; after 30 days he may continue **as an independent patient** with the right to leave.
- ▶ The **Mental Health Review Board (MHRB)** — chaired by a **District Judge** — reviews supported admissions beyond 30 days, hears appeals, and can order discharge.

Under MHA 1987 (historical):

- ▶ A **voluntary patient (S.18)** is discharged within 24 hours of request; a two-doctor board may keep him up to 90 days against his will if needed.
- ▶ The **officer-in-charge (S.40)** may discharge any patient, except a mentally ill prisoner, on two doctors' recommendation.
- ▶ On the **applicant's request (S.41)**, discharge follows unless the medical officer certifies the person **dangerous and unfit to be at large**.
- ▶ **Escape (S.48):** an escaped PMI may be retaken, but not if more than **one month** has passed (no limit for a mentally ill prisoner).

Medico-legal significance

- ▶ **Statutory definition:** mental illness is a "*substantial disorder of thinking, mood, perception, orientation or memory*" that grossly impairs judgment or behaviour — **Section 2(1)(s), MHCA 2017** — and excludes mental retardation (now intellectual disability).

- ▶ **Insanity defence:** an act is not an offence if unsoundness of mind stopped the person from knowing its nature or that it was wrong or unlawful — **Section 22, BNS 2023 (formerly Section 84, IPC 1860)**, India's *McNaughton rule*.
- ▶ **Trial of an unsound-mind accused** is governed by **Sections 367–378, BNSS 2023 (formerly Sections 328–339, CrPC 1973)**; he is kept in safe custody, not punished.
- ▶ **Decriminalised suicide attempt:** **Section 115, MHCA 2017** presumes "severe stress," entitling the person to care rather than punishment; **Section 309 IPC** has no general BNS equivalent — only the narrow **Section 226, BNS** survives, for coercing a public servant.
- ▶ **Doctor's duties:** certify mental illness honestly, distinguish **true from feigned (malingered) illness** — sudden onset, an evident motive, symptoms only when observed — and record the time, indication, and duration of any restraint used.
- ▶ **Liability:** restraint must be lawful and proportionate — unauthorised confinement exposes the doctor and institution to liability.
- ▶ Running an unregistered MHE, or ill-treating a PMI, are offences under **MHCA 2017 Chapter XVI**; wrongful restraint also attracts **Sections 126/127, BNS 2023 (formerly Sections 339/340, IPC)**.
- ▶ **Rights:** advance directives, the NR, community living, and MHRB oversight protect the PMI; ECT in a minor needs MHRB approval and guardian consent.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Restraint pathway:** *person appears mentally ill → acute danger to self or others?*
- ▶ If **yes** → *emergency restraint (Section 94, ≤72 h; physical restraint Section 97 — psychiatrist-
authorised, NR informed within 24 h) → nearest MHE.*
- ▶ If **no** → *needs treatment? → independent admission (Section 86) or supported admission
(Section 89/90).*
- ▶ Side branch: *found by police, wandering or ill-treated → Magistrate → MHE assessment (≤10
days).*
- ▶ **Discharge pathway:** *admitted patient branches to independent → self-discharge, minor →
NR request → discharge, and supported → psychiatrist + NR/family → MHRB review (>30
days) → discharge or leave.*
- ▶ Label the MHRB (District Judge) and the 30/90/120/180-day markers.



Civil responsibilities of an insane (mentally ill) person

Asked in: Paper III Oct 2025 — RGUHS MD Forensic Medicine

Definition

- ▶ **Civil responsibility** is a person's liability for acts or omissions in civil law — contracts, property, marriage, wills, evidence, consent.
- ▶ The law presumes **every adult is sane until proved otherwise**; the burden of proving mental illness lies on whoever alleges it.

- ▶ A **person with mental illness (PMI)** — the modern term for "insane," per the Mental Healthcare Act 2017 — has impaired **cognition**, the capacity to understand the nature and consequences of an act.
- ▶ A PMI's civil act is **valid** only if he was of **sound disposing mind (compos mentis)** at that exact moment, typically during a **lucid interval**.

Core concepts

- ▶ **Compos mentis:** sound disposing mind — the capacity to recollect, judge, and feel family and blood-relation obligations.
- ▶ **Non compos mentis:** "not of sound mind"; any will, dying declaration, or consent taken in this state is invalid.
- ▶ **Lucid interval:** the period between two episodes of illness when all signs and symptoms **completely disappear**.
 - The person can judge and foresee consequences of his acts; classic example is the **depressive phase of bipolar disorder**.
 - A civil act done in a true lucid interval is **valid**.
- ▶ **Cognition vs emotion/will:** capacity depends on **cognition** (understanding); if only affect or conation is disturbed while cognition stays intact, capacity is usually retained.
- ▶ **When in doubt, opine in favour of sanity** — the safe rule when certifying capacity.

Civil responsibilities / disabilities of a PMI

- ▶ **Managing property:** on judicial inquiry (moved by a relative, public curator, Advocate-General, or District Collector before the **District Court**), if found incapable of managing property (but not dangerous), the court appoints a **guardian** (for the person) and/or **manager** (for the property).
 - Property may be sold to pay his debts and expenses; a **second inquiry** can restore his rights once he recovers.
- ▶ **Contracts:** invalid if he could not understand it, due to illness, at the time of signing — only a person of **sound mind** who can judge its effect on his interests can contract (**Sections 11–12, Indian Contract Act 1872**).
 - May still be **valid** if the other party did not know of the illness and the deal was fair; illness arising **after** the contract does not invalidate it.
 - He remains liable for the **necessities of life** (food, shelter, clothing, medical care), not for unfair or excessive orders.
- ▶ **Witness competence:** generally not competent, but **not automatically excluded** — **Section 124, Bharatiya Sakshya Adhiniyam (BSA) 2023** (formerly **Section 118, Indian Evidence Act 1872**).
 - May testify during a **lucid interval**, or if the illness does not stop him understanding questions and giving rational answers.
- ▶ **Consent:** consent to surgery, sexual intercourse, MTP, organ donation, hurt, or medical examination is **invalid** — **Section 28, BNS 2023** (formerly **Section 90, IPC 1860**) — because he cannot grasp the nature and consequences of the act.

- ▶ **Marriage:** a PMI cannot validly contract marriage; the marriage is **voidable or void**.
 - Illness starting **after** marriage is usually not a ground for divorce, unless it is **incurable despite over 3 years of continuous treatment**.
- ▶ **Making a will:** needs a **sound disposing mind**; generally invalid, **except** in a lucid interval or when a delusion is unrelated to the will (see below).
- ▶ **Custody of children:** in divorce, custody usually goes to the mother; a PMI's incapacity affects who gets or keeps custody.
- ▶ **Adoption:** not allowed if either parent is **mentally ill**.
- ▶ **Inheritance:** mental illness does **not** disqualify a person from inheriting — **Section 28, Hindu Succession Act 1956** — a common exam trap.
- ▶ **Partnership:** a partner's mental illness does **not automatically dissolve** the partnership; dissolution needs a court order.
- ▶ **Government service:** a PMI **cannot** enter government service.

Testamentary capacity — the high-yield civil act

- ▶ **Testamentary capacity** = the mental ability to make a valid will (statutorily "any testamentary document," **Section 2(34), BNS 2023, formerly Section 31, IPC 1860**), governed by the **Indian Succession Act 1925**.
- ▶ The maker is the **testator** (male) / **testatrix** (female); a **holograph will** is written entirely in the testator's own handwriting.

Requirements of a valid will

- ▶ Written, **signed, and witnessed** by at least **2 witnesses** (a holograph will may be exempt from attestation).
- ▶ Testator must be a **major (over 18 years)** with a **sound disposing mind** at the time of making the will.
- ▶ No force, undue influence, or dishonest misrepresentation of facts.

Medical examination of the testator

- ▶ Rule out pain, infirmity, and the influence of alcohol or drugs.
- ▶ Ask preliminary questions about relatives, friends, and business partners, and test **recognition** and **orientation** in time, place, and person.
- ▶ Check understanding of the **nature, extent, and value of the property** and the planned distribution; probe any unjust or unusual distribution.
- ▶ Test **concentration** with simple arithmetic, and question him **in isolation** to rule out undue influence.

A will is VALID when

- ▶ Made during a **lucid interval**, or an insane **delusion exists but is unrelated** to the property or persons in the will.
- ▶ The maker has **extreme age or feeble health** with a defective memory, as long as he still understands the act.

- ▶ The maker has **aphasia, agraphia, or alexia**, or is deaf, dumb, or blind, but can still convey his wishes by gesture or writing.
- ▶ The maker is merely **eccentric**, with no other mental disorder.
- ▶ The maker **commits suicide soon afterwards**, provided there is no other evidence of mental disorder.

A will is INVALID when

- ▶ Made under an active **delusion related to the property or persons** affected by the will.
- ▶ Executed by a **dying person in delirium** — wills made *in extremis* (at the point of death) are viewed with suspicion.
- ▶ Made by a **drunken person** who cannot understand what he is doing (mere partial drunkenness does not invalidate a will).

Medico-legal significance

- ▶ Civil capacity is judged **act by act**, at the **time of that specific civil act**.
- ▶ Criminal responsibility, by contrast, is judged at the **time of the offence** and is an all-or-none defence — **Section 22, Bharatiya Nyaya Sanhita (BNS) 2023** (formerly **Section 84, IPC 1860**), the M'Naughten right-or-wrong test.
- ▶ The certifying doctor's evidence states that unsoundness is severe enough to make him **incapable of managing his property and affairs**; when in doubt, **opine in favour of sanity**.
- ▶ Attempted suicide is decriminalised — presumed to reflect severe stress unless proved otherwise — **Section 115, Mental Healthcare Act 2017**.
 - The old **Section 309, IPC 1860** has no general re-enactment in the BNS 2023 (Section 226 BNS covers only a suicide-attempt used to compel a public servant).

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Flow diagram** — "Is the civil act of a PMI valid?"
 - Box 1: PMI performs a civil act (will / contract / consent / evidence / marriage).
 - Decision: was he of sound disposing mind (*compos mentis*) at that moment?
 - YES (lucid interval, or a delusion unrelated to the act) leads to **VALID**.
 - NO leads to **INVALID / VOIDABLE**.
 - Labels: *compos mentis*, lucid interval, cognition, delusion (related vs unrelated).
- ▶ **Timeline of a lucid interval in bipolar disorder**
 - X-axis: time.
 - Blocks in sequence: Mania (episode) → Depressive phase = lucid interval (acts **VALID** here) → Mania (episode).



Describe the criminal responsibility of insane

Asked in: Paper III Dec 2023 — RGUHS MD Forensic Medicine

Definition and core concept

- ▶ **Criminal responsibility** is a person's legal liability to be punished for a criminal act.
- ▶ The law presumes **every person is sane**.
- ▶ The burden of proving insanity lies on the **accused**.
- ▶ Every crime needs two elements: *actus reus* (the act) and *mens rea* (the guilty mind).
- ▶ A person who, from unsoundness of mind, lacks *mens rea* cannot be held criminally responsible.
- ▶ India codifies this as the **M'Naghten rule**, under **Section 22 BNS 2023 (formerly Section 84 IPC 1860)**.

General principles

- ▶ **Both elements needed:** if unsoundness of mind removes *mens rea*, no offence is committed.
- ▶ **Time of the act matters:** only the mental state **at the moment of the offence** counts.
 - Sane before and after but insane during the act is exempt.
 - Insane generally but acting in a **lucid interval** (illness signs absent, judgment intact) is responsible.
- ▶ **Legal insanity is not medical insanity** — one can be medically ill without being legally exempt.
- ▶ **Cognition is the Indian test, not emotion or will.**
 - Impaired **cognition** (understanding the act) means not responsible.
 - Impaired only **emotion or will**, cognition intact, means still responsible.
- ▶ **Verdict:** insanity gives a "**not guilty by reason of insanity**" (NGRI) verdict — safe custody, not release.

When insanity can be pleaded

A plea of unsoundness of mind can block three legal stages.

- ▶ **Bar of conviction:** insane at the time of the crime — **Section 22 BNS 2023 (formerly Section 84 IPC 1860)**.
- ▶ **Bar of trial:** presently insane and unfit to conduct a defence — **Sections 367–368 BNSS 2023 (formerly Sections 328–329 CrPC 1973)**.
 - Cannot follow proceedings, distinguish a guilty from a not-guilty plea, or instruct counsel/examine witnesses.
- ▶ **Bar of execution:** a death-sentenced prisoner becomes insane before execution.

Legal tests of insanity

Mostly **all-or-none**: the person is either fully responsible or fully exempt.

Test (year)	Principle	Status in India
Wild beast test (1724)	Exempt only if totally deprived of understanding and memory	Historical

Test (year)	Principle	Status in India
M'Naghten rule (1843)	Did not know the act's nature, or that it was wrong, from disease of mind	Adopted — S.22 BNS (S.84 IPC)
Durham / product test (1954)	Not responsible if the act is a product of mental disease	Not followed
Currens rule (1961)	Not responsible if unable to conform conduct to law	Not followed
Irresistible impulse test	Not responsible if disease destroyed the will to resist	Not followed
ALI test (1972)	Lacks capacity to appreciate criminality or to conform conduct to law	Used in many US states

The M'Naghten rule — law applicable in India

- ▶ **Origin:** Daniel M'Naghten, likely with **paranoid schizophrenia**, tried to kill the Prime Minister in 1843 but mistakenly killed his secretary, Edward Drummond.
- ▶ Found insane and hospitalised for life — the outcry produced the **M'Naghten Rules**.
- ▶ **The rule:** not responsible if, from disease of mind, he did not know the act's nature or that it was wrong.
- ▶ "Clearly proved" — the illness must have **directly caused** the offence.
- ▶ "Disease of the mind" is a legal concept, excluding voluntary alcohol/drug effects.
- ▶ "Nature and quality of the act" means its physical nature (e.g. cutting bread, not a throat).
- ▶ **Doctrine of delusion:** the person is judged as if **the delusional facts were true**.
 - Killing someone he wrongly believes is about to kill him is exempt — it mirrors self-defence.
 - Killing in revenge for an imagined wrong is **not** exempt — revenge is never a legal justification.
- ▶ **Criticism:** a purely **cognitive test** — it ignores emotion, will, and loss of impulse control.

Special conditions and their effect on responsibility

- ▶ **Impulse:** sudden loss of self-control is **not** a defence unless true unsoundness of mind is present.
 - Kleptomania, pyromania, and mutilomania are **not** defences in India.
- ▶ **Automatism:** purposeful-looking behaviour without conscious control, followed by amnesia.
 - **Insane automatism** is from disease of the mind (e.g. epilepsy); **sane automatism** from external causes (concussion, hypoglycaemia, sleepwalking).
 - India has no separate law; S.22 BNS (S.84 IPC) may still apply if unaware of the act.
- ▶ **Somnambulism:** acts in deep NREM sleep, not wilful, not remembered — **not responsible**.
- ▶ **Delirium:** acts under delirium's delusions or hallucinations are **not legally responsible**.
- ▶ **Intoxication:**
 - **Involuntary** (given without knowledge or consent): **not an offence** — Section 23 BNS 2023 (formerly Section 85 IPC 1860).

- **Voluntary:** the person is **responsible** if he had the required intention or knowledge — **Section 24 BNS 2023 (formerly Section 86 IPC 1860)**.
- *Delirium tremens* (alcohol-withdrawal state with tremor and hallucinations) frees a person of responsibility.
- ▶ **Psychopathy / sociopathy:** cannot appreciate moral implications of acts, but is **not insane** and **not a defence** in India — held fully responsible under S.22 BNS.

Doctrine of diminished responsibility

- ▶ A **partial defence** for a borderline mental state that falls short of full unsoundness of mind.
- ▶ **May qualify:** arrested development, depression, obsessional states, head injury, paranoid or psychopathic states.
- ▶ **Does not qualify:** feigned illness, bad temper, jealousy, drug use, low intelligence, political fanaticism.
- ▶ **Effect:** where available, murder is reduced to **culpable homicide not amounting to murder**.
- ▶ Available in Scotland, England, France, Germany — **not in India**, since S.22 BNS is all-or-none.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Flowchart:** Crime committed → *actus reus* present? → *mens rea* present? → unsoundness of mind at the time?
 - If yes: did he know the act's nature/quality, or that it was wrong (M'Naghten / S.22 BNS)?
 - If no: not guilty by reason of insanity → safe custody in a psychiatric hospital.
 - If yes: criminally responsible → punishment.
- ▶ **Three compartments of mind:** circles for **Cognition** (understanding), **Conation** (will), and **Affect** (emotion).
 - M'Naghten tests only Cognition; the irresistible-impulse test covers only Conation; Durham/ALI attempt all three.

Medico-legal significance

- ▶ The psychiatrist examines the accused and runs psychiatric tests, EEG, CT/MRI, and blood/urine screens.
- ▶ The opinion on responsibility **at the time of the offence** is an inference, less reliable with a longer gap.
- ▶ **Features suggesting genuine insanity** in a homicide:
 - No or weak motive, no planning or accomplices.
 - Victims may be multiple, including own relatives.
 - No secrecy or attempt to destroy evidence — he may even report himself to police.
- ▶ **Feigned (malingered) insanity** should be suspected when:
 - Onset is sudden, with an obvious motive to escape punishment.
 - Symptoms are exaggerated, present only when someone is watching.

- The picture fits no recognised disease, and the person avoids dirt/exertion and resents repeated examination.
- ▶ An unsound person is still **competent to give evidence** in a lucid interval — **Section 124 BSA 2023 (formerly Section 118 IEA 1872)**.
- ▶ Trial-fitness and safe-custody procedure is under **Sections 367–378 BNSS 2023 (formerly Sections 328–339 CrPC 1973)**.
- ▶ The **Mental Healthcare Act 2017** governs admission, treatment, restraint, and advance directives.



Describe the various method of Restraint of mentally ill person and explain civil responsibilities of mentally ill-person

Asked in: Paper III Apr 2020 — RGUHS MD Forensic Medicine

Definition / Introduction

- ▶ **Restraint** of a mentally ill person means any physical, pharmacological, environmental, or legal method used to control the person's movements or behaviour.
- ▶ It is used to prevent imminent harm to the patient or others, or to allow safe treatment.
- ▶ **Civil responsibility** is a person's liability or capacity in non-criminal law — for property, contracts, marriage, consent, giving evidence, and making a will.
- ▶ Mental illness can abolish or limit this capacity.
- ▶ Indian law presumes **every person mentally sound until proved otherwise**.
- ▶ The governing statute is the **Mental Healthcare Act (MHCA), 2017**, which replaced the Mental Health Act, 1987.
- ▶ It renamed "mentally ill person" to **person with mental illness (PMI)**.
- ▶ **Mental illness (Section 2(1)(s) MHCA 2017)**: a substantial disorder of thinking, mood, perception, orientation, or memory that grossly impairs judgment or the capacity to recognise reality; excludes mental retardation.

Methods of restraint of a mentally ill person

- ▶ Restraint is always **graded** — the least restrictive effective method is used first.
- ▶ Restraint is never a substitute for treatment and never used as punishment.

Method	What it involves	Key safeguard
Verbal / behavioural de-escalation	Calm reassurance, removing triggers, talking the patient down	First-line; must be documented before any physical/chemical step
Physical (manual) restraint	Trained staff briefly hold the patient's limbs	Only to prevent imminent harm; minimum force, shortest duration
Mechanical restraint	Restraining belts, soft cuffs, camisole/straitjacket, restraining sheets, bed fixation	Padded, monitored continuously, circulation checked

Method	What it involves	Key safeguard
Chemical (pharmacological) restraint	Rapid tranquillisation — e.g., IV diazepam 5–10 mg or lorazepam 2–4 mg, titrated	Requires a doctor's order; vitals monitored; not routine
Seclusion	Patient placed alone in a safe, supervised room	Continuous medical supervision; solitary confinement is banned
Legal (statutory) restraint	Involuntary admission to a Mental Health Establishment under MHCA routes	Statutory criteria, time limits, Mental Health Review Board oversight

- ▶ **Section 97 MHCA 2017** governs every method:
 - Used **only** to prevent imminent and immediate harm.
 - Authorised by the psychiatrist in charge of treatment.
 - Continued **no longer than necessary**.
 - Patient kept under **continuous medical supervision**.
 - The **nominated representative (NR)** informed within **24 hours**.
 - **Seclusion, solitary confinement, and routine chemical/physical restraint are forbidden.**

Legal restraint — admission routes under MHCA, 2017

- ▶ **Independent admission:** adult (18+) who wants admission himself; admitted by the Medical Officer in charge; can discharge himself.
- ▶ **Admission of a minor:** on the NR's application, after exam by one psychiatrist and one mental-health professional; housed separately from adults.
- ▶ **Supported admission (up to 30 days):** for a PMI dangerous to self or others; needs exam within the preceding 7 days by one psychiatrist and one mental-health professional.
- ▶ **Supported admission beyond 30 days:** needs two psychiatrists; reported to the Mental Health Review Board; 90 days first, extendable to 120 then 180 days.
- ▶ **Observation:** up to 10 days in hospital, extendable by the Magistrate in 10-day blocks to a maximum of 30 days.
- ▶ **Other lawful routes:** police production of a wandering PMI before a Magistrate; report of an ill-treated PMI in a private home; mentally ill prisoners admitted under **Section 369 or 374 BNSS 2023 (formerly Section 330 or 335 CrPC 1973)**.
- ▶ An **Advance Directive** and the right to an NR protect the patient's autonomy during restraint.

Civil responsibilities of a mentally ill person

- ▶ Civil responsibility depends on whether the person could understand the **nature and consequences** of the act at that time.
- ▶ **Property and affairs:** on a relative's application, the Court can declare the person incapable of managing property and appoint a manager; a later inquiry can restore capacity.
- ▶ **Contracts:** invalid if the person could not understand it due to mental illness.
 - A person of usually unsound mind can contract validly during a **lucid interval**.

- He remains liable to pay a fair price for **necessaries of life** (food, shelter, clothing, medical care).
- ▶ **Marriage:** a PMI cannot validly contract marriage; the marriage is **voidable**, and void if unsoundness existed at the time of marriage.
 - Incurable insanity lasting **more than three years** is a ground for divorce by the sound spouse.
- ▶ **Guardianship and adoption:** custody is restricted; adoption is **not allowed** if either parent is mentally ill.
- ▶ **Consent:** invalid (for surgery, sexual intercourse, MTP, organ donation) if the person cannot understand its nature and consequences.
- ▶ **Competence as a witness:** a PMI is **not automatically incompetent**; he can testify if he can understand questions and give rational answers, including in a lucid interval.
- ▶ **Testamentary capacity (making a will):** needs a **sound disposing mind (compos mentis)** at the time of execution.
 - A will made in a lucid interval, or where a delusion is unrelated to property, is **valid**.
 - The doctor confirms the testator is a major, free of undue influence, and tests orientation, property awareness, recognition of relatives, and simple arithmetic.
 - A **holograph will** (entirely handwritten) needs no witnesses; otherwise it needs the testator's and **two witnesses'** signatures.
- ▶ **Government service:** a PMI cannot enter government service.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Flowchart** — "Graded methods of restraint of a PMI": boxes top to bottom — *Verbal de-escalation* → *Physical restraint* → *Mechanical restraint* → *Chemical restraint* → *Seclusion (supervised)* → *Legal restraint (MHCA admission)* — with a side box listing the Section 97 safeguards.
- ▶ **Box diagram** — "Civil capacities affected by mental illness": central label *Person with Mental Illness*, spokes to *Property*, *Contract*, *Marriage*, *Consent*, *Evidence*, *Will*, *Guardianship/Adoption*, *Government service*.

Medico-legal significance

- ▶ The treating doctor must order the least restrictive measure, record the indication and authorising psychiatrist, monitor continuously, and inform the NR within 24 hours.
- ▶ For a property inquiry, the certificate must state that unsoundness of mind makes the person incapable of managing property.
- ▶ **When in doubt, opine in favour of sanity.**
- ▶ Real illness must be distinguished from feigned illness (motive present, sudden onset, breaks down on exertion) before recommending custodial restraint.
- ▶ Death of a PMI in a Mental Health Establishment is a **custodial death**, requiring inquest under **Section 196 BNSS 2023 (formerly Section 176 CrPC 1973)**.
- ▶ **Restraint asphyxia** (positional asphyxia) is a recognised hazard of improper physical restraint.

- ▶ Fitness to stand trial and detention of an accused of unsound mind is governed by **Sections 367–378 BNSS 2023 (formerly Sections 328–339 CrPC 1973)**.
- ▶ Competence of a mentally ill witness is governed by **Section 124 BSA 2023 (formerly Section 118 IEA 1872)**.
- ▶ Consent given by an unsound person is invalid under **Section 28 BNS 2023 (formerly Section 90 IPC)**.
- ▶ Attempted suicide is decriminalised in practice under **Section 115 MHCA 2017** (severe-stress presumption); the old Section 309 IPC has no general BNS re-enactment.
- ▶ Criminal responsibility of the insane follows the **McNaughten Rule**, codified as **Section 22 BNS 2023 (formerly Section 84 IPC 1860)**: an act is not an offence if unsoundness of mind made the person incapable of knowing its nature, or that it was wrong or against the law.



Differentiate the feigned insanity from true insanity and add a note on Lucid Interval

Asked in: Paper III Oct 2021 — RGUHS MD Forensic Medicine

Definition

- ▶ **True insanity** is a genuine, involuntary mental illness.
- ▶ It grossly impairs judgment, perception of reality, and the ability to meet ordinary life demands.
- ▶ **Feigned insanity** (malingering of mental illness) is a deliberate act by a person who is actually sane.
- ▶ The person consciously imitates signs and symptoms of mental illness for some underlying motive.
- ▶ The commonest motive is to claim the defence of unsoundness of mind under **Section 22, Bharatiya Nyaya Sanhita (BNS) 2023 (formerly Section 84, Indian Penal Code 1860)**.
- ▶ Section 22 BNS is the statutory form of the **M'Naghten Rule**.
- ▶ Distinguishing true from feigned insanity is the forensic psychiatrist's task, because criminal and civil responsibility depend on it.
- ▶ A **lucid interval** is a period of clear mind between two episodes of mental illness, during which the person is sane and fully responsible.

Why insanity is feigned

- ▶ **Accused persons or convicts** feign it to avoid trial, escape punishment, or escape a death sentence.
- ▶ **Soldiers and policemen** feign it to avoid punishment for neglect of duty, or to leave a service they cannot otherwise quit.
- ▶ **Businessmen** feign it to avoid honouring contracts.
- ▶ Rarely, **investigators or psychologists** feign it to gain admission to mental institutions for study — the classic 1973 *Rosenhan experiment*.

- ▶ Mafia boss *Vincent Gigante* feigned insanity for over a decade before admitting it — even experienced clinicians can be fooled either way.

True insanity versus feigned insanity

Feature	True insanity	Feigned insanity
Onset	Gradual	Sudden, often right after the crime
Motive	Absent	Present — usually to claim Section 22 BNS (Section 84 IPC)
Signs & symptoms	Present whether or not observed; fit a recognisable disease	Present only when watched; variable and exaggerated; fit no disease
Activity / mood	Directed, consistent with the disorder	Bizarre, overacted
Facial expression	Vacant or fixed look	Frequently changing, exaggerated
Insomnia & exertion	Can go without sleep and withstand exertion for days	Cannot sustain it; breaks down after a day or two
Personal hygiene	Dirty, filthy; skin dry and harsh	Clean; skin normal
Repeated examination	Does not mind it — nothing to conceal	Resents it — fears detection

- ▶ The genuine patient is **consistent but careless**: same behaviour whether watched or not, self-neglect, unbothered by examination.
- ▶ The malingerer is **inconsistent but careful**: performs only when watched, stays reasonably clean, cannot sustain the act physically, and fears being caught.

Detecting feigned insanity

- ▶ **Prolonged observation**: the accused is observed for about **10 days**.
- ▶ This can be extended, with a Magistrate's permission, up to **30 days**, in further 10-day blocks.
- ▶ A malingerer cannot sustain the act that long and loses track of his own "symptoms".
- ▶ **Covert observation**: feigned signs appear only when the person feels watched, so secret observation is most revealing.
- ▶ **Detailed history**: true illness has a gradual course with prior episodes or treatment; feigned illness has no such background.
- ▶ **Crime-scene clues**: hiding the weapon or washing off fingerprints shows a sound, planning mind — evidence against true insanity.
- ▶ **Repeated interviews**: a sane person cannot maintain a consistent false picture over many sessions, and contradictions emerge.
- ▶ **Pattern mismatch**: the feigned picture does not fit any single recognised psychiatric disorder.
- ▶ **Standardised tests** used to detect malingering: **M-FAST, SIRS, SIMS, TOMM, VIP, PDRT**, and memory tests.

- ▶ **Adjunct investigations:** blood, urine, CSF, EEG, CT/MRI, and where relevant PET, help confirm or exclude organic disease.
- ▶ **Munchausen syndrome** also involves feigned or self-induced illness, but with no external motive beyond assuming the sick role for attention.
- ▶ Munchausen syndrome is itself a recognised psychiatric disorder, so it is **not** true malingering.

NOTE — FOR REFERENCE, NOT TO BE WRITTEN IN THE EXAM

- ▶ A lucid interval is the period **between two episodes of mental illness** when all signs and symptoms completely disappear.
- ▶ During it the person has clarity of mind and can judge and foresee the consequences of his acts.
- ▶ The term applies in two different forensic settings — **insanity** and **head injury** — and these must not be confused.
- ▶ **In insanity:** classically seen in **bipolar (manic-depressive) disorder** — the interval lies between two manic attacks.
- ▶ In practice, the **depressive phase is the lucid interval**.
- ▶ The person is sane and fully responsible for civil and criminal acts done during it.
- ▶ He may make a **valid will**, enter a **valid contract**, is **competent as a witness**, and is **criminally responsible** for any offence committed then.
- ▶ **In head injury:** a lucid interval is the classic feature of **extradural (epidural) haemorrhage**.
- ▶ It is the deceptively normal period between the initial concussion and the later cerebral compression — occurring **only once**, unlike the recurrent insanity type.
- ▶ It can also occur, less often, in subdural haemorrhage.
- ▶ A similar symptom-free interval is described in the second stage of phosphorus and iron poisoning.

Medico-legal significance

- ▶ Distinguishing true from feigned insanity decides whether an accused gets the protection of **Section 22 BNS 2023 (Section 84 IPC 1860)**.
- ▶ The law presumes every person is sane, so the **burden of proving unsoundness of mind lies on the defence**.
- ▶ The forensic psychiatrist certifies soundness of mind and opines on responsibility for the act, and on competence to consent, testify, stand trial, marry, or contract.
- ▶ **Fitness to stand trial** is assessed under **Sections 367–378, Bharatiya Nagarik Suraksha Sanhita (BNSS) 2023 (formerly Sections 328–339, Code of Criminal Procedure 1973)** — looking at the mind **at the time of the offence**, not in general.
- ▶ A person of unsound mind is not an incompetent witness unless the condition prevents rational answers, and is specifically competent **during a lucid interval** — **Section 124, Bharatiya Sakshya Adhiniyam (BSA) 2023 (formerly Section 118, Indian Evidence Act 1872)**.

- ▶ Legally, "mental illness" means a substantial disorder of thinking, mood, perception, orientation or memory that grossly impairs judgment or the capacity to meet ordinary life demands — **Section 2(1)(s), Mental Healthcare Act 2017.**
- ▶ Attempted suicide is presumed, unless proved otherwise, to result from severe stress and is not tried or punished — **Section 115, Mental Healthcare Act 2017.**
- ▶ Avoid two opposite errors: wrongly labelling a genuinely ill person a malingerer, or being deceived by a skilled one — prolonged, covert observation with objective tests is safer than a single interview.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Lucid interval in insanity (bipolar disorder):** X-Y plot, X-axis = *Time*, Y-axis = *Mental state*.
- ▶ Draw a curve rising into a **Manic phase (A-B)**, falling into a flat **Depressive phase = Lucid interval (B-C)**, then rising again into a second **Manic phase (C-D)**.
- ▶ Label the flat segment "Responsible for civil & criminal acts here".
- ▶ **Lucid interval in head injury (EDH):** a horizontal timeline with three boxes.
- ▶ Box 1: **Initial concussion** (brief unconsciousness). Box 2: **Lucid interval** (patient appears normal). Box 3: **Cerebral compression** (deterioration to coma).
- ▶ Join the boxes with arrows left to right.



Discuss salient features of mental health care act 2017

Asked in: Paper III Dec 2023 — RGUHS MD Forensic Medicine

Introduction

- ▶ The **Mental Healthcare Act (MHCA), 2017** is India's main law on the care, treatment, and rights of persons with mental illness.
- ▶ Assented on 7 April 2017, **in force from 7 July 2018**, it **repealed the Mental Health Act 1987** (which had replaced the Indian Lunacy Act 1912).
- ▶ The Act shifts mental healthcare from a *custodial, institution-centred* model to a *rights-based, patient-centred* model, aligning Indian law with the **UNCRPD** (ratified by India, 2007).
- ▶ **Mental illness** (Section 2(1)(s)) means a substantial disorder of thinking, mood, perception, orientation, or memory that severely impairs judgment or the ability to function; "mental retardation" is expressly excluded.
- ▶ The Act replaces the older term "mentally ill person" with "**person with mental illness**" (PMI).

Core rights-based framework

- ▶ **Decriminalisation of attempted suicide (Section 115)** is the flagship reform of the Act.
- ▶ Before 2017, attempting suicide was punishable under **Section 309 IPC 1860** — up to one year's imprisonment, fine, or both.

- ▶ Under **Section 115 MHCA**, a person who attempts suicide is **presumed to have severe stress** unless proved otherwise.
- ▶ Such a person **shall not be punished**, and must instead be given care, treatment, and rehabilitation.
- ▶ **Section 309 IPC** is now a dead letter: the new code has **no general re-enactment**, only **Section 226 BNS 2023**, and only for attempting suicide to compel or restrain a public servant on duty.
- ▶ **Right to access** affordable, good-quality, geographically accessible mental healthcare.
- ▶ **Right to dignity and equality** — no discrimination by gender, sex, orientation, religion, caste, class, or disability — and protection from cruel or degrading treatment.
- ▶ **Right to confidentiality**, to information about treatment, to access one's own records, and to make complaints about care.
- ▶ A woman with mental illness may keep her child with her up to age three, unless the Mental Health Review Board directs separation in the child's interest.

Advance Directive and Nominated Representative

These two instruments embody the Act's principle of **supported decision-making**, replacing the older paternalistic model.

- ▶ **Advance Directive (AD)** (Sections 5–13), also called a *Ulysses contract* — named for Ulysses binding himself to the mast so his earlier, competent wishes would bind his later, compromised self.
- ▶ Any competent person ≥ 18 years may write, in advance, how he wishes to be treated if he later loses decision-making capacity.
- ▶ It becomes **effective** once capacity is lost, stays effective until capacity returns, and a newer AD overrides an older one.
- ▶ The maker may **revoke, amend, or cancel** it at any time while competent.
- ▶ A professional or caregiver unwilling to follow an AD may ask the **Mental Health Review Board (MHRB)** to review or alter it.
- ▶ A professional who acts on a **valid** AD in good faith is **not liable** for any unforeseen consequence.
- ▶ **Nominated Representative (NR)** — every PMI aged ≥ 18 years may appoint, in writing, someone to take care decisions on his behalf during incapacity.
- ▶ Default order if none is appointed: a relative, a caregiver, a Board-appointed person, or a Social Welfare officer.
- ▶ The NR **supports**, and does not replace, the person's own preferences.

Establishments and oversight bodies

- ▶ **Mental Health Establishment (MHE)** — any Government or private facility, including AYUSH establishments, offering care for mental illness; every MHE **must be registered**.
- ▶ **Central/State Mental Health Authority (CMHA/SMHA)** register and maintain records of all MHEs and set quality and service standards.

- ▶ **Mental Health Review Board (MHRB)** is a quasi-judicial district/regional body, held **in camera** (in private).
- ▶ It reviews or cancels **Advance Directives**, appoints or alters **Nominated Representatives**, adjudicates **rights complaints**, and reviews admissions made without consent.

Admission, treatment, and discharge

Admission type	Salient rule
Independent (voluntary)	Person ≥ 18 y self-requests the MOIC; own consent for treatment; discharge at will.
Minor	NR applies and consents; kept separate from adults; reclassified as independent at 18 y.
Supported (involuntary)	Danger to self/others: MOIC admits up to 30 days on NR's application, two psychiatric assessments; MHRB reviews longer stays.
Discharge	Psychiatrist consults the PMI, NR, and family first.
Free treatment	Free for homeless/below-poverty-line PMI at Government establishments.

- ▶ **Electroconvulsive therapy (ECT, Section 95)** must be given only with **anaesthesia and muscle relaxants** — unmodified ECT is banned.
- ▶ **ECT must not be used as an emergency treatment.**
- ▶ ECT in a **minor** needs the guardian's informed consent **plus** prior MHRB permission.
- ▶ **Psychosurgery** needs the person's informed consent **and** MHRB approval.
- ▶ **Prohibited outright:** sterilisation solely for mental illness, chaining, and seclusion or solitary confinement.
- ▶ **Physical restraint (Section 97)** is allowed only to prevent **immediate, imminent harm**, never as punishment, and only for as long as necessary.
- ▶ It needs a psychiatrist's authorisation, must be recorded, and the **NR must be informed within 24 hours.**
- ▶ **Prisoners** with mental illness must be transferred to an MHE for treatment; the prison medical officer reports quarterly to the Board.
- ▶ **Insurance parity** — every insurer must cover mental illness on the **same basis** as physical illness.

Criminal responsibility (forensic relevance)

- ▶ MHCA 2017 governs **care and rights**, not **criminal responsibility**.
- ▶ Criminal responsibility is still decided under the insanity defence — **Section 84 IPC 1860 (now Section 22 BNS 2023)**, the codified **McNaughton's Rule (1843)**.
- ▶ It exempts an act done by a person who, by unsoundness of mind, cannot know its nature or that it is wrong.
- ▶ Consent given by a person of unsound mind is **invalid** — **Section 90 IPC 1860 (now Section 28 BNS 2023)**.

- ▶ An accused found not responsible is **detained**, not punished, under the unsound-mind-trial provisions of CrPC 1973 (now BNSS 2023).

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Flowchart** — "Pathways of Admission under MHCA 2017." Central node *PMI*, three branches: independent (self-request → own consent → discharge at will), minor (NR applies → consents → reclassified at 18 y), supported (danger to self/others → 30-day admission → two assessments → MHRB review). Label *CMHA/SMHA* and *MHRB* as oversight feeding all branches.
- ▶ **Concept map** — "Rights framework of MHCA 2017." Central node *PMI*, spokes for Advance Directive, Nominated Representative, right to access care, dignity, confidentiality, decriminalised suicide attempt, insurance parity, and a woman's right to keep her child under 3 years.

Medico-legal significance

- ▶ **Suicide-attempt survivors** are treated as patients in severe stress, not as criminals — IPC 309 formalities no longer apply.
- ▶ A doctor must **honour a valid Advance Directive** and treat the **Nominated Representative** as decision-maker during incapacity; good-faith action on a valid AD gives **statutory immunity**.
- ▶ **Unmodified ECT** and **ECT in minors without MHRB sanction** are now statutory offences; practising in an **unregistered MHE** also attracts penalty.
- ▶ **Certifying soundness of mind** and distinguishing true from feigned mental illness remain forensic-psychiatry duties, interfacing with but not replaced by the MHCA.
- ▶ The Act dovetails with the **Rights of Persons with Disabilities Act, 2016** to give effect to the UNCRPD.

Recent advances [RA]

- ▶ **Rapid tranquilisation (chemical restraint, Section 97)**: a meta-analysis of 18 trials (3,411 patients) found antipsychotic–benzodiazepine combinations sedate agitated patients faster than haloperidol alone, which also caused more extrapyramidal effects — relevant to lawful emergency sedation. [PMID 42259329]
- ▶ **Global disease burden**: mental disorders are now the **fifth leading cause of disability-adjusted life-years** worldwide (twelfth in 1990), with about 1.17 billion prevalent cases — the burden this Act was enacted to address. [PMID 42167272]
- ▶ **Restraint harms**: a 2024 review catalogues physical, chemical, and psychological restraint harms (injury, cognitive decline, over-sedation, rarely death) against the Section 97 safeguards. [PMID 38643681]
- ▶ **Rehabilitation as a legal right**: a 2026 analysis argues the Act converts rehabilitation from charity into a statutory entitlement, mandating halfway homes and community-based rehabilitation. [PMID 41616408]

- ▶ **UNCRPD alignment:** the Act is commended against UNCRPD Articles 12 (equal recognition before law) and 14 (liberty and security), though legislation alone cannot substitute for services and financing. [PMID 37738687]
- ▶ **Tele-MANAS:** India's tele-mental-health helpline (14416), launched 10 October 2022, had handled about 29.82 lakh calls by late 2025 across 53 cells in 36 States/UTs. [PIB 2025]
- ▶ **National Suicide Prevention Strategy (2022):** MoHFW's first such strategy (21 November 2022) targets a 10% cut in suicide mortality by 2030, giving effect to the Section 115 duty of care. [MoHFW 2022]
- ▶ **Insurance-parity gap:** IRDAI's 2018 circular mandated parity cover (Section 21(4)), but non-compliance persists and parity remains incomplete in 2025 policy analyses. [IRDAI 2018; CMHLP 2025]



Discuss the Mental Health Care Act 2017

Asked in: Paper III Jun 2024 — RGUHS MD Forensic Medicine

Introduction

- ▶ The **Mental Healthcare Act, 2017 (MHCA 2017)**, Act No. 10 of 2017, received Presidential assent on 7 April 2017 and came into force on 29 May 2018.
- ▶ It repealed the older **Mental Health Act, 1987 (MHA 1987)**.
- ▶ Its object is to provide mental healthcare and protect the rights of persons with mental illness, aligning Indian law with the **UN Convention on the Rights of Persons with Disabilities (UNCRPD)**.
- ▶ It shifts the law from a custodial model to a **patient-autonomy, rights-centred** model.
- ▶ Its single biggest medico-legal change: it **decriminalises attempted suicide** (Section 115).

Key definitions (Section 2(1))

- ▶ **Mental illness — Section 2(1)(s):** a substantial disorder of thinking, mood, perception, orientation or memory that grossly impairs judgement or the ability to recognise reality; **includes** alcohol/drug-abuse conditions, **excludes mental retardation** ("intellectual disability" in ICD-11/DSM-5).
- ▶ The Act replaces "mentally ill person" with the person-first term "**person with mental illness (PMI)**."
- ▶ **Medical practitioner — Section 2(1)(n):** any doctor registered under the Indian Medical Council Act 1956, Indian Medicine Central Council Act 1970, or Homoeopathy Central Council Act 1973 — no psychiatry PG needed.
- ▶ **Mental health professional — Section 2(1)(r):** a psychiatrist, a Section-55-registered professional, or a postgraduate AYUSH psychiatry degree holder (clause (r)(iii)) — never a "medical practitioner," a common exam trap.
- ▶ **Advance directive (AD) — Section 5:** a written statement by an adult on how he wants to be treated in a future mental-health crisis — a "Ulysses contract."

- ▶ **Nominated representative (NR) — Section 14:** a person the PMI appoints in writing to make treatment decisions during incapacity.
- ▶ **Mental health establishment (MHE) — Section 2(1)(p):** any facility, including AYUSH facilities, admitting PMIs for care; every MHE must be registered (Chapter X).

Rights and salient features

- ▶ **Chapter V rights bundle:**
 - Access to mental healthcare (Section 18) and community living (Section 19).
 - Protection from cruel, inhuman or degrading treatment (Section 20).
 - **Insurance parity** — cover on the same basis as physical illness (Section 21(4)).
 - Other rights: confidentiality, records, legal aid, complaints (Sections 23, 25, 27, 28).
- ▶ **Capacity-based autonomy (Section 4):** treatment rests on informed consent and the least-restrictive option, via the advance directive and nominated representative.
- ▶ **Decriminalisation of attempted suicide (Section 115):** a person who attempts suicide is presumed to be under severe stress and must not be tried or punished under **Section 309 Indian Penal Code (IPC) 1860**.
- ▶ **Ban on inhuman practices (Sections 95, 97):**
 - No unmodified ECT (electroconvulsive therapy given without anaesthesia and muscle relaxants).
 - No ECT in minors, except a narrow exception.
 - No sterilisation as treatment, no chaining, no seclusion.

Structure of the Act

The Act has 16 chapters and 126 sections. Exam-relevant anchors:

Chapter	Sections	Subject
XI	73–84	Mental Health Review Boards (MHRB)
XII	85–99	Admission, treatment and discharge
XV	107–109	Offences and penalties
XVI	110–126	Miscellaneous — includes Section 115

- ▶ **MHRB = Chapter XI; Section 115 = Chapter XVI (Miscellaneous), not the offences chapter** — both frequently mis-cited.

Authorities and review machinery

- ▶ **CMHA (Sections 33–44):** registers/supervises MHEs under Central-Government control (Section 43); keeps the national register of allied mental-health professionals.
- ▶ **SMHA (Sections 45–56):** registers State-controlled MHEs and State-level professionals.
- ▶ **MHRB (Sections 73–84):** a quasi-judicial, district-level Board formed by the State Authority.

- ▶ **Composition (Section 74):** District Judge (serving/eligible/retired) as chairperson, a District Collector/Magistrate representative, one psychiatrist plus one medical practitioner, and two members from PMIs/care-givers/NGOs.
- ▶ **Functions (Sections 77, 82):** register/review/alter/cancel advance directives, appoint NRs, review admissions beyond 30 days, hear rights-violation complaints.
- ▶ Proceedings are held *in camera* — private, closed to the public (Section 80(5)).

Admission, treatment and discharge (Chapter XII)

- ▶ **Independent admission — Sections 85–86:** any adult (≥ 18 y) who considers himself mentally ill may request admission from the MOIC (medical officer in charge); relatives' consent is **not** required.
- ▶ He may discharge himself on request (Section 88), subject to a 24-hour hold for assessment.
- ▶ **Minor admission — Section 87:** the NR applies to the MOIC; needs exam by 2 psychiatrists, or 1 psychiatrist plus a mental health professional or medical practitioner, both finding severe mental illness needing admission.
- ▶ The minor stays separate from adults, with the NR or an attendant present throughout; the Board is informed within 72 hours.
- ▶ At 18 years, the minor is reclassified as an independent patient.
- ▶ **Supported admission ≤ 30 days — Section 89:** the NR applies after exam by 1 psychiatrist plus a mental health professional or medical practitioner, both finding recent self-harm risk, violence or self-neglect, and admission the least restrictive option.
- ▶ At 30 days the person either meets the stricter Section 90 criteria or remains free to leave as an independent patient.
- ▶ **Supported admission > 30 days — Section 90:** 2 psychiatrists independently agree the danger or self-neglect is persistent, not just recent; reported to the MHRB within 7 days.
- ▶ First period 90 days, extendable to 120, then 180 days each time.
- ▶ **Emergency treatment — Section 94:** any registered medical practitioner may treat, with NR consent where available, to prevent death or serious harm; limited to 72 hours, or until MHE assessment (7 days in a disaster).
- ▶ **ECT is never permitted as emergency treatment.**
- ▶ **Prohibited procedures — Section 95:**
 - Unmodified ECT.
 - ECT in minors — only if a psychiatrist deems it necessary, the guardian consents, **and** the Board gives prior permission.
 - Sterilisation as treatment.
 - Chaining.
- ▶ **Psychosurgery — Section 96:** needs informed consent **plus** Board approval.
- ▶ **Restraint and seclusion — Section 97:** seclusion/solitary confinement is prohibited; restraint is allowed only to prevent imminent harm, for the shortest period, by the treating psychiatrist, never as punishment.

- ▶ NR informed within 24 hours; monthly report to the Board.

Medico-legal significance

- ▶ Decriminalisation (Section 115) makes Section 309 IPC 1860 effectively inoperative — the Bharatiya Nyaya Sanhita (BNS) 2023 has no general re-enactment of it.
- ▶ Only a narrow offence survives: Section 226 BNS (attempting suicide to compel/restrain a public servant's lawful duty).
- ▶ A casualty doctor can treat a suicide-attempt patient **without fear of a police case**.
- ▶ **Consent and capacity:** valid treatment turns on capacity (Section 4) and informed consent, via the AD/NR system that replaced MHA-1987's reception order (committal by government/court order).
- ▶ **Criminal responsibility stays with criminal law, not the MHCA:**
 - Insanity defence (*McNaughten* test) — Section 84 IPC 1860, now Section 22 BNS 2023.
 - Fitness to stand trial — Sections 328–339 Code of Criminal Procedure (CrPC) 1973, now Sections 367–378 Bharatiya Nagarik Suraksha Sanhita (BNSS) 2023.
 - Prisoners with mental illness — Section 103 MHCA with Sections 330/335 CrPC 1973, now Sections 369/374 BNSS 2023.
 - Disputed mental illness in court — referred to the MHRB (Section 105).
 - Competence to testify — Section 118 Indian Evidence Act (IEA) 1872, now Section 124 Bharatiya Sakshya Adhiniyam (BSA) 2023.
- ▶ **Penalties (Sections 107–108):** an unregistered MHE faces ₹5,000–50,000 first, ₹50,000–2 lakh second, ₹2–5 lakh for further offences.
- ▶ General contravention of the Act draws up to 6 months/₹10,000 first, up to 2 years/₹50,000–5 lakh on repeat.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Flowchart** — "Admission pathways under MHCA 2017." *Person with mental illness* branches to four pathways: *Independent* (86, ≥18y, self-discharge 88), *Supported ≤30 days* (89), *Supported >30 days* (90, two psychiatrists, 90→120→180 days), *Emergency* (94, ≤72h, no ECT) — all converging on *Least-restrictive treatment* → *MHRB review* → *Discharge*.
- ▶ **Box diagram** — "Three-tier authority structure." *CMHA* (33–44) → *SMHA* (45–56) → *MHRB* (73–84, district, quasi-judicial, District-Judge chair), with side-boxes: *Advance directive*, *Nominated representative*, *Rights complaints*, *Admissions >30 days*.

Recent advances

- ▶ [RA] Tele-MANAS [PIB, MoHFW, 10 Oct 2022] — 24×7 toll-free tele-mental-health helpline (14416), under the Section 18 access right.
- ▶ [RA] National Suicide Prevention Strategy [MoHFW, Nov 2022] — India's first such strategy, targeting a 10% cut in suicide mortality by 2030 (Section 115(2) duty).

- ▶ [RA] **New criminal codes** [Gazette of India, 2023; in force 1 Jul 2024] — BNS 2023 omits any general equivalent of Section 309 IPC, completing the decriminalisation Section 115 began; only Section 226 BNS survives.
- ▶ [RA] **Insurance parity enforcement** [IRDAI circular, Aug 2018] — insurers directed to cover mental illness on par with physical illness (Section 21(4)).
- ▶ [RA] **Territorial extension** [Gazette, S.O. 3912(E), 30 Oct 2019] — Act extended to Jammu & Kashmir and Ladakh.
- ▶ [RA] **Digital mental health** [MoHFW] — Telemedicine Practice Guidelines (Mar 2020) and draft digital mental-health rules bring telepsychiatry/online therapy under the Act's norms; MHRB funding remains uneven across States.



Discuss the restraint of a mentally ill person. Add a note on protection of human rights of mentally ill person

Asked in: Paper III Apr 2018 — RGUHS MD Forensic Medicine

Definition

- ▶ **Restraint** of a person with mental illness (PMI) is any measure — physical, mechanical, chemical, or environmental — used to limit the patient's movement or behaviour.
- ▶ Its only lawful purpose is to prevent imminent harm to the patient or to others.
- ▶ Restraint is a last-resort clinical intervention, never a punishment.
- ▶ It is governed by the **Mental Healthcare Act (MHCA) 2017**, which replaced the older custodial Mental Health Act 1987.
- ▶ The 1987 term "mentally ill person" is now called a "**person with mental illness**" (PMI).
- ▶ Mental illness is defined in **Section 2(1)(s) MHCA 2017** as a substantial disorder of thinking, mood, perception, orientation, or memory that grossly impairs judgment and behaviour.
- ▶ This definition specifically excludes mental retardation (intellectual disability).
- ▶ The same Act also builds a rights-based framework protecting the dignity and autonomy of the PMI — restraint and rights protection are two sides of one statute.

Types of restraint

- ▶ The least restrictive option must always be tried first.

Type	What it means	Key note
Physical (manual)	Trained staff hold the patient by hand to control acute violence	Only form named in Section 97; shortest possible duration
Mechanical	Devices such as straps, cuffs, or a straight-jacket	Needs ongoing medical supervision; chaining is banned
Chemical (pharmacological)	Rapid tranquillisation with an injected benzodiazepine	IV diazepam 5–10 mg or lorazepam 2–4 mg, titrated to effect

Type	What it means	Key note
Environmental (seclusion)	Confining the patient alone in a locked room	Prohibited under MHCA 2017

- ▶ Restraint may arise therapeutically in a mental health establishment, or within the legal custody of an accused of unsound mind.
- ▶ De-escalation and a safe environment come first; restraint is stopped as soon as the danger passes.

Legal safeguards governing restraint (Section 97)

- ▶ Restraint is lawful only when every one of these conditions is met.
- ▶ It must be the **only means available** to prevent imminent harm.
- ▶ It must be **authorised by the psychiatrist-in-charge** of treatment, not by nursing staff or relatives.
- ▶ It must **never be used as punishment** or for staff convenience.
- ▶ It must last **no longer than necessary** and be removed once the risk subsides.
- ▶ The patient must be kept under **regular ongoing medical supervision**.
- ▶ The **nominated representative (NR)** must be informed within **24 hours**.
- ▶ Seclusion and solitary confinement are absolutely prohibited.

Admission and detention — the lawful context of restraint

- ▶ Restraint usually arises during admission for treatment.
- ▶ **Independent (voluntary) admission (Sections 85–86):** any adult who believes he has mental illness may admit himself.
- ▶ No relative's consent is needed for voluntary admission, and the patient may discharge himself.
- ▶ **Supported admission:** applied for by the NR, with independent examination by two professionals (one a psychiatrist).
- ▶ Supported admission is limited to 30 days initially.
- ▶ Continuation beyond 30 days needs review and authorisation by the **Mental Health Review Board (MHRB)**.
- ▶ **Emergency treatment (Section 94):** up to 72 hours without the patient's consent, when there is immediate risk of harm.
- ▶ Electroconvulsive therapy (ECT) cannot be given as emergency treatment.
- ▶ The 72-hour limit can extend to 7 days during a notified disaster or emergency.
- ▶ A mentally ill prisoner may be admitted under the Prisoners Act 1900, the Armed Forces Acts, or **Section 369 or 374 BNSS 2023 (formerly Section 330 or 335 CrPC 1973)**.
- ▶ An accused of unsound mind is dealt with under **Sections 367–378 BNSS 2023 (formerly Sections 328–339 CrPC 1973)**.

Protection of human rights of the PMI

- ▶ MHCA 2017 is a rights-based, patient-centric law aligned with the **UN Convention on the Rights of Persons with Disabilities (UNCRPD)**.
- ▶ It came into force on **29 May 2018**.
- ▶ **Right to access mental healthcare** — affordable, good-quality care without discrimination.
- ▶ **Right to live with dignity**, free from cruel or degrading treatment.
- ▶ **Right to community living** — not to be segregated from society.
- ▶ **Advance Directive / "Ulysses contract" (Sections 5–13)**: a competent adult can state in writing, in advance, how he wishes to be treated during a future episode of incapacity.
- ▶ The Advance Directive takes effect once capacity is lost, and can be reviewed by the MHRB.
- ▶ **Right to appoint a Nominated Representative** to make treatment decisions during incapacity.
- ▶ **Right to information** about treatment and side-effects.
- ▶ **Right to confidentiality** and to access one's own basic medical records.
- ▶ **Right to make complaints** about care or treatment.
- ▶ A woman with mental illness has the **right to keep her child under 3 years** with her, unless the child is at risk of harm.
- ▶ **Section 115 decriminalises attempted suicide** — the person is presumed to be under severe stress, is not tried or punished, and must be offered care and rehabilitation.
- ▶ This overrides the old Section 309 IPC 1860, which has no general re-enactment in BNS 2023.
- ▶ **Inhuman practices are banned**: seclusion, chaining, unmodified ECT, ECT in minors without guardian consent and MHRB permission, and sterilisation as treatment.
- ▶ **Insurance parity** — mental illness must be insured on par with physical illness.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Flowchart — lawful restraint under Section 97**: acutely disturbed PMI → de-escalation tried first → imminent risk still present → psychiatrist-in-charge authorises restraint → physical / mechanical / chemical method used, never seclusion → regular medical supervision, shortest duration → nominated representative informed within 24 hours → restraint removed and documented once risk passes.
- ▶ **Spider diagram — rights of a PMI**: central box "Person with Mental Illness" with spokes for access to care, dignity, community living, Advance Directive, Nominated Representative, confidentiality, decriminalised suicide, insurance parity, and freedom from seclusion/chaining/unmodified ECT.

Medico-legal significance

- ▶ Documentation is the doctor's shield — record the indication, the type and duration of restraint, the psychiatrist's authorisation, the monitoring, and when the NR was informed.
- ▶ Unjustified or prolonged restraint exposes the doctor and the institution to action for ill-treatment or neglect of a PMI, a punishable offence under the Act.

- ▶ Restraint without lawful justification may amount to wrongful restraint — compare **Section 126 BNS 2023 (formerly Section 339 IPC 1860)**.
- ▶ The Section 97 conditions are what make therapeutic restraint lawful in the first place.
- ▶ The **MHRB** is the quasi-judicial body a PMI or NR can approach if rights are violated.
- ▶ The MHRB also reviews advance directives and supported admissions.
- ▶ Lawful restraint does not affect testimonial capacity — a PMI may testify if he understands the questions and answers rationally (**Section 124 BSA 2023, formerly Section 118 IEA 1872**).
- ▶ Criminal responsibility in mental illness is codified by the M'Naughten rule in **Section 22 BNS 2023 (formerly Section 84 IPC 1860)**.
- ▶ The forensic psychiatrist's role includes certifying soundness of mind, performing the mental status examination, distinguishing true from feigned illness, and assessing fitness to stand trial — never using restraint as punishment.



Disorders of perception

Asked in: Paper III Apr 2019 — RGUHS MD Forensic Medicine

Definition / Introduction

- ▶ **Perception** is how the brain receives and interprets sensory information from the outside world or the body.
- ▶ A **disorder of perception** occurs when this interpretation goes wrong.
- ▶ In an **illusion**, a real stimulus is misinterpreted.
- ▶ In a **hallucination**, the mind manufactures a sensory experience with no external stimulus at all.
- ▶ **Delusions** are grouped with these two because all three are cardinal symptoms of **psychosis**, in which the patient loses touch with reality.
- ▶ Under its influence a psychotic patient may commit suicide or homicide, which gives these symptoms direct medico-legal weight.

Classification of perceptual experiences

- ▶ **Illusion**: a false interpretation by the senses of a real external object or stimulus.
- ▶ **Hallucination**: a false sense-perception with no external stimulus at all; may affect any special sense.
- ▶ **Delusion**: a false, firm belief that persists despite proof of its falsity and is not shared by others of the same background.
- ▶ **Pseudohallucination**: a perception the patient recognises as arising within their own mind (insight retained), and is non-pathological.

Illusion vs hallucination vs delusion

Feature	Delusion	Illusion	Hallucination
Nature	False belief	False interpretation of a real stimulus	False perception , no stimulus
External stimulus	Not applicable	Present and real	Absent
Example	"My wife is unfaithful," despite proof otherwise	A rope mistaken for a snake	Seeing a snake where no rope exists at all
Corrected by reasoning?	No	Yes, in a sane person	No

- ▶ In the rope-and-snake example, an **illusion** needs the rope to actually be there, while in a **hallucination** the patient sees a snake even where there is no rope at all.
- ▶ A **sane** person corrects the illusion once shown the rope is harmless, but an **insane** person insists it is a snake despite demonstration — the single most testable distinction in the exam.

Types of hallucination

- ▶ **Auditory (paracusia)**: hearing voices or noises when no one is present.
 - The commonest hallucination overall, and the commonest in **functional** disorders such as schizophrenia.
 - Voices may be *benevolent* (encouraging) or *malicious* (abusive, belittling).
 - **Daniel M'Naghten** had auditory hallucinations of being accused of crimes.
- ▶ **Visual**: seeing something that does not exist — a god, an attacking animal, snakes.
 - The commonest hallucination in **organic** mental disorders: delirium tremens, focal CNS lesions, toxic states, drug withdrawal.
 - **Lilliputian** hallucinations: persons or objects appear reduced in size.
 - **Micropsia/macropsia**: objects appear smaller or larger than they really are.
- ▶ **Tactile (haptic)**: feeling insects or rats crawling on or under the skin when none are present.
 - Characteristic of alcohol-withdrawal syndrome and chronic cocaine abuse (the cocaine "bug," or *formication* — Magnan's syndrome).
- ▶ **Olfactory (phantosmia)**: perceiving smells that are not present; seen in organic brain disease and major depression.
- ▶ **Gustatory**: perceiving tastes with no food in the mouth; seen in organic brain disease and temporal-lobe (uncinate) epilepsy.
- ▶ **Psychomotor/kinaesthetic**: a false feeling of movement of a body part.
- ▶ **Command hallucination**: voices order the patient to perform an act, often dangerous.
 - May incite suicide, homicide, or self-mutilation (*Van Gogh syndrome*) — the most forensically dangerous type.
- ▶ **Non-pathological forms** — **hypnagogic** (falling asleep) and **hypnopompic** (awakening) hallucinations are vivid, dream-like, and **not** disease.
 - They form part of the narcolepsy tetrad, along with sleep attacks, cataplexy, and sleep paralysis.

- **Charles Bonnet syndrome:** visual hallucinations in the visually impaired, with insight retained.
- Tactile or visual hallucinations occurring *without* auditory ones suggest an **organic** cause, such as alcohol withdrawal.
- ▶ **Clinical correlate:** visual hallucinations predominate in organic disorders; auditory ones predominate in functional disorders like schizophrenia.
 - About 2–4% of the general population experience auditory hallucinations, but only about 30% of those have a mental illness — the symptom alone is not proof of insanity.

Conditions in which disorders of perception occur

- ▶ **Schizophrenia:** auditory hallucinations are the rule; visual and tactile hallucinations, plus bizarre delusions, also occur, especially in hebephrenic and paranoid types.
- ▶ **Delirium:** clouded consciousness with illusions and hallucinations, usually visual, a fluctuating course, disorientation, and "sun-downing" in the evening.
 - This is the commonest organic mental syndrome seen in hospital practice.
- ▶ **Delirium tremens / alcohol withdrawal:** visual and tactile hallucinations, such as insects or ants crawling — the "delirium of horrors."
- ▶ **Drug-induced or toxic states:** hallucinogens (LSD, mescaline), cannabis, cocaine, and datura alter perception, as do toxic doses of many drugs.
 - Heavy-metal poisoning, such as lead encephalopathy or mercury, can do the same.
- ▶ **Epilepsy:** temporal-lobe (psychomotor) epilepsy and twilight states cause visual hallucinations and automatic behaviour.
 - Gustatory or olfactory hallucinations occur in uncinate seizures.
- ▶ **Others:** affective psychoses, senile/pre-senile dementia, oneiroid (dream-like) states, confusional states, and fevers can all produce illusions and hallucinations.

Medico-legal significance

- ▶ A psychotic who has lost touch with reality may be incapable of knowing the nature of the act, or that it is wrong.
- ▶ Such a person may claim the insanity defence under **Section 84, Indian Penal Code 1860 (now Section 22, Bharatiya Nyaya Sanhita 2023)**, which embodies the **M'Naghten rule**.
- ▶ A person acting on a **command hallucination** to kill, or on a paranoid delusion, is generally held **not responsible**.
- ▶ **M'Naghten** himself, a paranoid schizophrenic with persecutory delusions and auditory hallucinations, shot Edward Drummond mistaking him for Prime Minister Robert Peel, and was found not guilty by reason of insanity.
- ▶ **The delusion test:** the law presumes the delusion to be real, then asks whether the act would still be a crime.
 - If the accused, under the delusion, believed someone was about to kill him, or was a wild beast attacking him, or that he was the lawful executioner, he is **exempt**.

- A delusion of mere character-assassination, infidelity, or theft does **not** exempt him — he should have gone to the police instead of taking the law into his own hands.
- ▶ The doctor's task is to show the patient cannot correct the false perception, which separates malingered (feigned) illness from genuine illness.
- ▶ **Civil law:** insane delusions affecting the testator's mind at the time of making a will may invalidate it.
 - A delusion unrelated to the disposal of property or to the beneficiaries does not, by itself, destroy testamentary capacity.
 - Perceptual disorders also bear on capacity to contract, to consent to treatment, to testify, and on the validity of marriage.
- ▶ **Doctor's duty:** observe and record behaviour, demeanour, and appearance, and document the exact perceptual abnormality in the patient's own words.
 - Obtain collateral history and exclude organic or toxic causes, such as delirium, drug withdrawal, or epilepsy.
 - Give a guarded opinion, since the patient may also be malingering insanity to escape punishment.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Comparative chart:** three columns — Illusion, Hallucination, Delusion — with rows for stimulus, nature, correctability, and example.
- ▶ **Rope-and-snake illustration, Panel A "Illusion":** a real coiled rope with a thought-bubble showing a snake (real stimulus misinterpreted).
- ▶ **Rope-and-snake illustration, Panel B "Hallucination":** an empty floor or bare tree with a thought-bubble showing a snake (no stimulus — mind-manufactured).



Explain in detail about Sec. 84 IPC

Asked in: Paper III Apr 2020 — RGUHS MD Forensic Medicine

Definition and concept

- ▶ **Section 84 IPC 1860 (now Section 22 BNS 2023)** exempts a person of unsound mind from criminal liability.
- ▶ It applies when unsoundness of mind made the person incapable of understanding the act at the time of the offence.
- ▶ It is India's legal test of insanity.
- ▶ It is adopted almost word for word from the English **McNaughten Rules of 1843**.
- ▶ Crime requires a guilty mind (**mens rea**).
- ▶ A person whose mind is too diseased to know the nature or wrongfulness of an act cannot form that guilty intent.
- ▶ Such a person is acquitted as "**not guilty by reason of unsoundness of mind.**"

Historical origin — the McNaughten trial (1843)

- ▶ *Daniel McNaughten*, a Scotsman, suffered from **paranoid schizophrenia**.
- ▶ He had delusions of persecution by Tory spies, plus auditory hallucinations.
- ▶ He planned to kill the Tory Prime Minister, **Sir Robert Peel**.
- ▶ On **20 January 1843** he shot Peel's private secretary, **Edward Drummond**, mistaking him for Peel.
- ▶ Ten physicians examined him; nine for the defence found him of unsound mind.
- ▶ He was acquitted "not guilty on grounds of insanity" and confined for life in **Bethlem Mental Hospital**.
- ▶ Public outcry followed, and Queen Victoria had the House of Lords convene **14 judges**.
- ▶ The Lord Chancellor put **5 hypothetical questions** to them.
- ▶ Their answers, given on **19 June 1843**, became the **McNaughten Rules**.
- ▶ This right-or-wrong test is what India later codified as Section 84 IPC / Section 22 BNS.

Three essential ingredients

- ▶ **Unsoundness of mind:** a defect of reason arising from disease of the mind.
 - There is no statutory definition of "unsoundness of mind" in the IPC/BNS.
 - Courts treat it as broadly equivalent to insanity — a major psychosis, functional or organic.
- ▶ **Existence at the relevant time:** the unsoundness must exist at the time of committing the act, not before or after.
- ▶ **Incapacity of knowing:** because of the unsoundness the accused could not know —
 - the nature of the act (its physical character), OR
 - that the act was wrong, OR
 - that it was contrary to law.
 - Any one of these three is enough.
- ▶ **Cognitive test only:** the impaired faculty must be cognition — reasoning, memory, judgment, understanding.
 - If only emotion (affect) or will (conation) is affected while cognition stays intact, the person is held responsible.
- ▶ **Legal, not medical, insanity:** "disease of the mind" is a legal concept, not a psychiatric one.
 - Mental dysfunction from voluntarily taken alcohol or drugs is not covered by Section 84.
- ▶ **Burden of proof:** it lies on the defence, since the law presumes everyone sane.
 - The standard is the lower civil one — preponderance of probabilities, not proof beyond reasonable doubt.
 - The unsoundness must be clearly proved to have directly caused the offence.

The insane-delusion rule

A person acting under an insane delusion is judged as though the delusional facts were real.

- ▶ Believes another is trying to kill him and kills in self-defence — **not responsible** (would have been valid private defence if the facts were true).
- ▶ Believes another is a wild animal and kills him — **not responsible**, because he does not know the physical nature of the act.
- ▶ Believes he is the State Executioner lawfully executing the victim — **exempt** from punishment.
- ▶ Believes another has ruined his character or fortune and kills him in revenge — **responsible**, because revenge killing is unlawful even on the imagined facts.

Other legal tests of insanity (for comparison)

Section 84 uses only the M'Naughten cognitive test; other countries went further.

Test	Operative principle	Followed in India?
McNaughten Rule (1843)	Right-or-wrong / nature-and-quality test	Yes — basis of Sec 84
Irresistible Impulse Test (1887)	Not responsible if disease destroyed free will, even if right and wrong were known	No
Durham Rule (1954)	Not responsible if the act was the "product of mental disease"	No
Currens' Rule (1961)	Not responsible if unable to regulate conduct to the requirements of law	No
ALI / Model Penal Code test (1962)	Not responsible if lacking substantial capacity to appreciate or conform conduct	No

- ▶ **Doctrine of diminished responsibility:** a middle path for borderline states such as psychopathy or head injury.
- ▶ It is recognised in England, France and Germany, among others.
- ▶ India does **not** recognise diminished responsibility.
- ▶ Section 84 / Section 22 BNS is an "all-or-none" law — the accused is either fully responsible or not at all.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Flowchart** — "Operating Section 84 IPC / Section 22 BNS": Accused commits act → presumption of sanity (burden on defence) → was there unsoundness of mind at the time of the act? → if yes, did it make him incapable of knowing the nature of the act, or that it was wrong, or that it was unlawful? → if yes, verdict is "**not guilty by reason of unsoundness of mind**" → detention in safe custody. If no at either step → criminally responsible, tried and punished.
- ▶ **Comparison box** — "Cognition vs Conation vs Affect": cognition (knowing/understanding) is covered by Section 84; conation (will/impulse) is covered only by the Irresistible-Impulse and ALI tests; affect (emotion/mood) is never exculpatory.

Medico-legal significance

- ▶ The psychiatrist assesses the accused's mental state **at the time of the offence**, not at the time of examination.
- ▶ Assessment draws on clinical state, past history, and conduct before, during and after the act.
- ▶ The longer the gap between the offence and the examination, the less reliable this retrospective opinion becomes.
- ▶ Features favouring a genuinely insane crime include a family or personal history of mental illness.
 - No motive, no premeditation, no accomplices.
 - No attempt to conceal or destroy evidence.
 - Sometimes the accused even reports himself to the police.
- ▶ Procedure for an accused of unsound mind is governed by **Sections 367–378 BNSS 2023 (Sections 328–339 CrPC 1973)**.
 - Unfitness to stand trial: **Sec 367 BNSS 2023 / Sec 328 CrPC 1973**.
 - Release pending trial: **Sec 369 BNSS 2023 / Sec 330 CrPC 1973**.
 - Resumption of trial once soundness returns: **Sec 370 BNSS 2023 / Sec 331 CrPC 1973**.
- ▶ The insanity plea can bar conviction, bar trial (if unfit to plead), or bar execution of a condemned prisoner.
- ▶ Fitness to stand trial (mental state at the time of trial) is a separate question from Section 84 (mental state at the time of the offence).
- ▶ Consent given by a person of unsound mind is invalid (**Sec 90 IPC / Sec 28 BNS**).
- ▶ A mentally ill person can still testify if able to understand questions and give rational answers (**Sec 118 IEA / Sec 124 BSA**).
- ▶ Involuntary intoxication is a valid defence (**Sec 85 IPC / Sec 23 BNS**); voluntary intoxication is not (**Sec 86 IPC / Sec 24 BNS**).
- ▶ Civil aspects — property, contracts, testamentary capacity — are governed by the **Mental Healthcare Act 2017**.

♦ ♦ ♦

Feigned mental illness and its medico-legal importance

Asked in: Paper III Oct 2025 — RGUHS MD Forensic Medicine

Definition

- ▶ **Feigned mental illness** is the deliberate, conscious imitation of mental-disorder symptoms by a person who is actually of sound mind.
- ▶ It is always done for a clear **external motive** — usually to escape criminal punishment through an insanity plea.
- ▶ It is the psychiatric form of **malinger** (wilful production or exaggeration of disease for secondary gain).
- ▶ Indian law excuses an offence for "**unsoundness of mind**" under **Section 22, Bharatiya Nyaya Sanhita (BNS) 2023** (formerly **Section 84, Indian Penal Code (IPC) 1860**).
- ▶ Because this plea can wipe out criminal responsibility, the forensic psychiatrist must reliably tell **genuine** mental illness apart from **feigned** — the distinction directly decides the course of justice.

Who feigns, and why

- ▶ Feigning is always driven by a **conscious motive for secondary gain** — this is its hallmark.
- ▶ **Accused persons / convicts**: the commonest setting — claiming insanity to escape the death penalty or long imprisonment.
- ▶ **Soldiers and policemen**: to avoid arduous duty or escape punishment for dereliction of duty.
- ▶ **Businessmen**: to avoid honouring contracts.
- ▶ **Workmen**: to claim compensation.
- ▶ **Beggars**: to attract public sympathy.
- ▶ Converse situation: a genuinely sane person may be **falsely presented as insane** by relatives, for example to seize property or invalidate a will.
- ▶ A malingerer does not know the true symptom-pattern of any one disorder, so the act is usually **bizarre and theatrical** and does not fit a recognised disease — a key diagnostic clue.

True versus feigned mental illness

Feature	True mental illness	Feigned mental illness
Onset	Gradual	Sudden
Motive	Absent	Present
Symptoms	Fit a recognised disorder; present even when unobserved	Exaggerated, fit no single disease; appear only when watched
Insomnia	Present	Not sustained — sleeps soundly after a day or two
Exertion	Tolerated for several days	Breaks down within a few days
Hygiene	Dirty, unkempt	Clean; dressed properly
Repeated examination	Does not mind	Resents it, fearing detection

How the forensic psychiatrist detects feigning

- ▶ The accused is referred for opinion by **court order or police**.
- ▶ The doctor may keep the person under **observation for up to 10 days**, extendable to **30 days** with a Magistrate's order.
- ▶ **History-taking**: a sudden "onset," with no past psychiatric history, appearing right at the time of the crime, is suspicious.
- ▶ **Prolonged, repeated interviews**: the longer the interview, the better the result — a malingerer cannot sustain a false performance indefinitely.
- ▶ **Covert observation**: watching the patient without his knowledge; feigned signs vanish once he believes he is unobserved.
- ▶ **Crime-scene reconstruction**: hiding the weapon, wiping fingerprints, or planning the act all show a **sound, goal-directed mind**.
- ▶ A truly insane person, in contrast, does not conceal evidence and may even inform the police.
- ▶ **Symptom incoherence**: the presentation matches no real disorder and is inconsistent on re-examination.
- ▶ **Narcoanalysis, examination under anaesthesia, or abreaction**: drug-assisted interviews used rarely to break down a feigned façade.
- ▶ **Validity / psychometric tests**: M-FAST, SIRS, SIMS, TOMM, VIP, PDRT, plus formal memory tests.

Related and contrasting concepts

- ▶ **Malingering** is the broader entity — conscious feigning of *any* disease, not just mental, for external gain (for example epilepsy, blindness, paralysis, or artificial bruises from marking-nut juice).
- ▶ True total simulation is rare; most malingerers simply **exaggerate real symptoms**.
- ▶ Malingering is **not perjury**, because the patient is not under oath.
- ▶ **Munchausen syndrome (factitious disorder imposed on self)**: the patient feigns or self-induces illness to gain the sick role, but with **no external incentive**.
- ▶ Munchausen syndrome is itself a genuine psychiatric disorder, so it is **not true malingering**.
- ▶ **Lucid interval**: a genuine, temporary period in true mental illness when symptoms disappear.
- ▶ A lucid interval matters for the validity of wills, contracts, and evidence given during that time — it must not be mistaken for feigning.
- ▶ The **Rosenhan experiment (1973)** showed how hard feigning is to unmask: sane volunteers faked hallucinations, were admitted, and then struggled to convince staff they were sane.

Medico-legal significance

- ▶ Detecting feigning **defeats a false insanity plea**, preventing a sane offender from escaping conviction under **Section 22 BNS 2023 (Section 84 IPC 1860)**.
- ▶ This defence follows the **McNaughten Rule (1843)** — a purely cognitive, "all-or-none" test: did the accused know the nature of the act, or that it was wrong or contrary to law?

- ▶ The same examination decides **fitness to stand trial** — whether the accused can understand proceedings and instruct counsel — under **Sections 367–378, BNSS 2023 (Sections 328–339, CrPC 1973)**.
- ▶ A mentally ill prisoner may be transferred to a psychiatric hospital under **Section 369 or 374, BNSS 2023 (Section 330 or 335, CrPC 1973)**.
- ▶ Mental illness itself is defined in law as "**a substantial disorder of thinking, mood, perception, orientation, or memory that grossly impairs judgment, behaviour, capacity to recognise reality, or ability to meet the ordinary demands of life**" — **Section 2(1)(s), Mental Healthcare Act (MHCA) 2017**.
- ▶ Feigned or falsely-imputed insanity also affects **civil law**: management of property, validity of contracts, testamentary capacity (sound disposing mind), and competence as a witness — **Section 124, BSA 2023 (Section 118, IEA 1872)**.
- ▶ A feigned plea must never void an otherwise valid civil act, and a genuine illness must never be dismissed as feigned.
- ▶ **Doctor's duties**: examine diligently and confidentially, record the start and end time of every session, never certify under pressure, and — when in doubt — lean toward an opinion of sanity.
- ▶ The opinion given must be honest and court-defensible under **Section 39, BSA 2023 (Section 45, IEA 1872)**.
- ▶ **Restraint**: a person under psychiatric observation must not be secluded or held in solitary confinement; physical restraint is allowed only to prevent imminent harm, authorised by the psychiatrist-in-charge (MHCA 2017).
- ▶ The law looks only at the state of mind **at the time of the offence** — the longer the gap before examination, the less reliable a retrospective opinion becomes.
- ▶ Attempted suicide is effectively decriminalised: **Section 115, MHCA 2017** presumes "severe stress" and bars punishment; the old **Section 309, IPC 1860** has **no re-enactment in the BNS 2023**.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Flowchart**: Court/police referral → observation (up to 10 days, extendable to 30 days by Magistrate's order) → history-taking + crime-scene reconstruction + covert/prolonged interviews + validity tests (M-FAST, SIRS, SIMS, TOMM) → branches to "True illness — not responsible (BNS S.22)" versus "Feigned — sound mind, fully responsible."
- ▶ **Two-column comparison chart**: TRUE versus FEIGNED, with rows for onset, motive, symptom pattern, insomnia, exertion tolerance, hygiene, and response to repeated examination.

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How do you diagnose mental illness?

Asked in: Paper III Apr 2022 — RGUHS MD Forensic Medicine

Definition and purpose

- ▶ Forensic psychiatry applies psychiatry to the administration of justice.
- ▶ **Mental illness (unsoundness of mind)** is a disease of the mind with derangement of mental/emotional processes and impaired control of behaviour.
- ▶ The **Mental Healthcare Act 2017, Section 2(1)(s)** defines it as a substantial disorder of thinking, mood, perception, orientation or memory that grossly impairs judgment, behaviour, or the capacity to recognise reality or meet ordinary demands of life — it covers alcohol/drug-related conditions but excludes intellectual disability.
- ▶ Diagnosis is a structured exercise: preliminaries, history, physical exam, a mental status examination (MSE), and supportive investigations.
- ▶ The goal is an opinion on the patient's mind and degree of civil/criminal responsibility, and to separate true illness from feigned (malingered) illness.

Aims and medico-legal setting

- ▶ The law presumes **every person is mentally sound until the opposite is proved**; the burden of proof lies on the party alleging illness, usually the defence.
- ▶ Examination is ordered by the **court or police** to decide criminal responsibility, competency to stand trial, capacity to consent/testify/make a will/manage property, and to detect malingering.
- ▶ Early and borderline cases (no fixed delusions yet) need repeated, prolonged observation, allowed **up to 10 days**, extendable with the magistrate's permission to a **maximum of 30 days**; violent/criminal persons are held in prison custody.

Step-by-step clinical method

- ▶ **Preliminaries:** name, age, sex, address, and the exact time each examination begins/ends — timing matters because symptoms may fluctuate or be feigned; note the informants (relatives, police) and take history confidentially and patiently.
- ▶ **Personal and family history:**
 - Family history of mental disease in the parents.
 - Environmental/psychogenic factors — over-protection, rejection, childhood maladjustment, emotional conflict.
 - Organic disease and drug dependence — stroke, head injury, renal/cardiac disease; opium, alcohol, cannabis.
 - Domestic difficulties or emotional shock in life, love, or sex.
- ▶ **Physical examination:** dress, gait, deformities; pulse/temperature may be raised; furred tongue, dry wrinkled skin — done to exclude organic disease.
- ▶ **Mental status examination (MSE):** the core of the assessment — detailed below.
- ▶ **Investigations:** blood/urine/CSF analysis; CT or MRI brain; EEG; psychometric/IQ testing.

Mental status examination — key components

- ▶ **Appearance and behaviour:** dress, facial expression, and gait; watch for stereotypy (repeated purposeless movements), negativism (doing the opposite of what is asked), and echopraxia (copying another's actions).
- ▶ **Talk and speech:** mutism, neologism (invented words), and echolalia (repeating another's words); note coherence and slurring/stammering.
- ▶ **Writing:** agraphia (loss of ability to write) and flight of ideas.
- ▶ **Mood and affect:** mood is the sustained, underlying feeling; affect is the observed, moment-to-moment expression — euphoria, apathy, irritability, or a labile mood.
- ▶ **Thought:** stream, form, content, and possession — thought block, insertion, withdrawal, or broadcasting; content disorders are delusions, obsessions, overvalued ideas.
- ▶ **Perception:** illusions and hallucinations (defined under cardinal symptoms below); auditory hallucinations are commonest in functional illness, visual in organic illness.
- ▶ **Cognition:** orientation, attention, and memory; intelligence by IQ (Binet–Simon) — normal adult IQ 90–110%, intellectual disability below 70.
- ▶ **Insight:** awareness of one's own condition — classically **absent in psychosis, present in neurosis**, a key discriminator.
- ▶ **Judgement:** the ability to foresee the consequences of one's acts and behave appropriately.

Cardinal symptoms to recognise

- ▶ **Delusion:** a false, firm, unshakeable belief not shared by the person's social group and not corrected by proof of its falsity; commonest type is persecutory (paranoid); seen in psychosis, never in neurosis.
- ▶ **Illusion:** misinterpretation of a real external object — a sane person corrects it, an insane person does not.
- ▶ **Hallucination:** a false perception with no real object at all (auditory, visual, gustatory, olfactory, tactile, or command).
- ▶ **Obsession:** a recurrent thought the person knows is irrational but cannot suppress — the borderline between sanity and neurotic illness.

Psychosis vs neurosis

Feature	Psychosis	Neurosis
Nature	Disease entity, often genetic/organic	Reaction to stress or an adverse experience
Severity	Major	Minor
Contact with reality	Absent	Present
Insight	Absent	Present
Examples	Schizophrenia, bipolar disorder, dementia	Anxiety, hysteria, phobia, OCD, PTSD

Classification systems

- ▶ A formal diagnosis is fitted into an international classification: **ICD-11** (WHO, effective 1 January 2022; Chapter 6 covers mental/behavioural/neurodevelopmental disorders), used worldwide, or **DSM-5** (American Psychiatric Association), used mainly in the US and for research.

Real illness vs feigned (malingering)

- ▶ Feigned by criminals to escape the death sentence or long imprisonment, by soldiers/police to leave service, or by businessmen to avoid contracts.
- ▶ A feigner does not know the symptoms of any real disorder, so the picture never fits a recognised disease; key to detection is **prolonged, unobtrusive observation**, aided by tests like **M-FAST**, **SIRS**, **SIMS**, and **TOMM**.
- ▶ **Onset and motive**: gradual onset with no motive in real illness; sudden onset with a clear motive (e.g. a crime committed) if feigned.
- ▶ **Predisposing factors**: often present in real illness (family history, sudden loss, grief), absent if feigned.
- ▶ **Symptoms**: uniform and present whether or not observed in real illness; only when watched, exaggerated, and fitting no single disease if feigned.
- ▶ **Insomnia and exertion**: sustained in real illness; a feigner cannot sustain insomnia and breaks down quickly under exertion.
- ▶ **Response to repeated examination**: a genuinely ill person does not mind it; a feigner resents it, fearing detection.

Medico-legal significance

- ▶ The diagnosis underpins the opinion on **civil responsibility** — capacity to manage property, validity of contracts/consent, and testamentary capacity (sound disposing mind).
- ▶ A person of unsound mind can testify unless the condition prevents understanding questions and giving rational answers (**Section 118 IEA 1872, now Section 124 BSA 2023**).
- ▶ Criminal responsibility follows the **McNaughten Rule** — exempt only if unsoundness of mind meant the person could not know the act's nature, or that it was wrong or contrary to law (**Section 84 IPC 1860, now Section 22 BNS 2023**).
- ▶ Only **cognitive** impairment exempts, not emotional/volitional disorder alone; India does **not** recognise diminished responsibility.
- ▶ Competency to stand trial: provisions for an accused of unsound mind are in **Sections 328–339 CrPC 1973 (now Sections 367–378 BNSS 2023)**.
- ▶ Detecting feigned illness prevents abuse of the insanity defence; certifying **compos mentis** (sound mind) is needed to witness a will.
- ▶ **Section 309 IPC** (attempt to suicide) has no BNS re-enactment; **Section 115, Mental Healthcare Act 2017** bars punishment for it, presuming severe stress.
- ▶ Genuine illness is managed under the Mental Healthcare Act 2017 — admission, advance directive, nominated representative, restraint only for imminent harm.

High-yield exam pointers

- ▶ Object of examination = opinion on the **mind** and the **degree of responsibility**, not just a label.
- ▶ Sequence: preliminaries → history → physical exam → MSE → investigations → classification → exclude feigned → opinion.
- ▶ Feigned illness clues: sudden onset, a clear motive, symptoms only when observed, no fit with any one disease.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Flow-chart** — "**Stepwise diagnosis of mental illness**": Preliminaries → History → Physical examination → Mental Status Examination (branching into appearance/behaviour, speech, mood/affect, thought, perception, cognition, insight, judgement) → Investigations (blood/urine/CSF, CT/MRI, EEG, IQ) → Classification (ICD-11/DSM-5) → Exclude feigned illness → Opinion (diagnosis plus responsibility/competence).
- ▶ **Two-column chart** — "**Real vs feigned mental illness**": rows for onset, motive, predisposing factors, symptoms, insomnia, exertion, and response to examination.



McNaughten's rule

Asked in: Paper III Apr 2022 — RGUHS MD Forensic Medicine

Definition

- ▶ **McNaughten's rule** (also spelt *M'Naghten*) is the classical legal test of criminal responsibility of the mentally ill, framed by English judges in **1843**.
- ▶ It is popularly called the "**right or wrong test**" or the **cognitive test of insanity**.
- ▶ It asks only whether the accused knew the **nature and quality** of the act, and knew it was **wrong**.
- ▶ A crime needs both a guilty act (*actus reus*) and a guilty mind (*mens rea*).
- ▶ Unsoundness of mind that abolishes *mens rea* removes criminal responsibility.
- ▶ It is the foundation of Indian law on insanity.
- ▶ It is carried almost verbatim into **Section 22, Bharatiya Nyaya Sanhita (BNS) 2023** (previously **Section 84, Indian Penal Code, IPC 1860**).

The McNaughten case (1843)

- ▶ **Daniel McNaughten** was a Scottish wood-turner in his late twenties.
- ▶ He was probably suffering from **paranoid schizophrenia**.
- ▶ He had a long-standing **delusion of persecution** — he believed spies sent by Catholic priests and the Tories were following and plotting against him.
- ▶ He also had **auditory hallucinations** of being accused of crimes.
- ▶ He planned to kill the Tory Prime Minister, **Sir Robert Peel**.
- ▶ On **20 January 1843** he shot **Edward Drummond**, Peel's Private Secretary, mistaking him for Peel.

- ▶ Drummond died a few days later.
- ▶ At trial, ten physicians testified he was of unsound mind.
- ▶ He was found "**not guilty by reason of insanity**" and committed for life to **Bethlem Mental Hospital**.
- ▶ The verdict caused a public outcry, and the **House of Lords** convened judges to clarify the law on insanity.
- ▶ The judges were put **five hypothetical questions**.
- ▶ Their answers, given on **19 June 1843**, became known as the **McNaughten Rules**.

The rule and its key elements

- ▶ **Operative rule:** an accused is not guilty if, at the time of the act, a **defect of reason from disease of the mind** meant he did not know the nature and quality of the act, or did not know it was wrong.
- ▶ The accused is **not legally responsible** only if it is **clearly proved** that:
 - The defect existed **at the time of the crime** — only that moment matters, not his mental state in general.
 - It arose from a genuine **disease of the mind** (a legal, not psychiatric, concept).
 - Because of it, he **did not know the physical nature** of the act, or
 - He **did not know the act was contrary to law**.
- ▶ "**Clearly proved**" means the unsoundness of mind must have **directly caused** the offence.
- ▶ Mental dysfunction from **voluntarily taken alcohol or drugs** does **not** count as disease of the mind.
- ▶ **Insane-delusion doctrine:** a person who acts under a delusion is judged **as if the delusion were true**.
- ▶ The test then becomes: would the act have been justified had the delusion been true?

Insane delusions — is the accused responsible?

Delusion believed by the accused	Responsible?	Why
Another man is trying to kill him; he kills him in self-defence	No	Lawful self-defence if the delusion were true
Another man is a wild animal; he kills him	No	Did not know the physical nature of the act
He is the State Executioner and executes the "victim"	No	Lawful execution if the delusion were true
Another ruined his character or property; he kills him in revenge	Yes	Revenge is never lawful, even if the belief were true

Other legal tests of insanity (not used in India)

- ▶ **Irresistible-impulse test (1887):** not responsible if mental disease destroyed his power to control himself, even though he knew the act was wrong.

- ▶ **Durham / "product" rule (1954):** not responsible if the act was simply a product of mental disease.
- ▶ This test was too broad and was abandoned by around 1972.
- ▶ **Curren's rule (1961):** not responsible if mental disease left him unable to conform his conduct to the law.
- ▶ **ALI / substantial-capacity test (1962):** not responsible if he lacked substantial capacity either to appreciate the criminality of his act, or to conform his conduct to law.
- ▶ Memory frame: the mind has **cognition** (reason), **conation** (will) and **affect** (emotion) — McNaughten covers cognition only.

Criticisms of McNaughten's rule

- ▶ It considers only the **cognitive/intellectual** factor and ignores emotion and volition.
- ▶ It is an **all-or-none** test — the person is either fully responsible or not responsible at all.
- ▶ There is **no middle path** of partial or diminished responsibility under the rule itself.
- ▶ It protects only **severe** mental illness, not mild or borderline states.
- ▶ Someone who knows right from wrong but cannot control himself (for example, compulsive self-mutilation) is still held guilty.

Medico-legal significance

- ▶ **Section 22 BNS 2023** (old **Section 84 IPC 1860**) is India's direct legislative adoption of McNaughten's rule and the legal test of insanity applied in Indian courts.
- ▶ Unsoundness of mind can be pleaded to bar **conviction** — unsound at the time of the offence.
- ▶ It can also be pleaded to bar **trial** — presently unfit to plead, under **Section 367 BNSS 2023** (old **Section 328 CrPC 1973**).
- ▶ It can also be pleaded to bar **execution** of a prisoner who has since become insane.
- ▶ The doctor must assess the **mental state at the time of the offence**, not the present state.
- ▶ Pointers favouring genuine insanity:
 - No motive.
 - No preplanning.
 - No accomplices.
 - No attempt to conceal evidence.
 - The accused even reports himself to the police.
- ▶ **Legal insanity is not the same as medical insanity** — a person can be medically ill (for example, psychopathy) yet still legally responsible if cognition is intact.
- ▶ Disorders of only emotion or will do **not** excuse under McNaughten.
- ▶ **Diminished responsibility** for borderline mental states is recognised abroad (for example *R v. Byrne*, 1959), but has **no place** in McNaughten's all-or-none rule.
- ▶ Related defences that are not responsible: **automatism, somnambulism (sleep-walking) and delirium**.

- ▶ **Voluntary intoxication** stays responsible if intent or knowledge was present (Section 24 BNS 2023, old Section 86 IPC 1860).
- ▶ **Involuntary intoxication** is not responsible (Section 23 BNS 2023, old Section 85 IPC 1860).
- ▶ **Burden of proof:** the law presumes every person is sane.
- ▶ Once insanity is pleaded, the burden of proving it shifts to the accused (Section 105, Indian Evidence Act 1872, now the corresponding Bharatiya Sakshya Adhiniyam, BSA 2023 provision).

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ Three overlapping circles labelled **Cognition**, **Conation** and **Affect**.
- ▶ Shade only the Cognition circle and label it "McNaughten's rule — covers cognition only."
- ▶ Add side notes: irresistible-impulse adds conation, Durham tries to cover all three, ALI covers cognition + conation.
- ▶ **Flowchart:** Act committed → was there a defect of reason from disease of mind at the time of the act?
- ▶ If **No** → criminally responsible.
- ▶ If **Yes** → did he know the nature and quality of the act, and that it was wrong?
- ▶ If **Yes to both** → criminally responsible.
- ▶ If **No to either** → not criminally responsible (Section 22 BNS) → committed to safe custody / psychiatric hospital.

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Discuss Mental Health Act

Asked in: Paper III Apr 2021 · Paper II Apr 2020 · Paper III Oct 2016 (3×) — RGUHS MD Forensic Medicine

Definition and evolution of the law

- ▶ The **Mental Healthcare Act (MHCA), 2017** is India's main law on the care, treatment and rights of persons with mental illness; it came into force **7 July 2018**.
- ▶ It repealed the **Mental Health Act, 1987**, which had itself replaced the colonial **Indian Lunacy Act, 1912** (a custodial, not a care-based, law).
- ▶ MHCA 2017 is **rights-based and patient-centric**, aligned with the **UN Convention on the Rights of Persons with Disabilities (UNCRPD)** (ratified by India, 2007).
- ▶ It matters to the forensic physician because it governs certification, admission, restraint and competence.
- ▶ It replaced the term "mentally ill person" with "**person with mental illness**" (PMI), centring the law on rights, capacity and consent.

Key definitions

- ▶ **Person with mental illness (PMI):** the Act's preferred term for a patient.

- ▶ **Mental illness** (Section 2(1)(s), MHCA 2017): a substantial disorder of thinking, mood, perception, orientation or memory that grossly impairs judgment, behaviour, reality-testing, or ability to meet ordinary life demands; it **includes** alcohol/drug-related conditions.
- ▶ Mental illness **excludes** **mental retardation / intellectual disability** — arrested or incomplete mental development with sub-normal intelligence.
- ▶ **Mental health establishment (MHE)**: any facility (including AYUSH) admitting/treating PMIs; must be registered.
- ▶ **Capacity to decide**: the Act presumes every person has capacity; loss of capacity must be proved, never assumed.

Rights of persons with mental illness

- ▶ **Right to access** affordable, good-quality mental healthcare without discrimination.
- ▶ **Right to community living**, not to be segregated from society.
- ▶ **Right to protection** from cruel, inhuman or degrading treatment, and to live with dignity.
- ▶ **Right to equality**, including **insurance parity** with physical illness.
- ▶ **Right to information, confidentiality and complaint**, including access to one's own records.
- ▶ **Right of a woman PMI** to keep her child below 3 years with her, unless harmful to the child.
- ▶ **Right to legal aid** and to make an **advance directive**.

Advance directive and nominated representative

- ▶ An **advance directive (AD)** is a written document by a competent person stating how he wants to be treated for a future mental illness — conceptually a "**Ulysses contract**" binding one's later, incapacitated self.
- ▶ **Who can make one**: any adult (18+); for a minor, the legal guardian.
- ▶ The AD becomes **effective** when capacity is lost and **lapses** when capacity returns; the maker can revoke, amend or cancel it any time.
- ▶ A professional who disagrees can ask the **Mental Health Review Board** to review or cancel it; one who follows a valid AD in good faith is **not liable** for unforeseen outcomes.
- ▶ **Nominated representative (NR)**: a person the PMI appoints in writing to take treatment decisions during incapacity; if none is named, the Act sets a default order (relative, caregiver, etc.).

Admission, care and discharge

- ▶ MHCA makes **independent (voluntary) admission** the norm and **supported (involuntary) admission** the exception.

Type	Who applies / requirement	Safeguard
Independent	Adult (≥ 18 y) self-requests	No consent needed; self-discharge allowed
Minor	NR applies; 2 psychiatrists agree	Kept separate from adults; independent at 18

Type	Who applies / requirement	Safeguard
Supported, ≤30 days	NR applies; 1 psychiatrist + 1 mental health professional agree	Limited to 30 days
Supported, >30 days	NR applies; 2 psychiatrists agree	Reported to MHRB; 90 → 120 → 180 days

- ▶ **Emergency treatment (up to 72 hours)** may be given to save life/prevent serious harm; **ECT is never allowed as emergency treatment.**
- ▶ Before discharge, the psychiatrist consults the PMI, the NR, and the future treating doctor.
- ▶ **Other admission routes:**
 - **Wandering person:** taken by police to the nearest MHE.
 - **Home neglect:** a Magistrate can order assessment for up to **10 days**.
 - **Prisoner with mental illness:** admitted under **Sections 369/374 BNSS 2023** (formerly Sections 330/335 CrPC 1973).

Restraint, ECT and decriminalisation of suicide

- ▶ **Section 115 — attempt to suicide:** presumed to be from **severe stress, not tried or punished**, and given care and rehabilitation instead.
- ▶ This makes **Section 309 IPC** inoperative; there is **no general re-enactment of attempted suicide in the BNS 2023**.
- ▶ **Section 97 — restraint:** seclusion or solitary confinement is **never allowed**.
- ▶ Physical restraint is allowed only as the **sole means** of preventing imminent harm, only as long as necessary, and only on the psychiatrist-in-charge's authorisation; it must **never be used as punishment**, and the NR must be informed within **24 hours**.
- ▶ **Section 95 — ECT:** allowed only with anaesthesia and a muscle relaxant (unmodified ECT is banned); in a minor it needs guardian consent **and** Mental Health Review Board approval.
- ▶ **Banned outright:** chaining, unmodified ECT, and sterilisation done solely because of mental illness.

Authorities and review boards

- ▶ **Central and State Mental Health Authorities** register, supervise and audit MHEs and professionals.
- ▶ **Mental Health Review Board (MHRB):** a quasi-judicial body (usually a district judge plus a psychiatrist) that registers/reviews advance directives, appoints NRs, reviews supported admissions, and hears rights complaints — proceedings are held **in camera**.
- ▶ **Penalties:** running an unregistered MHE draws escalating fines; other contraventions draw imprisonment and/or fine.

Medico-legal significance

- ▶ Certifying **compos mentis** (a legally sound state of mind) and distinguishing **true from feigned mental illness** are core forensic duties — true illness has gradual onset and no motive; feigned illness has sudden onset, a clear motive, and signs only when observed.
- ▶ **Civil responsibility**: a PMI cannot give valid consent for surgery, sexual intercourse, MTP, or marriage — consent is invalid under **Section 28 BNS 2023 (formerly Section 90 IPC)**.
- ▶ A PMI is **generally incompetent to testify**, except during a **lucid interval** (temporary full clarity), under **Section 124 BSA 2023 (formerly Section 118 IEA 1872)**.
- ▶ Contracts and wills made while of unsound mind are invalid; a valid will needs **testamentary capacity** (a sound disposing mind), certified by the doctor.
- ▶ **Criminal responsibility** is governed by **Section 22 BNS 2023 (Section 84 IPC)** — the all-or-none **McNaughten "right or wrong" test**; India does not recognise **diminished responsibility** or the **irresistible-impulse test**.
- ▶ **Fitness to stand trial** for an accused of unsound mind is covered by **Sections 367–378 BNSS 2023 (Sections 328–339 CrPC 1973)**.
- ▶ A person acquitted on grounds of unsoundness of mind is "not guilty by reason of mental illness" and is detained, not freed.
- ▶ Restraint or ECT done contrary to Sections 95/97 exposes the doctor to liability; the NR must be notified within 24 hours of any restraint.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Flow chart** — "Admission pathways under MHCA 2017." Three branches: independent admission (adult, self-request, self-discharge); supported admission (30 days → 90 → 120 → 180 days via MHRB); special routes (police, Magistrate, prisoner under BNSS 369/374). Side boxes: advance directive, nominated representative, MHRB.
- ▶ **Timeline bar** — "Evolution of Indian mental health law." 1912 Lunacy Act → 1987 Mental Health Act → 2017 MHCA assent → 7 July 2018 in force; annotate UNCRPD alignment and Section 115 decriminalisation.

Recent advances [RA]

- ▶ **BNS 2023 dropped the general attempt-to-suicide offence**, but added a narrow **Section 226 BNS** for attempting suicide to compel or restrain a public servant (e.g. protest fasts, self-harm in custody). [PMID 39564309]
- ▶ **Section 22 BNS re-enacts Section 84 IPC's McNaughten test almost verbatim** — no volitional/affective limb; Parliament also reverted "person with mental illness" to the older, stigmatising "person of unsound mind." [PMID 39564309]
- ▶ In 74 outpatients assessed with the official **Capacity Assessment Guidance Document**, **89% retained capacity** to decide on their own treatment, assessable in about **15 minutes**. [PMID 41458008]

- ▶ In 233 psychiatric in-patients, 75% **lacked capacity** and 80% **lacked insight** at admission; capacity is dynamic, returning faster in mood/substance-use disorders than psychosis, and must be **re-assessed, not presumed**. [PMID 40371255]
- ▶ A critique of the **Mental Health Review Board** calls the statutory six-member board impractical and proposes a leaner **3–5 member board** instead. [PMID 35007802]
- ▶ A 2026 analysis highlights the Act's **rehabilitation mandate** — halfway homes and community-based rehabilitation. [PMID 41616408]
- ▶ India's first **National Suicide Prevention Strategy** (MoHFW, 2022) targets a **10% cut in suicide mortality by 2030**, operationalising Section 115's care-not-punishment stance. [MoHFW 2022-Nov]
- ▶ **Tele-MANAS**, India's tele mental health programme, now runs **53 cells across 36 States/UTs** and has handled about **29.8 lakh helpline calls**. [PIB 2025]



Procedures for admission and detention of a mentally ill person in mental health establishment

Asked in: Paper III Dec 2023 — RGUHS MD Forensic Medicine

Definition / Introduction

- ▶ Admission and detention of a person with mental illness is governed by the **Mental Healthcare Act (MHCA), 2017**.
- ▶ It was notified into force on **29 May 2018** (Gazette notification S.O. 2173(E)) and repealed the Mental Health Act, 1987.
- ▶ It is a rights-based, patient-centric law aligned with the **UN Convention on the Rights of Persons with Disabilities (UNCRPD)**.
- ▶ It removes the old magistrate-driven *reception order* system.
- ▶ Two admission routes exist now: consent-based **independent admission**, and, only when unavoidable, **supported admission** with strong safeguards (advance directive, nominated representative, Mental Health Review Board oversight).
- ▶ Guiding principle: the **least restrictive alternative** — admission should be voluntary wherever possible; involuntary detention is a time-limited, reviewable exception.

Key concepts and terms

- ▶ **Person with mental illness (PMI)**: the statutory term for "mentally ill person."
- ▶ **Mental illness (Section 2(1)(s), MHCA 2017)**: a substantial disorder of thinking, mood, perception, orientation or memory that grossly impairs judgment, behaviour, or the ability to recognise reality or meet ordinary life demands; includes alcohol/drug-related disorders but **excludes mental retardation**.
- ▶ **Mental health establishment (MHE)**: any facility, including AYUSH establishments, offering treatment for mental illness; **must be registered** with the Central or State Mental Health Authority.

- ▶ **Advance directive (AD):** a *Ulysses contract* — a competent adult (18+) records in advance how he wants to be treated for a future mental illness, for use once he loses decision-making capacity (Sections 5–13, MHCA 2017).
- ▶ **Nominated representative (NR):** a person appointed to make care-and-treatment decisions during the patient's incapacity.
- ▶ **Mental Health Review Board (MHRB):** a district-level quasi-judicial body that registers advance directives, appoints NRs, and reviews supported admissions and detentions.
- ▶ **Central/State Mental Health Authority:** registers all MHEs and mental health professionals.

General principles governing admission

- ▶ **Voluntariness is the default** — admission should be independent wherever possible.
- ▶ **Capacity decides the route** — independent vs supported admission turns on whether the person can make his own treatment decisions.
- ▶ **Least restrictive, most dignified care** — no seclusion or solitary confinement, and only a registered MHE may admit a patient.

Types of admission and detention

The Act sets out five distinct pathways under Chapter XII.

Type of admission	Section	Applicant	Examination required	Maximum duration
Independent (voluntary)	Sec 86	Person's own free will; no relative's consent needed	Medical Officer satisfied person needs and will benefit	No cap; self-discharge
Minor's admission	Sec 87	Nominated representative	2 psychiatrists, or 1 psychiatrist + 1 mental health professional	Reviewed; discharged if NR requests
Supported, ≤30 days	Sec 89	Nominated representative	1 psychiatrist + 1 MHP/medical practitioner, within 7 days	30 days
Supported, >30 days	Sec 90	Nominated representative	2 psychiatrists, within 7 days; reported to MHRB	90 → 120 → 180 days
Emergency treatment	Sec 94	Any registered medical practitioner	Clinical judgement of immediate risk	72 hours

- ▶ **Independent admission (Sec 86):** a major requests admission himself, of his own **free will**.
 - He may **discharge himself**; cannot be treated without his informed consent.
- ▶ **Minor's admission (Sec 87):** minor is kept **separate from adults**, with the NR or an attendant present throughout.
 - A female attendant is required for a girl with a male NR.

- Reclassified as an independent patient on turning 18.
- ▶ **Supported, ≤30 days (Sec 89):** for a person of high support needs who cannot make care decisions, is a danger to self/others, or cannot care for himself.
 - After 30 days he can continue only as an independent patient, with the right to leave.
- ▶ **Supported, >30 days (Sec 90):** must be **reported to the Mental Health Review Board** — the key safeguard against indefinite detention.
- ▶ **Emergency (Sec 94):** any registered medical practitioner may give emergency treatment, including transport to an MHE, to prevent **immediate risk of harm**.
 - Family or the concerned authority must be informed.
 - ECT cannot be given as emergency treatment.

Special / custodial situations

- ▶ **Found wandering or at risk in public:** a police officer who reasonably believes a person has mental illness and cannot care for himself, or is a risk, takes him to the **nearest MHE** for assessment.
- ▶ **Ill-treated or neglected in a private residence:** the station house officer reports to the **Magistrate**, who may order production of the person and transfer to a public MHE, or **detention for assessment up to 10 days**.
- ▶ **Mentally ill prisoners:** admitted to a psychiatric establishment under the Prisoners Act 1900, the Army/Navy/Air Force Acts, or **Section 369 or 374 BNSS 2023 (Section 330 or 335 CrPC 1973)**.
- ▶ **Custodial institutions** (beggar homes, orphanages, children's homes): the in-charge takes any resident believed mentally ill to the nearest MHE.
- ▶ **Escaped patient:** taken into protection by any police officer, at the MHE's request, and returned immediately.

Safeguards during detention

- ▶ **No seclusion or solitary confinement, ever.**
- ▶ **Physical restraint (Section 97):** only to prevent **immediate, significant harm**, never as punishment, for the shortest time necessary.
 - Must be authorised by the psychiatrist in-charge; the NR must be told within **24 hours**.
- ▶ **ECT (Section 95):** only **modified** — given under anaesthesia and muscle relaxants.
 - **Prohibited in minors** unless the psychiatrist justifies it with the guardian's informed consent and prior MHRB permission.
- ▶ **Right to leave:** independent patients leave at will; the MHE in-charge may grant leave of absence to admitted patients.
- ▶ **Right to make an advance directive, appoint an NR, access records, confidentiality, and to complain.**
- ▶ **A woman may keep her child under 3 years with her during admission.**

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ Flowchart: "Admission pathways under MHCA 2017."
- ▶ Top box: person needing care at a registered MHE.
- ▶ Decision diamond: does the person have capacity/consent?
 - Yes → **Independent admission (Sec 86)**: self-request, free will, self-discharge.
 - No → **Supported admission**, branching to:
 - ≤30 days (Sec 89): NR applies; 1 psychiatrist + 1 MHP, within 7 days.
 - >30 days (Sec 90): NR applies; 2 psychiatrists within 7 days; reported to MHRB; 90 → 120 → 180 days.
 - Side branch: **Emergency (Sec 94)**: 72 hours.
- ▶ Bottom safeguard band: advance directive, nominated representative, MHRB, restraint limits (Sec 97), modified ECT (Sec 95).
- ▶ Label every box and arrow with its section number.

Medico-legal significance

- ▶ The registered medical practitioner or forensic psychiatrist certifies the need for admission and performs the **mental status examination**.
- ▶ For **suspected feigned insanity**, the person may be kept under observation for **10 days**, extendable to **30 days**, with **magistrate authorisation**.
- ▶ **Documentation is medico-legal evidence** — record the applicant (NR), both examiners' findings, the capacity assessment, and report supported admissions >30 days to the MHRB.
- ▶ **Unregistered MHE**: fines of ₹5,000–₹50,000 (first offence), ₹50,000–₹2,00,000 (second), ₹2,00,000–₹5,00,000 (subsequent).
- ▶ **Fitness to stand trial** for an accused of unsound mind is decided under **Sections 367–378 BNSS 2023 (Sections 328–339 CrPC 1973)**.
- ▶ **Criminal responsibility** of a person with mental illness is decided under **Section 22 BNS 2023 (Section 84 IPC 1860 — McNaughton's rule)**.
- ▶ **Attempted suicide is decriminalised** — Section 115, MHCA 2017: presumed to reflect severe stress, the person is treated and rehabilitated, **not prosecuted**.
- ▶ **Section 309 IPC 1860 (attempt to suicide)** has **no general re-enactment in BNS 2023**; only a narrow survivor, **Section 226 BNS 2023**, punishes attempting suicide to compel or restrain a public servant from official duty.

Recent advances [RA]

- ▶ As of mid-2025, there are **no major amendments to the MHCA 2017** — the framework above remains current.
- ▶ **Draft rules for digital mental health services** (telepsychiatry/online consultation) are proposed, extending consent-and-confidentiality safeguards to remote admission and emergency assessment.

- ▶ Remote assessment currently rests on the **Telemedicine Practice Guidelines, 25 March 2020** (MoHFW) [Telemedicine Practice Guidelines 2020, MoHFW] and the **Telepsychiatry Operational Guidelines, 2020** (NIMHANS/IPS/TSI) [Telepsychiatry Operational Guidelines 2020, NIMHANS/IPS/TSI], read with the Mental Healthcare (Rights of Persons with Mental Illness) Rules, 2018.
- ▶ The **National Mental Health Programme (NMHP)** is being integrated with the Act to expand **community-based care**, reinforcing the least-restrictive-care principle that decides whether detention is justified at all.



Procedures for Discharge of a Mentally Ill Person from a Mental Health Establishment

Asked in: Paper III Oct 2025 — RGUHS MD Forensic Medicine

- ▶ **Discharge:** the formal, lawful ending of a person's admission to a **Mental Health Establishment (MHE)** and release from in-patient care.
- ▶ Governed by the **Mental Healthcare Act (MHCA), 2017**, which repealed the Mental Health Act, 1987.
- ▶ The Act treats discharge as a **rights-based** event and renames the patient a "**person with mental illness**" (PMI).
- ▶ Most admissions are voluntary ("independent"); the discharge route depends entirely on **how the person was admitted**.
- ▶ **Mental illness** (Section 2(1)(s), MHCA 2017): a substantial disorder of thinking, mood, perception, orientation, or memory that grossly impairs judgment and everyday functioning — does not include mental retardation.

Statutory framework governing discharge

- ▶ Built on the principle of the **least restrictive environment** — care should restrict liberty no more than is strictly necessary.
- ▶ Admission, treatment and discharge are covered together in **Chapter XII, Sections 85–99**.
- ▶ **Advance Directive (AD):** lets a competent person specify future care wishes in advance.
 - Also called a *Ulysses contract* — a pre-commitment made while well that still binds during a later crisis.
 - Covered under Sections 5–13.
- ▶ **Nominated Representative (NR):** appointed by the PMI, or by the guardian for a minor, to take treatment decisions during incapacity.
- ▶ Every MHE must be **registered** with the Central or State Mental Health Authority.
- ▶ The **Mental Health Review Board (MHRB)** — a quasi-judicial tribunal — supervises supported admissions and reviews discharge decisions.

Discharge procedure by category of admission

The route to discharge depends entirely on how the patient was admitted.

Admission category	Section	Discharge trigger
Independent (voluntary) adult	Admission S.86; discharge S.88	Patient discharges himself; no medical officer consent needed
Minor (admitted via NR)	S.87	Discharged whenever the NR requests it
Supported, high support, up to 30 days	S.89	After 30 days, continues only as independent patient with right to leave
Supported, beyond 30 days	S.90	MHRB review in blocks of 90 → 120 → 180 days; discharged when Board declines extension
Emergency treatment	S.94	Limited to 72 hours; then discharged or moved to a regular admission category

► **Independent admission — the default route:**

- Any major who admits himself is an independent patient; no relative's consent is needed.
- He may **discharge himself without the medical officer's consent** — the cornerstone of the Act.

► **Minor:**

- Admitted on the NR's application; discharged whenever the NR requests it.
- On turning 18, reclassified as an independent patient.

► **Supported admission, high support need:**

- Used when the person is violent or threatening self-harm; admitted for 30 days on the NR's application after psychiatric examination.
- After 30 days he can continue **only as an independent patient with a right to leave**.
- Continuation beyond 30 days needs **two psychiatrists' certification**, reported to the MHRB, in blocks of 90 → 120 → 180 days.

Pre-discharge consultation (Section 98)

- Before discharge, the **psychiatrist responsible for care** must consult:
 - the **person with mental illness (PMI)** himself,
 - the **Nominated Representative (NR)**,
 - the **family members** he will live with after discharge, and
 - the **psychiatrist taking over future care**, if care is being transferred.
- This turns discharge into a planned **handover**, not a mere administrative release.
- It protects against premature release, abandonment, or loss to follow-up.

Other ways of leaving an MHE

- **Leave of absence:** the MHE in-charge may grant temporary, supervised leave — short of full discharge.

- ▶ **Escape is not a valid discharge:** a police officer must return an absconding patient to the MHE at the in-charge's request.
- ▶ **Civil "recovery":** if a court had earlier declared a person of unsound mind and unfit to manage his property, it may order a second inquiry; if unsoundness has ceased, the court closes the proceedings.
- ▶ **Prisoners / accused of unsound mind:**
 - Admitted under **Section 369 or 374 BNSS 2023 (Sections 330 or 335 CrPC 1973)**.
 - Release is by order of the court/authority, not by the patient or the NR; the medical officer sends periodic reports on his condition to the authority.

Recent advances

- ▶ **Rules, 2018:** the Mental Healthcare (Rights of Persons with Mental Illness) Rules, 2018 operationalise AD registration and NR appointment — registering an AD with the Board is what makes it enforceable [Gazette].
- ▶ **BNS 2023 interaction:** Section 309 IPC (attempt to suicide) was not re-enacted in the BNS, so the Section 115 presumption of "severe stress" now operates without any competing penal provision — discharge moves into a care pathway, not a custodial one [Gazette].
- ▶ **Telepsychiatry follow-up:** the Telemedicine Practice Guidelines, 2020 and Telepsychiatry Operational Guidelines, 2020 support remote review of discharged patients, reinforcing least-restrictive care [Guideline].
- ▶ **Suicide-prevention framing:** the National Suicide Prevention Strategy, 2022 (MoHFW) sets time-bound targets for structured rehabilitation and follow-up after discharge of a person who attempted suicide [MoHFW].
- ▶ **Implementation gap:** uneven constitution of State Mental Health Authorities and MHRBs across states delays supported-admission review and lawful discharge decisions — a legitimate point of critique in an MD answer.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ Flowchart — "Discharge pathways under MHCA 2017": central box "Admitted PMI in MHE" branches to four boxes:
 - Independent patient → self-discharge, no MO consent needed (S.86/88)
 - Minor → discharge on NR's request (S.87)
 - Supported, high support → ≤30 days, then continues as independent / right to leave (S.89)
 - Supported >30 days → MHRB review, 90 → 120 → 180-day blocks, discharge when Board declines (S.90)
- ▶ A side box "Pre-discharge consultation (S.98)" links to all four: *PMI · NR · Family · Future-care psychiatrist.*
- ▶ A separate box: "Not a discharge — leave of absence / escape (returned by police)."
- ▶ Box diagram — Safeguards: Advance Directive (Ulysses contract, S.5–13), Nominated Representative, Mental Health Review Board.

Medico-legal significance

- ▶ **Mode of admission dictates mode of discharge** — the single most examinable principle; record the admission category in the case sheet.
- ▶ The **pre-discharge consultation** (Section 98) is a statutory duty; skipping it is a deficiency in care and can be raised before the MHRB.
- ▶ **Restraint and dignity**: a PMI must not be secluded or solitarily confined.
 - Physical restraint (Section 97) is allowed only to prevent imminent harm.
 - It must be authorised by the psychiatrist in-charge and must never be punitive.
 - The NR must be informed within 24 hours.
- ▶ **Documentation** must include the discharge summary, Advance Directive status, NR's instructions, and — for supported admission beyond 30 days — the report to the MHRB.
- ▶ **Decriminalised suicide**: under Section 115 MHCA, a person who attempts suicide is presumed to have severe stress and is not tried under Section 309 IPC, which was **not re-enacted in the BNS 2023** — so discharge leads to care and rehabilitation, not custody.
- ▶ **Forensic interface**: an accused found of unsound mind is discharged only by court order under Section 369/374 BNSS 2023 (Sections 330/335 CrPC 1973); the psychiatrist's opinion on fitness is advisory to the court (Section 367 BNSS 2023; Section 328 CrPC 1973).
- ▶ **Criminal responsibility test**: Section 22 BNS 2023 (Section 84 IPC 1860) — an act is not an offence if, due to unsoundness of mind, the person could not know its nature or that it was wrong.
- ▶ **Insurance parity and the right to community living** reinforce discharge to the least restrictive setting, with follow-up rather than indefinite institutionalisation.

High-yield exam pointers

- ▶ MHCA 2017 (assent 7 April 2017, in force 2018) repealed the Mental Health Act 1987; term changed to PMI.
- ▶ Admission, treatment and discharge sit together in **Chapter XII (Sections 85–99)**.
- ▶ **Independent patient discharges himself without the medical officer's consent (S.86/88)** — write this line first.
- ▶ **Minor discharged whenever the NR requests it (S.87)**.
- ▶ Supported, high support: **≤30 days (S.89)**; beyond that, **MHRB review in blocks of 90 → 120 → 180 days (S.90)**.
- ▶ **Pre-discharge consultation (S.98)**: PMI + NR + family + future-care psychiatrist.
- ▶ **Leave of absence** = temporary release; **escape ≠ discharge**.
- ▶ Safeguards trio for the viva: **Advance Directive (Ulysses contract)**, **Nominated Representative**, **Mental Health Review Board**.



Restraint of the mentally ill person

Asked in: Paper III Oct 2022 — RGUHS MD Forensic Medicine

Definition / Introduction

- ▶ **Restraint of the mentally ill** means lawfully limiting the movement of a person with mental illness who is a danger to himself, to others, or to property.
- ▶ It is done only to prevent imminent harm, and it must never be used as punishment.
- ▶ In India it is governed by the **Mental Healthcare Act (MHCA), 2017**.
- ▶ MHCA 2017 came into force on **29 May 2018** (Gazette notification S.O. 2158(E)) and repealed the Mental Health Act 1987.
- ▶ It aligns Indian law with the **UN Convention on the Rights of Persons with Disabilities (UNCRPD)**.
- ▶ Two classic types exist: **immediate (emergency) restraint** and **restraint through formal admission**.
- ▶ Methods of restraint are **physical, mechanical, chemical, and seclusion**.
- ▶ The law strongly favours the **least restrictive method**, used for the **shortest possible time**.

Classification of restraint

Basis	Type	Meaning
Legal mode	Immediate / emergency restraint	Taking a suddenly violent patient into control to prevent harm, pending assessment.
Legal mode	Restraint by admission	Lawful detention and treatment under statutory admission procedures.

Basis	Type	Meaning
Method	Physical (manual)	Trained staff hold or secure the person for the shortest time needed.
Method	Mechanical	Devices restrict movement (chains, strait-jacket) — now largely prohibited.
Method	Chemical	Rapid sedation (for example diazepam, lorazepam, or haloperidol) to control agitation.
Method	Seclusion	Confining the person alone — prohibited under MHCA 2017.

Immediate (emergency) restraint

- ▶ **Indication:** sudden violent behaviour in a mentally ill person that endangers himself, others, or property.
- ▶ **Common causes:** mania, organic delirium, and delirium tremens (the withdrawal state of a chronic alcoholic).
- ▶ **Purpose:** prevent injury and wasteful property damage until proper assessment and treatment can be arranged.
- ▶ **Legal basis:** the necessity principle — an act done in good faith to prevent greater harm is not an offence.
- ▶ This is **Section 81 IPC 1860, now Section 19 BNS 2023**.
- ▶ **Consent:** informed consent of the guardian or nominated representative should be taken first.
- ▶ If consent cannot be obtained, the person may be restrained without it, but **only while the danger actually exists**.
- ▶ **Method:** secure the person safely under attendant care — never by cruelty, beating, or chaining.
- ▶ **History:** *Philippe Pinel* (1745–1826) pioneered abolishing chains and shackles, the origin of today's "least restrictive" ethic.

Restraint under the Mental Healthcare Act, 2017

- ▶ Restraint is exercised lawfully through the **admission framework**, backed by the anti-restraint safeguards of **Section 97**.

Admission categories:

- ▶ **Independent (voluntary) admission:** an adult aged 18 or above who wants treatment can admit himself.
 - No relative's consent is needed, and he may discharge himself at will.
- ▶ **Admission of a minor:** the nominated representative applies; two psychiatrists (or one psychiatrist plus one mental health professional or doctor) must independently agree admission is needed.
 - The minor is kept separate from adults, with an attendant present.

- ▶ **Supported admission up to 30 days (Section 89):** for a person who is a danger to himself or others, or cannot care for himself.
 - The medical officer admits him on the nominated representative's application, after examination by a psychiatrist and a mental health professional or doctor.
- ▶ **Supported admission beyond 30 days (Section 90):** needs independent examination by two psychiatrists.
 - It is reported to the **Mental Health Review Board (MHRB)**.
 - Under **Section 90(9)**, this admission cannot exceed **90 days** the first time, then a further **120 days**, then a further **180 days** at a time.
- ▶ **Other routes:** police-assisted conveyance of a wandering or at-risk person to an establishment.
 - A Magistrate's report where a person is ill-treated or neglected at home (assessment up to 10 days).
 - Admission of a mentally ill prisoner under **Section 103**, with quarterly reports from the prison medical officer to the Board.
 - Re-taking an escaped patient at the establishment's request.
- ▶ Accused persons of unsound mind (fitness to stand trial) are handled separately under **BNSS Sections 367–378, 2023 (formerly CrPC Sections 328–339, 1973)** — this is distinct from convicted prisoners.

Section 97 safeguards on restraint:

- ▶ **Seclusion or solitary confinement is absolutely prohibited.**
- ▶ Physical restraint is allowed only when it is the **only way** to prevent imminent harm to the person or others.
- ▶ It must be **authorised by the psychiatrist in charge** of the person's treatment.
- ▶ It must **not exceed the period absolutely necessary**.
- ▶ It must **never be used as punishment, a deterrent, or because of staff shortage**.
- ▶ The **method, reason, and duration must be recorded** in the medical notes.
- ▶ The person must be kept under **regular ongoing medical supervision**.
- ▶ The **nominated representative must be informed within 24 hours**.
- ▶ Every instance of restraint is **reported to the Board**.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Flowchart** — "Approach to restraint of a mentally ill person": acutely disturbed patient → is there imminent risk of harm to self, others, or property? → if no, least-restrictive care with no restraint; if yes, immediate restraint (necessity, BNS Section 19) with guardian/nominated-representative consent if possible → conveyance to a mental health establishment → assessment and admission (independent / supported 30 days / beyond 30 days) → apply the Section 97 safeguards box.
- ▶ **Comparison box** — "Methods of restraint": four labelled cells for physical, mechanical (prohibited), chemical, and seclusion (prohibited), with a banner reading "least restrictive method, shortest time."

Medico-legal significance

- ▶ A doctor **must restrain** a mentally ill patient who is likely to harm himself or others.
- ▶ Failure to do so can mean **liability in negligence** if avoidable harm results.
- ▶ Restraint must itself stay lawful — cruelty, beating, chaining, or detention without authority is punishable and can be complained of to the MHRB.
- ▶ Restraint beyond lawful limits amounts to **wrongful restraint** (Section 339 IPC → Section 126 BNS 2023).
- ▶ It may also amount to **wrongful confinement** (Sections 340–348 IPC → Section 127 BNS 2023).
- ▶ **Restraint (positional) asphyxia** is a fatal hazard: prone restraint or hog-tying, especially in "excited delirium," can cause sudden death.
- ▶ This is a recognised cause of **custody or restraint death** — avoid prone holds and document every episode carefully.
- ▶ An unnatural or suspicious death during restraint needs a police inquest under Section 174/176 CrPC 1973 (now Section 194/196 BNSS 2023).
- ▶ The treating doctor may later give expert evidence under Section 45 IEA 1872 (now Section 39 BSA 2023).
- ▶ A suicide attempt is **decriminalised**: it is presumed to reflect severe stress and is not tried under the old code — Section 115 MHCA 2017.
- ▶ IPC Section 309 has **no general re-enactment in the BNS 2023**; only Section 226 BNS retains an offence, for suicide attempted to compel or restrain a public servant.
- ▶ An act by a person who, due to unsoundness of mind, cannot know the nature of his act or that it is wrong, is **not an offence** — Section 84 IPC 1860, now Section 22 BNS 2023 (the M'Naughten Rule).

♦ ♦ ♦

Testamentary capacity

Asked in: Paper III Oct 2018 · Paper III Apr 2018 (2×) — RGUHS MD Forensic Medicine

Definition

- ▶ **Testamentary capacity** is the mental ability of a person to make a valid will.
- ▶ A **will** (or testament) is a legal declaration of a person's wishes for disposing of their property after death.
- ▶ The male maker of a will is a **testator**; the female maker is a **testatrix**.
- ▶ Will-making in India is governed by the **Indian Succession Act, 1925**.
- ▶ The legal essence of testamentary capacity is a *"**sound and disposing mind**" (*compos mentis*)*.
- ▶ Doctors are often asked to certify this when witnessing the will of a sick, dying, or elderly person.
- ▶ Testamentary capacity is one of the civil responsibilities linked to mental illness.

Sound and disposing mind

- ▶ A sound and disposing mind can **recollect** memories, **judge** relationships, and **feel** the obligations owed to family and blood relations.
- ▶ The testator must **recognise relatives and friends**, understand **their relationship to him**, and **judge his obligations** to them.
- ▶ He must be able to dispose of his property **with understanding and reason**.
- ▶ He must know the **nature, extent, and value** of his property and how he wants it distributed.
- ▶ The opposite state, ***non compos mentis*** ("not of sound mind"), makes a will invalid.
- ▶ A person who is *non compos mentis* is also not held responsible for their acts.
- ▶ The law **presumes every person is of sound mind** until proved otherwise.
- ▶ The burden of proving unsoundness lies on whoever challenges the will.

Requirements of a valid will

- ▶ **Document**: the will must be written or typed, signed by the testator, and attested by at least **two witnesses**.
- ▶ **Age**: the testator must be a major, over **18 years**.
- ▶ **Sound disposing mind**: the testator must be *compos mentis* **at the time the will is made** — this is the critical legal moment.
- ▶ **Free will**: there must be no force, no undue influence, and no fraud.
- ▶ The doctor must exclude disease, infirmity, pain, strain, drug or alcohol influence, and insane delusion before certifying capacity.

Types of will

Type	Key feature
Ordinary (attested)	Written/typed, signed by testator + at least two witnesses

Type	Key feature
Holographic	Entirely handwritten and signed by testator; no witnesses needed (S.66(2)(a) Indian Succession Act 1925)
Nuncupative	Oral/deathbed will; lapses after one month if testator survives (S.66(2)(h) Indian Succession Act 1925)
Video-taped	Not recognised by law; only supports evidence of mental competence

- ▶ An **executor** is the person named in the will to carry out its terms after death.

Medical examination of the testator

- ▶ First exclude disease, pain, infirmity, and the influence of alcohol or drugs.
- ▶ Then perform a physical exam, mental-state exam, and any lab tests needed.
- ▶ **Preliminary questions:** ask about relatives, social contacts, and views on family, business, and hobbies.
- ▶ **Orientation:** check awareness of time, place, and person.
- ▶ **Property awareness:** confirm he knows the nature, extent, and value of his property and how he wants it distributed.
- ▶ If the planned distribution is unusual, find out whether it is intentional and why.
- ▶ Ask him to **repeat the main provisions** of the will.
- ▶ **Recognition:** test recognition of family, friends, and business partners, e.g. using photographs.
- ▶ **Concentration:** test with simple arithmetic.
- ▶ **Freedom from influence:** ask everyone else to leave the room, then question him alone.
- ▶ Encourage him to speak the truth if undue influence is suspected.
- ▶ Look for delusions, mental strain, or memory impairment before confirming he is *compos mentis*.

When a will IS valid

- ▶ **Insane delusion:** valid if the delusion is unrelated to the property or to the persons named in the will.
- ▶ **Lucid interval:** a will made during a lucid interval is valid.
- ▶ **Suicide after making the will:** valid if the suicide was not due to mental disorder.
- ▶ **Extreme age or feeble health:** valid unless the mind is too impaired to understand the act.
- ▶ **Communication or sensory loss:** valid for aphasia, agraphia, alexia, or a deaf, dumb, or blind testator, if he understands what he is doing and can convey his wishes.
- ▶ **Eccentricity:** valid if there is no other mental disorder.

When a will is INVALID

- ▶ **In extremis** (made at the point of death): regarded with suspicion, since a clear mind is unusual at that stage.

- ▶ **Delirium:** a will made during delirium is invalid.
- ▶ **Drunkenness:** partial drunkenness does not invalidate a will.
- ▶ A will made during a temporary loss of reasoning from drunkenness is invalid.
- ▶ **Disqualifying delusion:** invalid if the testator is of unsound mind, or the delusion relates to the property or persons named in the will.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ Flow-chart: "Testator wishes to make a will" branches into three checks — age (>18 y), sound disposing mind, free will.
- ▶ All three "Yes" → **VALID WILL**; any "No" → **INVALID WILL**.
- ▶ Side notes — Valid: lucid interval, unrelated delusion, suicide unrelated to disorder, extreme age with intact mind.
- ▶ Side notes — Invalid: in extremis, delirium, disqualifying delusion, disabling drunkenness.
- ▶ Box: doctor's bedside checklist — exclude disease/drug/drink, orientation, property knowledge, recognition, concentration, examine in isolation, certify *compos mentis*.

Medico-legal significance

- ▶ The doctor often witnesses the execution of a will and certifies the testator is *compos mentis*.
- ▶ This certificate can be decisive in court if the will is later contested.
- ▶ The certificate records the mental state **at the moment of execution**, the legally critical point.
- ▶ "Will" is defined as "any testamentary document" — Section 2(34) Bharatiya Nyaya Sanhita (BNS) 2023 (formerly Section 31 IPC 1860).
- ▶ The disposing-mind requirement comes from **Explanation 4 of Section 59, Indian Succession Act 1925**.
- ▶ It says a person cannot make a will while, from intoxication, illness, or any other cause, "he does not know what he is doing."
- ▶ If a will is challenged for insanity, the presumption of sanity applies.
- ▶ The challenger then bears the burden of proving unsoundness.
- ▶ The test for legal incapacity is the same **McNaughten test** used in criminal insanity.
- ▶ That test asks whether the person was "**incapable of knowing the nature of the act**" — Section 22 BNS 2023 (formerly Section 84 IPC 1860).
- ▶ Testamentary capacity sits alongside other civil capacities of a mentally ill person.
- ▶ **Capacity to contract:** only a person of sound mind, capable of rational judgment, can contract.
- ▶ **Competence as a witness:** a person of unsound mind who can understand questions and give rational answers may testify.
- ▶ The same applies to a person in a lucid interval — **Section 124 Bharatiya Sakshya Adhiniyam (BSA) 2023** (formerly Section 118 Indian Evidence Act (IEA) 1872).
- ▶ **Validity of consent:** consent given by a person of unsound mind or while intoxicated is invalid — **Section 28 BNS 2023** (formerly Section 90 IPC).

- ▶ The same *compos mentis* standard also governs the validity of a **dying declaration** — Section 26 BSA 2023 (formerly Section 32 IEA 1872).



What is lucid interval? Discuss its medico-legal implications

Asked in: Paper III Jun 2024 — RGUHS MD Forensic Medicine

- ▶ **Lucid interval** is a period of clear, normal mental functioning between two phases of impaired consciousness or mental disorder.
- ▶ It has **two entirely different contexts** in forensic medicine — keep them separate in the exam.
- ▶ **Head injury**: the deceptively normal conscious interval between the brief unconsciousness of impact and the later coma of a slowly expanding intracranial haematoma, classically **extradural (epidural) haemorrhage**.
- ▶ **Insanity**: the symptom-free period between two attacks of a recurrent mental illness (typically bipolar disorder) when the person regains a sound, disposing mind.
- ▶ Both carry major medico-legal weight — cause/manner of death and survival-of-action in the first, and criminal responsibility, testamentary capacity, and witness competence in the second.

Lucid interval in head injury

- ▶ **Setting**: trauma is almost the only cause of extradural haemorrhage.
- ▶ At impact, the skull moves against the dura (the tough outer membrane covering the brain) and strips it away from the inner bony surface, creating a potential space.
- ▶ A vessel torn at the same moment bleeds into that space.
- ▶ **Vessel involved**: a blow over the side of the head fractures the thin **squamous temporal bone** and tears the **middle meningeal artery** (usually its posterior branch) as it crosses the temple.
- ▶ Less commonly torn instead: the posterior meningeal artery (posterior-fossa clot), the anterior ethmoidal artery (frontal blows), or a venous sinus.
- ▶ **Three-phase clinical course**:
 - **Phase 1 — concussion**: brief loss of consciousness at impact, absent in about 25% of cases.
 - **Phase 2 — lucid interval**: normal consciousness for a few hours (typically 2–4 hours) up to a week, while the haematoma slowly enlarges.
 - **Phase 3 — deterioration**: rising intracranial pressure brings confusion, then drowsiness, coma, hemiparesis opposite the injury, a fixed dilated pupil on the same side (later both sides), decerebrate rigidity, and death from respiratory failure.
- ▶ **Frequency**: the lucid interval is seen in only about **30–40%** of extradural haemorrhage cases.
- ▶ **Absent when the brain injury itself is severe** — the primary unconsciousness overlaps and masks the rising pressure.
- ▶ Do not equate "no lucid interval" with "no significant head injury".
- ▶ **Other settings**: also occurs with **subdural haematoma** (less often — brain contusion keeps consciousness impaired longer) and **post-traumatic intracerebral haemorrhage with an extradural collection**.

- ▶ A similar "silent" period occurs in **fat embolism** (12–72 hours after a long-bone fracture) and in **phosphorus/iron poisoning** — these are figurative parallels, not true cerebral-compression lucid intervals.

Lucid interval in insanity

- ▶ **Definition:** the period during an illness when all symptoms of insanity disappear completely.
- ▶ The person can judge his acts soundly and becomes legally liable for them.
- ▶ **When it occurs:** most typically in **bipolar (manic-depressive) disorder**.
- ▶ The depressive phase between two manic attacks corresponds to the lucid interval.
- ▶ Also described in mania and melancholia (an older term for severe depression) generally.
- ▶ **Variability:** duration varies between individuals and even within the same person over time.
- ▶ One can never be certain when the person will slip back into the insane state, which makes dating an offence against the interval difficult.
- ▶ **Legal effect:** during a genuine lucid interval the person is of sound mind.
- ▶ He is fully responsible for civil acts (a valid will or contract) and criminal acts done in that period.
- ▶ An act committed during the insane phase, by contrast, may attract the insanity defence.

Comparison: head-injury vs insanity lucid interval

Feature	Head injury	Insanity
History of	Trauma	Recurrent mental illness
Preceded by	Concussion (initial unconsciousness)	Symptoms of mental illness (e.g. mania)
Followed by	Cerebral compression and coma	Recurrence of insanity
Episodes	Usually only once	Recurrent
Duration	Hours (2–4) to a week	Days, weeks, or longer — highly variable
Mechanism	Expanding intracranial haematoma	Inter-episode remission of a cyclical illness
Chief issue	Cause/manner of death, dying declaration	Criminal responsibility, testamentary capacity

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Diagram 1 — extradural haemorrhage with lucid interval** (coronal section of head): label *scalp, fractured squamous temporal bone, torn middle meningeal artery, biconvex clot stripping dura from inner table, compressed and shifted brain, ipsilateral dilated pupil, contralateral hemiparesis*.
- ▶ Add a small time-line inset: *Impact → brief unconsciousness → LUCID INTERVAL (2–4 h to 1 week) → coma → death*.
- ▶ **Diagram 2 — lucid interval in bipolar disorder** (mood graph): X-axis "time", Y-axis "mood/symptoms".
- ▶ Plot two mania peaks with a trough between them; label the trough "**depressive phase = LUCID INTERVAL — sane and legally responsible**".

Medico-legal significance**Head-injury context:**

- ▶ **Cause and manner of death:** the lucid interval explains why a person can "talk and die" — a victim may walk, talk, even be discharged, then collapse hours later from an expanding clot.
- ▶ The pathologist must recognise this to correctly attribute death to the original assault.
- ▶ **Dying declaration:** a statement recorded during the lucid interval is admissible and valuable under **Section 32 Indian Evidence Act 1872 (now Section 26 Bharatiya Sakshya Adhiniyam 2023)**, since the declarant is conscious and rational.
- ▶ **Negligence:** missing a deceptively well head-injury patient without CT-scan and serial neurological observation is a common basis for medical-negligence claims.
- ▶ **Liability and grading:** the interval affects the fatal period and whether intervening events broke the chain of causation.
- ▶ It also bears on grading the injury as grievous hurt under **Section 320 IPC 1860 (now Section 116 BNS 2023)** versus a homicide charge under **Sections 300/302 IPC (now Sections 101/103 BNS 2023)**.

Insanity context:

- ▶ **Criminal responsibility:** the key question is whether the accused was in the lucid interval or the insane phase at the time of the act.
- ▶ If the offence occurred during the lucid interval, he is fully responsible.
- ▶ If during the insane phase, he may claim the insanity defence under **Section 84 IPC 1860 (now Section 22 BNS 2023)** — the Indian version of the *McNaughten* rules.
- ▶ A bipolar patient who kills during the manic phase may get this defence; one who kills during the depressive (lucid) phase does not.
- ▶ **Fitness to stand trial:** a person examined during a lucid interval may be found fit to plead, under the inquiry provisions of **Section 328 CrPC 1973 (now Section 367 BNSS 2023)** and the trial-avoidance rule of **Section 329 CrPC (now Section 368 BNSS 2023)**.

- ▶ **Testamentary capacity:** a will or contract made during a lucid interval is valid, the person being *compos mentis* (of sound disposing mind) at that moment.
- ▶ The doctor witnessing such a will must document the mental-state examination establishing lucidity.
- ▶ **Competence as a witness:** a mentally ill person may testify during a lucid interval under **Section 118 IEA 1872 (now Section 124 BSA 2023)**.
- ▶ **Consent:** consent given by a person of unsound mind is invalid under **Section 90 IPC 1860 (now Section 28 BNS 2023)**, but regains validity if given during a genuine lucid interval.
- ▶ **Doctor's duties:** careful mental-state examination, contemporaneous documentation of orientation, judgement and insight, and a guarded opinion — since the interval's onset and end cannot be predicted.



What is psychosis? Write differences between psychosis and neurosis

Asked in: Paper III Jun 2024 — RGUHS MD Forensic Medicine

Definitions

- ▶ **Psychosis** (Greek *psyche* = mind, *osis* = disease) is a serious mental disorder in which the person loses touch with reality.
- ▶ He cannot tell what is real from what is not.
- ▶ He lives in a world of delusions, illusions, and hallucinations.
- ▶ A **delusion** is a false fixed belief.
- ▶ An **illusion** is a false interpretation of a real stimulus.
- ▶ A **hallucination** is a false perception with no stimulus at all.
- ▶ Insight is also lost — the patient does not recognise that he is ill.
- ▶ Personality is impaired and behaviour becomes abnormal.
- ▶ Such a person is called "**psychotic**."
- ▶ **Neurosis** (Greek *neuron* = nerve, *osis* = disease) is a minor, non-psychotic mental illness.
- ▶ Here contact with reality and insight are both preserved, and behaviour stays within socially acceptable limits.
- ▶ The distinction matters legally: a psychotic person may escape criminal responsibility under **Section 22 Bharatiya Nyaya Sanhita (BNS) 2023 [formerly Section 84 IPC 1860]**, while a neurotic person, who retains insight, ordinarily does not.

Psychosis — defining features

- ▶ **Loss of touch with reality** is the cardinal feature — the patient makes wrong inferences about the world even when the evidence contradicts him.
- ▶ **Loss of insight** — he does not know he is ill, so he rarely seeks help on his own.
- ▶ **Delusions and hallucinations are common.**

- ▶ Common delusions: persecution, grandeur, infidelity (*Othello syndrome*), reference, influence, and nihilism (*Cotard's syndrome*).
- ▶ Hallucinations are usually **auditory** in functional psychoses and **visual** in organic ones.
- ▶ **Personality deteriorates** as the patient withdraws further into fantasy.
- ▶ **Severity is major**.
- ▶ Risk of **suicide and homicide is high** — psychosis is the mental illness most often linked to homicidal crime, especially against strangers.
- ▶ **Empathy is absent**.
- ▶ Treatment is mainly with **antipsychotic drugs**.

Classification of psychoses

- ▶ Psychoses split into two groups: **organic** and **functional**.
- ▶ **Organic psychoses** have a demonstrable structural brain cause.
- ▶ They show mood swings, failing memory, deteriorating intellect, irritability, confusion, and loss of social inhibition.
- ▶ Causes include dementia (Alzheimer's, Pick's, Creutzfeldt–Jakob, Huntington's chorea), cerebral tumours, cerebral trauma, drug-induced psychosis (amphetamines, cannabis, LSD, cocaine), toxic psychosis (arsenic, mercury), alcoholic psychosis (delirium tremens, *Korsakoff's psychosis*), deficiency states, and epilepsy-related states.
- ▶ **Functional psychoses** have no structural brain lesion — the disorder is of thought or mood, not anatomy.
- ▶ **Schizophrenic psychoses** — disorder of *thought* is dominant (simple, hebephrenic, catatonic, paranoid, schizo-affective types).
- ▶ Schizophrenia shows withdrawal, thought-block, neologisms, delusions, hallucinations, and personality deterioration.
- ▶ **Affective (mood) psychoses** — disorder of *mood* is dominant, the chief example being **manic-depressive psychosis (bipolar disorder)**.
- ▶ In the depressive phase of manic-depressive psychosis, suicide is well-planned, and the patient may also kill dependent young children.
- ▶ **Puerperal (postpartum) psychosis** can arise any time from early pregnancy through lactation; the mother may kill herself or her infant.

Neurosis — defining features and types

- ▶ A minor, non-psychotic illness — **insight and contact with reality stay intact**, so the patient knows he is unwell and seeks help.
- ▶ It is really a group of personality disturbances that react to life stress; the distress is out of proportion to the actual situation, but behaviour stays socially acceptable.
- ▶ **Delusions and hallucinations are absent in neurosis**.
- ▶ **Anxiety neurosis** — autonomic over-arousal: dyspnoea, choking, palpitations, insomnia, trembling, headache, chest pain; the patient worries constantly about his health.

- ▶ **Hysterical neurosis** — common in young females; facing an unpleasant situation, the patient develops deafness, blindness, anaesthesia, paralysis, or aphonia.
- ▶ Its dissociative type shows altered consciousness and identity.
- ▶ **Phobic neurosis** — irrational fears that the patient himself recognises as irrational (acrophobia, agoraphobia, claustrophobia, and similar).
- ▶ **Obsessive-compulsive neurosis** — a recurrent irrational idea the patient knows is irrational but cannot resist, relieved only by a compulsive act; called a "borderline between sanity and insanity."
- ▶ Other stress-related conditions: hypochondriasis and post-traumatic stress disorder (PTSD).
- ▶ Treatment is usually **psychological**, not drug-based.

Differences between psychosis and neurosis

Feature	Psychosis	Neurosis
Nature / cause	Disease entity, physical basis, often genetic	Reaction to stress / adverse life events
Severity	Major	Minor
Contact with reality	Lost	Retained
Insight	Absent	Present
Delusions / hallucinations	Present	Absent
Personality & social behaviour	Deteriorated; behaviour outside social norms	Preserved; behaviour within social norms
Risk of self-harm / suicide	High	Lower
Examples	Schizophrenia, bipolar disorder, dementia	Anxiety, hysteria, phobias, OCD
Treatment	Antipsychotic drugs	Usually psychotherapy
Criminal responsibility (India)	May be exempt under Section 22 BNS 2023 (Section 84 IPC)	Ordinarily fully responsible

Medico-legal significance

- ▶ The law presumes every person sane.
- ▶ A **psychotic** accused who, from unsoundness of mind, did not know the nature of the act — or that it was wrong or contrary to law — is **not criminally responsible** under **Section 22 Bharatiya Nyaya Sanhita (BNS) 2023 [formerly Section 84 IPC 1860]**.
- ▶ This section applies the **McNaughton rule**, an all-or-none test of whether the accused knew right from wrong.
- ▶ The rule comes from *R v. McNaughton* (1843), where Daniel McNaughton, suffering paranoid schizophrenia with a delusion of persecution, shot Edward Drummond while aiming at Prime Minister Robert Peel.
- ▶ A **neurotic** accused, who keeps insight and reason, is ordinarily fully responsible for his acts.

- ▶ A person of unsound mind who cannot understand court proceedings may also avoid trial as unfit to plead under **Section 367–368 BNSS 2023 (formerly Section 328–329 CrPC 1973)**.
- ▶ Distinguish the psychotic killer from the **psychopath**: the psychotic has lost touch with reality and may be exempt, but the psychopath keeps contact with reality and gets **no insanity defence**, though he may plead diminished responsibility.
- ▶ The doctor's duties are to examine and certify the mental state, tell real illness apart from feigned (malingered) illness, advise admission or observation, and give expert evidence in court under **Section 39 Bharatiya Sakshya Adhiniyam (BSA) 2023 [formerly Section 45 Indian Evidence Act 1872]**.
- ▶ Psychosis also affects **testamentary capacity** (making a valid will), capacity to contract, fitness to stand trial, validity of marriage, and competence to consent.
- ▶ The **lucid interval** — a symptom-free period during insanity — matters legally, since an act done in it is valid.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Two-column comparison chart, "Psychosis vs Neurosis"** — rows for contact with reality, insight, severity, delusions/hallucinations, personality, behaviour within norms, risk of self-harm, examples, treatment, and criminal responsibility; left column reads "Absent/Lost/Major" for psychosis, right column "Present/Retained/Minor" for neurosis.
- ▶ **Tree diagram of psychosis classification** — root **PSYCHOSES**, branching to **Organic** (dementia, cerebral tumour, cerebral trauma, drug-induced, toxic, alcoholic/Korsakoff, epileptic, puerperal) and **Functional** (schizophrenic, and affective/manic-depressive).



Who is a voluntary boarder? Describe different methods of admission and discharge of a mentally ill person in a psychiatric hospital

Asked in: Paper III Apr 2025 — RGUHS MD Forensic Medicine

Definition

- ▶ A **voluntary boarder** is a term from the now-repealed **Mental Health Act (MHA) 1987**, Sections 15–18.
- ▶ An adult of sound understanding who feels he needs psychiatric care and applies for admission on his own free will — no compulsion from a magistrate or a relative.
- ▶ He applies personally to the **Medical Officer in-charge (MOIC)** of a registered Mental Health Establishment.
- ▶ The MOIC had to enquire within **24 hours (Section 17)** and admit only if treatment was genuinely needed.
- ▶ A **minor** admitted on a guardian's request (Section 16) was called a **voluntary patient**, not a voluntary boarder.

- ▶ Under the current **Mental Healthcare Act (MHCA) 2017** (in force from 7 July 2018), the same patient is called an **independent patient** (Section 86).
- ▶ The MOIC admits him only if the illness needs, or would benefit from, admission — and only if it is truly his own free will.
- ▶ **No relative's or caregiver's consent is required**, and he can **discharge himself at will**.
- ▶ Guiding rule of the Act: all admissions should be independent admissions "as far as possible"; supported (involuntary) admission is used only when unavoidable.

Methods of admission — current law (MHCA 2017)

Mode	Section	Who applies	Key safeguard
Independent admission (the "voluntary boarder")	S.86	The patient himself	No relative's consent needed; patient can leave at will
Admission of a minor	S.87	Nominated representative (NR)	Two independent examinations; minor kept separate from adults
Supported admission, up to 30 days	S.89	NR	Two examiners must agree admission is necessary
Supported admission, beyond 30 days	S.90	NR	Two psychiatrists examine; reported to Mental Health Review Board (MHRB)
Emergency treatment	S.94	Any registered medical practitioner	Up to 72 hours without consent, for immediate risk of harm

- ▶ **Supported admission** is for a person who lacks capacity to decide and, due to severity of illness, has recently threatened/attempted harm or cannot safely care for himself.
- ▶ Other minor routes: a **wandering/at-risk** person is taken by police to the nearest facility; a **neglected** patient is reported by police to a Magistrate (admission up to 10 days).
- ▶ A **mentally ill prisoner** or a resident of a custodial institution is likewise admitted via the appropriate authority.

Methods of admission — under the repealed MHA 1987 (older scheme, still asked)

The question's 1987-era term means the older five-fold scheme is expected too.

- ▶ **Voluntary admission (S.15–17)**: major applies himself, or minor is admitted by guardian; MOIC enquiry within 24 hours.
- ▶ **Special-circumstances admission (S.19, S.30)**: a relative/friend applies when the patient cannot express willingness.
 - Up to 90 days; needs two medical certificates, one from a government doctor.

- ▶ **Reception order on application (S.20–22):** a magisterial order to detain the patient, sought by the MOIC or a spouse/relative.
 - Needs two medical certificates and a private (*in camera*) enquiry.
- ▶ **Reception order on production (S.23–25):** for a wandering, dangerous, or cruelly treated patient produced before a Magistrate by police.
 - Observation up to 10 days, extendable; diagnosis within 30 days.
- ▶ **Admission after judicial inquisition (S.26):** a District Court inquiry into the mental state and property of a patient owning property.

Methods of discharge

- ▶ **Independent/voluntary patient:** discharges himself on request; no one else's consent is needed.
- ▶ Before discharge, the psychiatrist should consult the patient, the NR, and the family, for continuity of care (Section 88).
- ▶ **Acute exception:** if the patient is threatening or has caused harm, the MOIC may convert him to a **supported admission for up to 30 days (Section 89)** for re-assessment.
- ▶ **Minor:** discharged when the nominated representative requests it.
- ▶ **Supported admission:** discharged when the period lapses and the patient is fit, or earlier on improvement.
- ▶ Continuing beyond the statutory limit needs fresh examinations and the **Mental Health Review Board's** approval (Section 90).
- ▶ **Under MHA 1987 (historical):** a voluntary patient was discharged within 24 hours of request (S.18).
- ▶ If more treatment seemed necessary, a Board of two doctors, within 72 hours, could recommend detention up to 90 days.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ Flowchart — "Admission routes under MHCA 2017": top box "Person needs psychiatric care".
- ▶ Branch 1: has capacity and is willing → Independent admission (S.86) = the voluntary boarder.
- ▶ Branch 2: minor → nominated representative applies (S.87).
- ▶ Branch 3: lacks capacity, severe/dangerous → Supported admission: ≤30 days (S.89) or >30 days with MHRB review (S.90).
- ▶ Branch 4: immediate risk → Emergency treatment ≤72 h (S.94).
- ▶ Add a return arrow "Discharge" from each box: self-discharge from S.86, NR-discharge from S.87, Board-reviewed discharge from S.89/90.
- ▶ **Comparison strip:** two facing columns — "Voluntary boarder (S.15)" vs "Independent patient (S.86)" — sharing the labels self-application, adult, free will, self-discharge.

Medico-legal significance

- ▶ **Mental illness** (Section 2(1)(s), MHCA 2017) is a substantial disorder of thinking, mood, perception, orientation, or memory that grossly impairs judgment, behaviour, or the capacity to recognise reality.
- ▶ The definition includes alcohol/drug-related mental conditions but excludes mental retardation.
- ▶ **Wrongful or improper admission** of a person who is not mentally ill is a serious offence.
- ▶ The Act penalises unregistered establishments and the ill-treatment or neglect of a patient; every establishment must register with the Central or State Mental Health Authority.
- ▶ **Capacity and consent:** an independent patient is treated only with informed consent.
- ▶ The **advance directive** (a statement made in advance on future treatment) and the **nominated representative** protect autonomy once capacity is lost.
- ▶ The **Mental Health Review Board (MHRB)** is a quasi-judicial safeguard reviewing supported admissions, advance directives, and complaints.
- ▶ **Prohibited practices:** no seclusion or chaining; restraint only to prevent immediate harm, never as punishment, NR informed within 24 hours (Section 97).
- ▶ **Electroconvulsive therapy (ECT):** only with muscle relaxants and anaesthesia (Section 95); in a minor only with guardian's consent and MHRB approval; never as emergency treatment.
- ▶ **Mentally ill prisoners** are admitted under **Section 369 or 374 BNSS 2023** (formerly Section 330 or 335 CrPC 1973).
- ▶ **Criminal responsibility** of the mentally ill is governed by **Section 22 BNS 2023** (formerly Section 84 IPC 1860) — the *McNaughten* rule, the classic test for legal insanity.
- ▶ **Abetment of suicide** by a person of unsound mind: **Section 107 BNS 2023** (formerly Section 305 IPC 1860).
- ▶ A person acquitted as "not guilty by reason of insanity" is kept in safe custody under **Section 374 BNSS 2023** (formerly Section 335 CrPC 1973).

- ▶ Attempted suicide (Section 309 IPC 1860) has **no re-enactment in the BNS 2023** — effectively decriminalised.
- ▶ **Section 115, MHCA 2017** presumes severe stress in such a person and bars trial or punishment, replacing penalty with care and rehabilitation.

High-yield exam pointers

- ▶ Memorise the section quartet: **86 (independent) · 87 (minor) · 89 (supported ≤30 days) · 90 (supported >30 days, MHRB) · 94 (emergency ≤72 h).**
- ▶ Core safeguards to name: advance directive, nominated representative, MHRB, no seclusion/chaining, modified ECT only.
- ▶ Old MHA 1987 five-fold scheme, in order: voluntary, special circumstances, reception order on application, reception order on production, judicial inquisition.



Testamentary capacity of the insane

Asked in: Paper III Apr 2025 — RGUHS MD Forensic Medicine

Definition / Introduction

- ▶ A **testament (will)** is a legal document stating how a person's property should be distributed after death.
- ▶ The maker of a will is the **testator** (male) or **testatrix** (female).
- ▶ **Testamentary capacity** is the mental ability to make a *valid* will.
- ▶ A valid will needs a **sound and disposing mind**, called *compos mentis* (Latin for "of sound mind").
- ▶ The key question is not whether mental illness exists, but whether it defeats the testator's understanding of the act of making the will.
- ▶ Insanity does **not** automatically invalidate a will — a person insane in general may still have testamentary capacity at the moment of signing.
- ▶ Doctors are often asked to **witness a will** and certify the testator's mental state.

Requirements of a valid will

- ▶ **Written, signed and witnessed** — a written document, signed by the testator and attested by **two witnesses**.
- ▶ **Exception — holograph will**: written entirely in the testator's own handwriting.
 - Needs no signature or witnesses, since the handwriting itself proves authorship.
- ▶ **Testator must be a major** — over **18 years** of age.
- ▶ **Sound and disposing mind** at the time of making (*compos mentis*):
 - Can recollect, judge, and feel obligations to family and blood relations.
 - Understands the nature, extent, and value of his property.
 - Understands to whom and how he wishes to give it away.
- ▶ **Free of force, undue influence, or fraud** — the will must be made voluntarily.

- ▶ Legally, a will is "any testamentary document" — Section 2(34) BNS 2023 (formerly Section 31 IPC 1860).

Types of will

Type	Key feature	Signature / witnesses
Holograph will	Entirely in the testator's own handwriting	None required
Ordinary (written) will	Written by another person or typed	Testator's signature + two witnesses
Nuncupative will	Oral, not written	As legally permitted

Mental soundness in the insane — when the will IS valid

- ▶ Mental illness defeats a will only when it acts directly on the act of making it.
- ▶ Two faculties must stay intact at the moment of execution: understanding of property, and understanding of one's natural heirs.
- ▶ **Insane delusion unrelated to the will** — valid if the delusion has nothing to do with the property or the persons named in the will.
- ▶ **Lucid interval** — valid if made during a lucid interval.
 - A lucid interval is the gap between two episodes of illness when all signs and symptoms disappear.
 - In bipolar disorder, the depressive phase is classically the lucid interval.
- ▶ **Extreme age, feeble health, or defective memory** — valid unless the mind is so impaired he cannot understand the will's nature and consequences.
- ▶ **Sensory or communication defects** — valid in **aphasia** (loss of speech), **agraphia** (cannot write), **alexia** (cannot read), or if deaf, dumb, or blind.
 - Condition: he knows what he is doing, can convey his wish by gestures, and understands questions put to him.
- ▶ **Eccentricity alone** — valid if there is no other mental disorder.
- ▶ **Suicide soon after** — the will remains valid if there is no other evidence of mental disorder.

When the will is INVALID

- ▶ **Insane delusion related to the property or heirs** — for example, a delusional belief that a rightful heir is an enemy.
- ▶ **Delirium** — a will made during delirium is invalid.
- ▶ ***Wills made in extremis***** (at the point of death) are viewed with suspicion, since a clear mind is unusual then.
- ▶ **Intoxication causing loss of reason** — mere partial drunkenness does not invalidate a will.
 - But a temporary loss of reasoning power from drink does.
- ▶ **Drugs** that alter consciousness, reasoning, perception, or memory (including withdrawal) impair capacity the same way.

- ▶ **Severe impairment of the disposing mind** — from any disease, pain, strain, or insane delusion that destroys understanding of the act.

Medical examination of the testator

- ▶ Proceed as in any clinical assessment: physical examination, mental state examination (with intelligence testing), and lab investigations.
- ▶ First exclude disease, infirmity, pain, strain, or the influence of drug, drink, or insane delusion.
- ▶ Confirm the testator is a **major** (over 18 years).
- ▶ Confirm he is **not under the influence of another person**.
 - Ask other people to leave the room.
 - Encourage him to speak the truth if undue influence is suspected.
- ▶ **Five tests of a sound and disposing mind:**
 - Ask about relatives, family, friends, and business partners — tests recollection of natural heirs.
 - Ask orientation questions — time, place, person.
 - Ask about the nature, extent, and value of his property and how he wants it distributed; if unusual or unjust, find out whether it is intentional.
 - Ask him to identify family, relatives, friends, or business partners present.
 - Give simple arithmetic sums — tests concentration.

Medico-legal significance

- ▶ The doctor's role as **witness or certifier** carries evidentiary weight — if the will is contested, his examination and documentation become primary evidence.
- ▶ The test is **issue-specific**: capacity must exist at the exact moment of execution.
- ▶ A will fails only when the mental defect — especially a delusion related to property or heirs — corrupts the act of disposal.
- ▶ **Document meticulously**: orientation, recognition of relatives, knowledge of property, tests applied and their results, exclusion of intoxication or undue influence, and the timing of examination relative to execution.
- ▶ A person cannot make a will if intoxication, illness, or any other cause leaves him not knowing what he is doing — **Explanation 4 to Section 59, Indian Succession Act 1925**.
- ▶ If a will is later disputed, a person of unsound mind is **not an incompetent witness**, unless his illness stops him understanding questions and giving rational answers — **Section 118, Indian Evidence Act 1872 (now Section 124, Bharatiya Sakshya Adhiniyam (BSA) 2023)**.
- ▶ The same *compos mentis* standard also governs **dying declarations** — admissible under **Section 26, BSA 2023 (formerly Section 32, IEA 1872)** — and **consent**.
 - If the person is *non compos mentis*, all three (will, dying declaration, consent) become inadmissible.
- ▶ Testamentary capacity is a **civil competency**.

- Do not confuse it with the criminal insanity test (the *McNaughten Rule*) under **Section 22, BNS 2023** (formerly **Section 84, IPC 1860**), even though both ask whether the disorder operated on the relevant act.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Decision flowchart — "Does the insane person have testamentary capacity?"**
 - Start: person of unsound mind wishes to make a will.
 - Check: is he a major (over 18 years)?
 - Check: sound and disposing mind at the time of execution?
 - Branch on insane delusion: unrelated to property/beneficiaries → valid; related → invalid.
 - Parallel branches: lucid interval → valid; delirium or *in extremis* → invalid; drink causing loss of reason → invalid; no undue influence → continue.
 - End nodes: valid will / invalid will.
- ▶ **Timeline of bipolar illness showing the lucid interval**
 - Horizontal time axis alternating mania and depression phases.
 - Mark the inter-episode normal period as the lucid interval.
 - Note: a will, dying declaration, or consent made here is valid.



Write DSM classification of mental illness. Enlist the differences between psychosis and neurosis

Asked in: Paper III Dec 2023 — RGUHS MD Forensic Medicine

Definition / introduction

- ▶ The **Diagnostic and Statistical Manual of Mental Disorders (DSM)** is the classification of mental illness published by the **American Psychiatric Association (APA)**.
- ▶ It gives a common diagnostic language and standardised criteria for mental disorders, used worldwide by psychiatrists.
- ▶ In India, DSM is used mainly for research; legal and administrative diagnosis follows Indian statute instead.
- ▶ The current edition is **DSM-5 (2013)**.
- ▶ Mental illness is classically split into two broad bands: **psychosis** (severe, loss of contact with reality and insight) and **neurosis** (milder, insight and reality contact preserved).
- ▶ This split matters forensically because criminal responsibility under **Section 22 Bharatiya Nyaya Sanhita (BNS) 2023** (formerly **Section 84 IPC 1860**) turns on "unsoundness of mind" — psychotics may satisfy this test, neurotics ordinarily do not.

The DSM — editions and scope

- ▶ DSM is published by the **APA** to give a common language and standard criteria for classifying mental disorders.
- ▶ **Editions** (R = Revised, TR = Text Revised; from the 5th edition onward APA switched from Roman to Arabic numerals):
 - DSM-I (1952)
 - DSM-II (1968)
 - DSM-III (1980)
 - DSM-III-R (1987)
 - DSM-IV (1994)
 - DSM-IV-TR (2000)
 - DSM-5 (2013) — current edition.
- ▶ DSM classifies **only mental and behavioural disorders** — the WHO's ICD covers all diseases of body and mind, with large overlap on mental disorders.
- ▶ **Exam point:** the term "**neurosis**" last appeared as a formal DSM category in **DSM-II (1968)** and has since been dropped, though it stays a useful descriptive contrast.

DSM-5 classification of mental illness (2013) — 22 classes

- ▶ **Neurodevelopmental disorders** — intellectual disability, autism spectrum, ADHD.
- ▶ **Schizophrenia spectrum and other psychotic disorders** — schizophrenia, delusional disorder.
- ▶ **Bipolar and related disorders** — bipolar (manic-depressive psychosis).
- ▶ **Depressive disorders** — major depressive disorder.
- ▶ **Anxiety disorders** — phobias, panic disorder.
- ▶ **Obsessive-compulsive and related disorders** — OCD, body dysmorphic disorder.
- ▶ **Trauma- and stressor-related disorders** — PTSD, adjustment disorder.
- ▶ **Dissociative disorders** — dissociative amnesia, dissociative identity disorder.
- ▶ **Somatic symptom and related disorders** — somatic symptom disorder, factitious disorder (Münchausen).
- ▶ **Feeding and eating disorders** — anorexia nervosa, bulimia nervosa.
- ▶ **Elimination disorders** — enuresis, encopresis.
- ▶ **Sleep-wake disorders** — insomnia, narcolepsy.
- ▶ **Sexual dysfunctions** — erectile disorder, anorgasmia.
- ▶ **Gender dysphoria.**
- ▶ **Disruptive, impulse-control, and conduct disorders** — conduct disorder, kleptomania, pyromania.
- ▶ **Substance-related and addictive disorders** — alcohol/drug use disorders, gambling disorder.
- ▶ **Neurocognitive disorders** — delirium, dementia.
- ▶ **Personality disorders** — includes **Antisocial Personality Disorder** [DSM-5 301.7 (F60.2)].
- ▶ **Paraphilic disorders** — exhibitionism (302.4), transvestism (302.3), voyeurism, paedophilia.

- ▶ Other mental disorders.
- ▶ Medication-induced movement disorders and other adverse drug effects — tardive dyskinesia.
- ▶ Other conditions that may be a focus of clinical attention.
- ▶ Forensically important: *psychopathy/sociopath* is not a DSM-5/ICD-10 term — replaced by **Antisocial Personality Disorder** [301.7 (F60.2)].
- ▶ "Mental retardation" is now called **Intellectual Disability**.
- ▶ Old schizophrenia subtypes (simple, hebephrenic, catatonic, paranoid) are gone in DSM-5/ICD-11 — now just "schizophrenia spectrum and other psychotic disorders."

The WHO (ICD) classification — for contrast

- ▶ ICD-10 (1992) places mental and behavioural disorders in Chapter 5, codes F00–F99.
- ▶ ICD-11 came into force **1 January 2022**, with 26 chapters; **Chapter 6** covers mental, behavioural, and neurodevelopmental disorders.
- ▶ ICD is the scheme used worldwide for clinical diagnosis and is the one the standard forensic textbooks follow.

Psychosis and neurosis — definitions

- ▶ Psychosis (Greek *psyche* = mind, *osis* = disease) — a **serious mental disorder** marked by:
 - Loss of contact with reality — cannot distinguish real from unreal; **delusions, illusions, and hallucinations** are present.
 - Loss of insight.
 - Impaired personality.
 - Abnormal behaviour.
 - Two types: **organic psychosis** (structural brain damage — head injury, epilepsy, brain tumour, psychosis of pregnancy/puerperium) and **functional psychosis** (no structural disease — schizophrenic psychosis, affective/bipolar psychosis, drug-induced psychosis e.g. LSD).
- ▶ Neurosis (Greek *neuron* = nerve, *osis* = disease; also called *psychoneurosis*) — a **non-psychotic** disorder in which:
 - **Insight is present.**
 - Behaviour stays within **socially acceptable norms**.
 - **Reality contact is retained** — no delusions or hallucinations.
 - It is **less serious** than psychosis, causing distress out of proportion to circumstances.
 - Examples: anxiety disorders, phobias, OCD, hysteria, hypochondriasis, PTSD.

Differences between psychosis and neurosis

Feature	Psychosis	Neurosis
Origin	Disease entity, often genetic, physical basis	Reaction to stressful circumstances
Severity	Major	Minor

Feature	Psychosis	Neurosis
Reality contact	Absent	Present
Insight	Absent	Present
Delusions/hallucinations	Common	Absent
Personality	Deteriorates	Largely unaffected
Suicide risk	High	Lower
Treatment	Antipsychotics, often needs admission	Psychotherapy
Examples	Schizophrenia, bipolar, dementia	Anxiety, phobia, hysteria, OCD, PTSD

Medico-legal significance

- ▶ **Insanity defence (core forensic use):** an accused pleading insanity must satisfy **Section 22 BNS 2023 (formerly Section 84 IPC 1860)**, the *McNaughten rule*.
- ▶ A **psychotic** (e.g. a paranoid schizophrenic acting on a delusion of persecution) may be found **not criminally responsible**.
- ▶ A **neurotic** retains insight and reality contact and is **ordinarily held responsible**.
- ▶ **Unfitness to plead:** trial may be postponed under **Section 368 Bharatiya Nagarik Suraksha Sanhita (BNSS) 2023 (formerly Section 329 CrPC 1973)** if the accused cannot understand proceedings.
- ▶ **Antisocial personality disorder (psychopathy)** is **neither insanity nor mental defect** — not a ground for the insanity defence in India, though some other countries allow diminished responsibility.
- ▶ **Consent** from a person of unsound mind is **not valid** — **Section 28 BNS 2023 (formerly Section 90 IPC)** — relevant to surgery, sexual intercourse, MTP, and organ donation.
- ▶ **Attempt to suicide** is effectively decriminalised: **Section 309 IPC 1860** has no general re-enactment in the BNS; under **Section 115, Mental Healthcare Act (MHCA) 2017**, such a person is presumed under severe stress and given care, not punishment (the narrow surviving offence — suicide threat to coerce a public servant — is **Section 226 BNS 2023**).
- ▶ **"Mental illness"** is legally defined under **Section 2(1)(s), MHCA 2017** as a substantial disorder of thinking, mood, perception, orientation, or memory that grossly impairs judgment or reality contact — this definition **excludes** intellectual disability.
- ▶ **Certification and admission** of psychiatric patients are governed by the **MHCA 2017**, which repealed the Mental Health Act 1987 and added advance directives, a Mental Health Review Board, and ECT safeguards.
- ▶ **Feigned (malingered) insanity** must be excluded: true insanity has gradual onset and consistent symptoms whether or not observed, with no antecedent motive; malingering shows sudden onset, exaggerated symptoms that vary and worsen when watched, and often a prior crime motive.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Psychosis vs neurosis chart:** "Mental illness" branching into two boxes — **PSYCHOSIS** (severe, reality contact absent, insight absent, delusions/hallucinations present, personality deteriorates) and **NEUROSIS** (mild, reality contact present, insight present, no delusions/hallucinations). Under Psychosis, add two sub-boxes: **Organic psychosis** and **Functional psychosis** (split further into *Schizophrenic* and *Affective/Bipolar*).
- ▶ **DSM vs ICD block:** two columns — left, "DSM-5 (APA, 2013) — 22 classes — mental disorders only — used mainly for research"; right, "ICD-10/11 (WHO) — F00–F99 / Chapter 6 — all diseases — used worldwide for clinical diagnosis."

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Medical jurisprudence, ethics & law

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"Professional death sentence" being imposed to some registered medical practitioner — are there any possibilities to come out of it? Explain*Asked in: Paper III Oct 2019 — RGUHS MD Forensic Medicine***Definition / Introduction**

- ▶ "Professional death sentence" is the popular name for **penal erasure** — removal of a registered medical practitioner's (RMP) name from the Medical Register.
- ▶ It is ordered by the regulator — the State Medical Council (SMC) or the National Medical Commission (NMC) — as a **penalty for serious professional misconduct**.
- ▶ The doctor stays physically alive, but erasure removes every privilege of registration, so he is "dead" professionally.
- ▶ Crucially, erasure is **not always permanent**. Whether the doctor can come out of it depends on whether it was ordered temporary or permanent, and on the remedies of appeal and restoration.

Why the name is removed

- ▶ Erasure is one of **four causes** for removing a name from the register, and only one is punitive.
- ▶ **Death** of the practitioner.
- ▶ **Entries made in error or by fraud**, e.g. a forged qualification.
- ▶ **Doctor not traceable**, or the entry was made by fault.
- ▶ **Penal erasure** — the only punitive ground, and the only one called the professional death sentence.
- ▶ Erasure strips the doctor of every privilege of registration: right to practise, to dispense/possess dangerous drugs, to recover fees through a court, to issue medical certificates, and to give expert evidence.

- ▶ Deletion is **widely publicised** in the press and medical-association journals, so the doctor cannot quietly continue to practise.
- ▶ **Trigger:** "serious professional misconduct" (infamous conduct) — conduct a doctor's peers of good repute would reasonably regard as disgraceful or dishonourable, involving an abuse of professional position.
- ▶ The Code of Ethics lists illustrative examples, but the list is **not exhaustive** — an unlisted act can still count as infamous conduct.

The "6 A's" of grave misconduct

"A"	Example
Adultery	Sexual relationship with a patient under cover of treatment
Advertising	Oversized signboard, touting, self-promoting articles in the lay press
Abortion (unlawful)	Illegal MTP; prenatal sex determination followed by abortion
Association with unqualified persons	"Covering" a quack, or employing touts
Addiction	Addiction to narcotics; supplying addictive drugs (e.g. pethidine) to addicts
Alcohol	Drinking at the workplace; seeing patients while intoxicated

- ▶ Other listed misconducts: conviction involving moral turpitude, issuing false or misleading certificates, fee-splitting (dichotomy), breach of professional secrecy, violating the Drugs and Cosmetics Act, and accepting gifts or travel from pharmaceutical companies.

The enquiry — where it can stop short of erasure

- ▶ The first chance to avoid the sentence lies inside the enquiry itself, a fair, quasi-judicial process run by the Council, which has the **same powers as a civil court** (Code of Civil Procedure, 1908).
- ▶ Proceedings can start three ways: conviction/censure by a competent authority; a complaint; or *suo moto* action by the Council.
- ▶ **Steps:** Registrar receives the complaint → refers it to the Penal & Ethical Sub-committee.
 - **No prima facie case:** complaint dropped, complainant informed — this protects doctors from frivolous complaints.
 - **Case exists:** a charge-sheet is served, a written reply sought, then a hearing with both sides present.
 - The **onus of proof is on the complainant**; after the evidence, the Council votes on guilt.
- ▶ **Two-stage voting is the built-in safeguard:** the Council first votes on whether the charge is proved, and only if guilty does it vote again on the penalty — a **warning** or **removal of name**.
- ▶ A doctor can come out of it right here, with only a warning and no erasure at all.

Possibilities of coming out of it — the routes back

- ▶ **No case at all:** if there is no prima facie case, or the charge fails on the merits at the hearing, no erasure occurs.
- ▶ **Warning instead of erasure:** at the penalty-vote stage the Council may simply warn the doctor; the name is never removed.
- ▶ **Temporary erasure:** the Council can remove a name "permanently or for a specific period." If it is for a fixed period, the doctor **automatically becomes eligible for re-entry** once that period ends.
- ▶ **Statutory appeal:** a doctor erased from a State Medical Register may appeal to the **Central Government within 30 days**, after exhausting remedies under the State Medical Council Act, stating the grounds and attaching the relevant documents.
 - The Central Government's decision, given after consulting the regulator, **binds** the State Government and the SMC — a successful appeal **sets aside the erasure**.
 - Under the NMC Act, 2019, this appellate role now sits with the **Ethics and Medical Registration Board (EMRB)**.
- ▶ **Restoration of name:** the single most important route. The regulator is "authorised to direct the restoration of the name so removed."
 - Usually sought after a reasonable interval, with evidence of good conduct and rehabilitation.
 - At the Council's discretion, which may attach conditions; all privileges return once the name is restored.
- ▶ **Reinstatement even after a serious finding:** **John Bodkin Adams** was erased in 1957 (prescription fraud, false cremation certificates, obstructing a police search) — yet reinstated in 1961, after two earlier failed applications.
- ▶ **When it is truly permanent:** if erasure is ordered **permanently**, the doctor cannot practise for life — the genuine professional death sentence, whose only realistic remedy is a successful appeal. **Andrew Wakefield**, of the fraudulent MMR-vaccine research, was permanently erased on 24 May 2010.

Medico-legal significance

- ▶ Erasure or warning is an **ethical/regulatory** penalty from the SMC/NMC for infamous conduct, separate from civil damages or a criminal sentence for the same act — a doctor can face both a court and the Council for one episode.
- ▶ A valid erasure needs **natural justice**: charge-sheet, hearing, a chance to defend, onus on the complainant, and a reasoned two-stage vote. Breaching this is itself a ground for appeal or restoration.
- ▶ Where an underlying criminal conviction triggers the enquiry, that conviction falls under the **Bharatiya Nyaya Sanhita (BNS) 2023** (replacing the **IPC 1860** from 1 July 2024) — but the Council's own process is regulatory, not a penal-code sentence, so no separate BNS/BNSS/BSA citation attaches to the erasure itself.

- ▶ A doctor's practical remedies once "sentenced": appeal within 30 days, apply for restoration with proof of good conduct, wait out a temporary erasure, or seek judicial review in the High Court if natural justice was breached.
- ▶ Practising or issuing certificates while erased exposes the doctor to fresh action for **unauthorised practice and issuing false documents** — which would defeat any future restoration plea.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Flowchart — "Erasure and the routes out"**: Complaint/conviction/suo moto → Registrar → President → Penal & Ethical Sub-committee → "Prima facie case?" (No → dropped; Yes →) Charge-sheet and hearing → "Guilty?" (No → acquitted; Yes →) "Warning or erasure?" → if erasure, branch into **Temporary** (auto re-entry after the period) vs **Permanent**.
 - From erasure, two arrows lead up to "Appeal to Central Govt/EMRB (30 days)" and "Restoration of name," both feeding into "Name restored — privileges regained." Label the permanent branch the true "professional death sentence."
- ▶ **Box diagram — "Privileges lost on erasure"**: central box "Penal erasure," radiating to right to practise, dispense/possess dangerous drugs, recover fees, issue medical certificates, and give expert evidence.



Care and Protection Of Children Act 2007

Asked in: Paper III Oct 2016 — RGUHS MD Forensic Medicine

What this Act actually is

- ▶ The exam question names an Act of 2007 that does not exist.
- ▶ The correct statute is the **Juvenile Justice (Care and Protection of Children) Act** — the "JJ Act."
- ▶ It began as the JJ Act 2000, amended in 2006 (the source of the "2006/2007" confusion).
- ▶ It was **repealed and replaced by the JJ Act 2015** (Act No. 2 of 2016), in force from **15 January 2016**.
- ▶ Further amended by the JJ (Amendment) Act 2021.
- ▶ It is a **welfare-and-justice law**, not a purely punitive one.
- ▶ For the forensic examinee, the key uses are **age estimation in a disputed juvenile**, the **age of criminal responsibility**, and the **doctor's duties before the Juvenile Justice Board**.

Background and evolution

- ▶ Enacted to fulfil **Articles 15(3), 39(e)–(f) and 45 of the Constitution of India**, and India's UNCRF (1992) and Beijing Rules (1985) commitments.
- ▶ Lineage: **Children Act 1960 → Juvenile Justice Act 1986 → JJ Act 2000 → 2006 Amendment → JJ Act 2015 → 2021 Amendment**.
- ▶ Core philosophy: a child is **reformed, not punished**, because children differ mentally from adults.

- ▶ The 2012 "Nirbhaya" case pushed Parliament to let 16–18-year-olds who commit heinous offences be tried as adults, after assessment.

The two categories of children

- ▶ **Child in conflict with law (CICL):** a child alleged or found to have committed an offence before turning 18.
 - Handled by the **Juvenile Justice Board (JJB)**.
- ▶ **Child in need of care and protection (CNCP):** a child who is destitute, abandoned, abused, neglected, trafficked, or otherwise at risk.
 - Handled by the **Child Welfare Committee (CWC)**.
- ▶ **Child** legally means "a person who has not completed eighteen years of age" — **Section 2(12), JJ Act 2015**.

Classification of offences (2015 Act) — read the MINIMUM sentence

- ▶ Each class is fixed by the **minimum** prescribed sentence, not the maximum — this distinction carries marks.

Offence class	Threshold [section]	16–18-year-old outcome
Petty	Max punishment up to 3 years [S.2(45)]	Disposed by JJB; never adult trial
Serious	Min imprisonment >3 and ≤7 years [S.2(54)]	Disposed by JJB; never adult trial
Heinous	Min punishment ≥7 years (e.g. murder, rape) [S.2(33)]	Preliminary assessment; may be tried as adult

- ▶ The "fourth category" gap: a maximum over 7 years but no fixed minimum (or a minimum under 7 years) fell between "serious" and "heinous."
- ▶ *Shilpa Mittal v State (NCT of Delhi)* (2020): the Supreme Court held these are **serious**, so a 16–18-year-old cannot be tried as adult for them.
- ▶ The 2021 Amendment codified this by adding clause (b) to the "serious offence" definition [S.2(54)].

Bodies and institutions under the Act

- ▶ **Juvenile Justice Board (JJB):** one per district; handles children in conflict with law.
 - Composed of a **Magistrate plus two social workers**, at least one a woman.
- ▶ **Child Welfare Committee (CWC):** handles children in need of care and protection.
- ▶ **Special Juvenile Police Unit (SJPU):** each police station has a designated **Child Welfare Police Officer**.
- ▶ **Child care institutions:**
 - **Observation Home** — during inquiry.
 - **Special Home** — rehabilitation of a CICL after inquiry.
 - **Children's Home** — for CNCP children.
 - **Place of Safety** — for those 18 or above, or being tried as adults.

- **After-care support** continues up to 21 years.
- ▶ **Powers of the JJB:** advise/warn the child, order counselling or community service, release on probation, fine, or send to a special home.
- ▶ **Absolute bar:** *"No juvenile in conflict with law shall be sentenced to death or life imprisonment, or committed to prison."*

The 16–18 heinous-offence pathway (most-examined point)

- ▶ For a 16–18-year-old alleged of a **heinous offence**, the JJB conducts a **preliminary assessment** (Section 15).
- ▶ The assessment covers the child's mental and physical capacity, ability to understand consequences, and the circumstances, with expert or psychologist help.
- ▶ If the JJB decides adult trial is warranted, the case is **transferred to the Children's Court** (Section 18(3)).
- ▶ Even after transfer, the child stays in a **place of safety**, not an adult jail.
- ▶ The sentence still **cannot be death or life imprisonment without the possibility of release**.
- ▶ **2021 Amendment:** shifted adoption-order power from civil courts to the **District Magistrate**, who also monitors JJB/CWC functioning.

Medico-legal significance

- ▶ **Age estimation is the forensic physician's central role** when an alleged offender claims to be a juvenile, done by combined **physical, dental, and radiological (skeletal ossification)** examination.
- ▶ This medical opinion decides whether the **JJB** or an **adult court** has jurisdiction; benefit of doubt in a borderline age goes to the **child**.
- ▶ Examination of a child must be **child-friendly**: with consent, in the presence of a guardian or female attendant, in privacy, and without force.
- ▶ A doctor who detects **child abuse, neglect, or a sexual offence** must report it to the CWC or SJPU (also **POCSO Section 19**); failure invites penal consequences.
- ▶ Before the JJB or Children's Court, the doctor gives **expert opinion on age and injuries** — **Section 45 IEA 1872 (now Section 39 BSA 2023)**.
- ▶ **No death or life sentence** for a child is an absolute safeguard to state in the exam.
- ▶ **Criminal-responsibility ages decide whether the JJ Act applies at all:**
 - **Under 7 years:** absolute *doli incapax* — "nothing is an offence" — **Section 20 BNS 2023 (formerly Section 82 IPC 1860)**.
 - **7–12 years:** rebuttable *doli incapax*, unless the child had "sufficient maturity of understanding" — **Section 21 BNS 2023 (formerly Section 83 IPC 1860)**.
 - The **POCSO Act 2012** runs in parallel for child sexual offences; a child offender under POCSO is dealt with under the **JJ Act 2015 (POCSO Section 34)**.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS► **Flowchart — pathway of a child apprehended for an offence:**

- Child apprehended → Special Juvenile Police Unit/Child Welfare Police Officer → produced before JJB within 24 hours → branch.
- Petty/Serious → JJB disposal (counselling, community service, probation, fine, special home).
- Heinous + age 16–18 → preliminary assessment (S.15) → tried as adult in Children's Court (S.18(3)) → Place of Safety, no death/life sentence.
- Side box: Child in need of care & protection → Child Welfare Committee → Children's Home / restoration / adoption.

► **Ladder diagram — ages of medico-legal importance:**

- <7 yr — absolute doli incapax (S.20 BNS); 7–12 yr — rebuttable doli incapax (S.21 BNS); <12 yr — cannot consent (S.27 BNS); <18 yr — child/juvenile; 16–18 yr — may be tried as adult for heinous offence; 21 yr — after-care ends.



Corporate negligence

Asked in: Paper III Apr 2020 — RGUHS MD Forensic Medicine

Definition

- **Corporate negligence** is negligence of the **hospital or healthcare institution itself**, not of any one doctor.
- It happens when the people running the hospital fail to provide proper accommodation, facilities, staff, or systems of treatment.
- If that failure injures a patient the institution owed a duty of care to, the hospital itself is negligent.
- It is one of the recognised types of medical negligence, and it matters more today because of large corporate hospitals.

Where corporate negligence fits

- Medical negligence is part of the **law of torts** — a civil wrong for which the patient can claim compensation.

Type	Who is negligent	Who is liable
Doctor's negligence	The treating doctor	Doctor
Patient negligence	The patient only	Doctor not liable
Contributory negligence	Both doctor and patient	Compensation apportioned
Composite negligence	Two or more doctors together	Doctors jointly liable

Type	Who is negligent	Who is liable
Corporate negligence	The hospital/institution itself	Hospital liable; doctor may or may not also be liable

- ▶ The defining feature: the **institution** is at fault, and the individual doctor can be entirely blameless.

Why the hospital is held liable

- ▶ The hospital, not the patient, is best placed to supervise quality and ensure safety.
- ▶ Hospitals owe an **independent duty** to check the competence of their staff doctors.
- ▶ Failing to do this is called **negligent credentialing**.
- ▶ The same theory covers negligent **selection, retention, or supervision** of doctors.
- ▶ When several people at different levels all fail in their duty, everyone responsible, including the treating doctor, is held liable together.

Examples of corporate negligence

- ▶ Using defective or poorly maintained equipment or drugs.
- ▶ Hiring or retaining incompetent staff.
- ▶ No oxygen cylinders kept in the ICU.
- ▶ An operation theatre that is not kept sterile.
- ▶ Any other failure to meet the accepted standard of care that injures a patient.

Liability for an independent (visiting) doctor

- ▶ If the hospital **knew or should have known** that a staff doctor was likely to be negligent, the **hospital is liable**.
- ▶ This applies even if that doctor is an independent practitioner with only visiting/staff privileges.
- ▶ If the patient privately engages the doctor and the hospital only provides facilities, **only the doctor** is liable.
- ▶ In that situation the institution escapes corporate liability.

Corporate negligence vs vicarious liability

- ▶ Corporate negligence is the hospital's **own, direct fault** — defective systems, equipment, or credentialing.
- ▶ Vicarious liability is the hospital being held liable for **its employee's fault** — indirect/derivative liability.
- ▶ In corporate negligence the doctor may be blameless; in vicarious liability the doctor was actually negligent.
- ▶ Vicarious liability rests on ***respondeat superior** ("*let the superior reply*"), also called the "captain of the ship"* doctrine.
- ▶ It is also called the **doctrine of deep pockets** — the hospital, not the individual doctor, has the funds to pay.

- ▶ **Preconditions:** an employer–employee relationship, the act within the scope of employment, and it happening while on duty.
- ▶ **Borrowed servant doctrine:** if another employer temporarily borrows and directly supervises the doctor, that new employer becomes vicariously liable.
- ▶ This borrowed-servant liability lasts only as long as that direct supervision continues.

Medico-legal significance

- ▶ Civil/consumer claims need only "**balance of probabilities**" (over 50%).
- ▶ Criminal prosecution needs proof "**beyond reasonable doubt**".
- ▶ ***Res ipsa loquitur*** ("the thing speaks for itself") can apply when negligence is obvious.
- ▶ Examples: a mismatched blood transfusion, a swab left in the abdomen, no oxygen available.
- ▶ Here the burden shifts onto the hospital to explain what happened.
- ▶ The Supreme Court (*Jacob Mathew v. State of Punjab*, 2005) requires a credible independent medical opinion before a private criminal complaint proceeds.
- ▶ The investigating officer must also obtain an independent opinion, preferably from a government doctor.
- ▶ The **Bolam test** — "the ordinary skill of an ordinary competent man" — is the accepted standard in India.
- ▶ Endangering life by a rash or negligent act, with no injury, is **Section 336 IPC 1860 (now Section 125 BNS 2023)**.
- ▶ Causing **hurt** this way is **Section 337 IPC (now Section 125(a) BNS 2023)**.
- ▶ Causing **grievous hurt** this way is **Section 338 IPC (now Section 125(b) BNS 2023)**.
- ▶ **Causing death by negligence**, the section most used against doctors/hospitals, is **Section 304-A IPC 1860 (now Section 106 BNS 2023)**.
- ▶ The usual civil remedy is the **Consumer Protection Act 1986 (now 2019)**.
- ▶ Under this Act, medical service for payment is a "service", and the patient is a "consumer" who can claim compensation before consumer fora.
- ▶ Complete, accurate, legible medical records are the hospital's primary defence in any corporate-negligence case.
- ▶ **Prevention:** run a hospital injury-prevention programme and regular clinical audit.
- ▶ Check equipment often and use available safety installations.
- ▶ Ensure proper credentialing and supervision of staff.
- ▶ Always keep the operation theatre sterile and life-support (oxygen, ICU) ready.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Triangle diagram:** three vertices labelled **Hospital, Doctor, Patient**.
- ▶ An arrow runs from Hospital to Patient, labelled "**Patient suffers harm**".
- ▶ Note beside it: Hospital is negligent; Doctor is NOT negligent; Patient is NOT negligent.
- ▶ **Two-tier liability chart:** a box labelled "**Hospital**" branches into two arrows.
- ▶ One arrow is **corporate negligence** — the hospital's own fault (defective equipment, no ICU oxygen, non-sterile OT, negligent credentialing).
- ▶ The other arrow is **vicarious liability** — *respondeat superior*/deep pockets, the fault of an employee doctor.
- ▶ Both arrows end at a box labelled "**Compensation to patient.**"



Define medical negligence. Draft a protocol to be followed in operative and anesthetic deaths in a tertiary care teaching hospital

Asked in: Paper III Apr 2021 — RGUHS MD Forensic Medicine

Definition

- ▶ **Medical negligence:** absence of reasonable care and skill, or wilful negligence, by a doctor treating a patient, causing bodily injury or death.
- ▶ In short: doing what a prudent doctor would not do, or vice versa.
- ▶ It falls under the **law of torts** — a civil wrong for which the patient can claim compensation.
- ▶ **Operative death:** death during, or resulting from, a surgical procedure.
- ▶ **Anaesthetic death:** death during, or resulting from, giving anaesthesia; rare, about **1 in 10,000** cases.
- ▶ Both are, by statute, **unnatural/medico-legal deaths** needing inquest and autopsy — hence the protocol below.

Essential elements of negligence — the "4 Ds"

All four must be proved (by *preponderance of evidence*) for civil liability to arise:

- ▶ **Duty:** a duty of care owed by the doctor, beginning once a doctor–patient relationship starts.
- ▶ **Dereliction (breach):** failing the "prudent physician" standard, by **omission** (departing from accepted practice) or **commission** (doing it unskillfully).
- ▶ **Direct causation:** a close, proximate link between breach and injury — the "but for" test.
- ▶ **Damage:** actual, foreseeable harm resulted. **No damage, no suit**, even against a negligent doctor.

Types of medical negligence

- ▶ **Civil negligence:** patient seeks monetary compensation in a civil court; simple absence of care suffices; **consent is a good defence**.

- ▶ **Criminal negligence:** gross absence of care/skill, a crime against the State; punishable with imprisonment; **consent is not a defence** (e.g. wrong-limb amputation, retained swabs).
- ▶ **Corporate negligence:** failure of the **hospital/institution** itself — defective equipment or negligent staff supervision.
- ▶ **Contributory negligence:** the **patient's** own unreasonable conduct adds to the doctor's negligence; a **partial defence in civil cases only**.
- ▶ **Composite negligence:** more than one negligent person causes the injury; the patient may claim from any one.

Feature	Civil negligence	Criminal negligence
Degree	Simple absence of care	Gross negligence
Consent	Good defence	Not a defence
Proof	Preponderance of evidence	Beyond reasonable doubt
Punishment	Damages	Imprisonment ± fine

Legal doctrines and defences

- ▶ ***Res ipsa loquitur** ("*the thing speaks for itself*"): *no expert evidence needed if the injury wouldn't ordinarily occur without negligence, the doctor had exclusive control**, and the patient wasn't contributorily negligent.
 - Classic example: a retained swab after operation (*Mohn vs Osborne*).
- ▶ ***Volenti non fit injuria*** (assumption of risk): valid where the patient accepted a known, unavoidable risk after being warned.
- ▶ **Medical misadventure:** no liability for an honest error of judgement or an inevitable accident — "in biology, variation is the rule."
 - Example: *Roe vs Ministry of Health* — Nupercaine seeped through a cracked ampoule, causing paraplegia; held to be **misadventure, not negligence**.
- ▶ ***The Bolam test:** *not negligent if conduct matches a practice accepted as proper by a responsible body of medical opinion, judged by knowledge available at the time**.

Why operative and anaesthetic deaths need this protocol

- ▶ **Deaths during, not due to, anaesthesia:** the underlying disease, an undiagnosed lesion, surgical shock, or injury to a great vessel.
- ▶ **Deaths due to the anaesthetic:**
 - **Respiratory failure:** overdose/relaxants, or airway obstruction from laryngeal spasm or aspiration.
 - **Vagal inhibition / cardiac arrest:** reflex slowing of the heart, from inadequate pre-medication.
 - **Arrhythmia:** the heart sensitised to adrenaline-type hormones by halogenated agents.
 - **Overdose, hypersensitivity or idiosyncrasy:** an abnormal individual drug reaction.

- ▶ **Malignant hyperthermia:** rare, autosomal-dominant, triggered by **halothane and succinylcholine**; temperature to **40–45°C**; incidence **1:14,000**; mortality **60–80%**.
- ▶ Most such deaths are "physiological" and **leave no mark at autopsy** — the cause is reached by **exclusion and reasoning**.

Protocol for operative and anaesthetic deaths

A. Immediate steps in the OT

- ▶ Resuscitate fully; once death is declared, **stop all manipulation** of the body.
- ▶ **Leave all tubes and lines in situ** — they confirm correct placement at autopsy.
- ▶ **Seal and preserve** the anaesthetic machine, gas cylinders, IV fluids and drug containers; discard nothing.
- ▶ **Inform** the medical superintendent, HOD, surgeon, anaesthetist and family.
- ▶ **Never alter, backdate or destroy records** — alteration itself suggests negligence.
- ▶ Treat it as an **unnatural death**: inform police; hold the body until autopsy is done.

B. Medico-legal reporting and inquest

- ▶ A listed indication for **inquest**: police inquest under **Section 174 CrPC 1973 (now Section 194 BNSS 2023)**, or a **magistrate's inquest** under **Section 176(1A) CrPC 1973 (now Section 196 BNSS 2023)** where mandated.
- ▶ The autopsy should be done by a **team of doctors**, not a single pathologist, with an **impartial expert** reviewing the case sheet.

C. Review history before the autopsy

- ▶ Check the pre-anaesthetic assessment, premedication and total anaesthesia time.
- ▶ Check surgery planned versus done, operative findings, and **whether valid informed consent was obtained**.
- ▶ Check comorbidities and every drug/transfusion given; discuss with the surgical and anaesthetic team.

D. The autopsy

- ▶ **Photograph** the whole body before removing dressings.
- ▶ **Before opening**, test for **air embolism/pneumothorax** — seal the wound with a rubber sheet and collect trapped gas by needle.
- ▶ Trace each drainage tube to its internal end before removing it.
- ▶ **Inspect every suture line** for leakage; look for **retained sponges/instruments**, slipped ligatures and organ injury.
- ▶ Examine the airway for aspiration/intubation injury, and the lungs for oedema/collapse/embolism.
- ▶ Look for **engorgement of dependent organs** (suggests prolonged anaesthesia), and exclude occult cardiac disease.

E. Evidence collection

- ▶ Send blood for grouping/culture, and a **full set of histology** to exclude occult disease.

- ▶ For **volatile anaesthetics**, collect alveolar air **before opening the chest**; seal **airtight**, **minimal head-space**, and **refrigerate immediately**.
- ▶ Fatal blood levels: **chloroform 40–60 mg%**, **ether 180 mg%**, **halothane 20 mg%**.

F. Final opinion

- ▶ Ask in sequence: disease or surgery/anaesthetic; would the patient have died anyway; was surgery essential; was there a technique defect; predisposing disease; an unrelated cause; too poor a risk for anything but urgent surgery.
- ▶ Reach the opinion **by exclusion and reasoning**, after discussion with the surgeon and anaesthetist.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Flowchart:** Death in OT → seal tubes/machine/drugs → inform team/family, secure records → notify police → inquest (§194/§196 BNSS) → team autopsy + expert review → history review → special autopsy → evidence collection → 7 evaluation questions → opinion by exclusion.
- ▶ **The "4 Ds" wheel:** Duty, Dereliction, Direct causation, Damage — caption "all four required for civil negligence".

Medico-legal significance

- ▶ These are **unnatural deaths** requiring inquest and autopsy; failure to report is itself misconduct.
- ▶ **Valid, informed, documented consent** is the most scrutinised issue in operative deaths — its absence is itself negligence.
- ▶ **Documentation is the doctor's best defence** — contemporaneous, unaltered records of assessment and care.
- ▶ A negligent act causing death is punishable under **Section 106(1) BNS 2023** (replacing **Section 304-A IPC 1860**): up to **five years plus fine**, but only **two years plus fine** for a **registered medical practitioner** performing a procedure.
- ▶ A doctor's expert opinion is admissible under **Section 45 IEA 1872** (now **Section 39 BSA 2023**).
- ▶ **Supreme Court safeguards** (*Jacob Mathew vs State of Punjab*, 2005): prosecuting a doctor needs **gross negligence** plus a **prima facie opinion from another competent doctor**; no routine arrest.
- ▶ Distinguish **negligence** from **medical misadventure** (not negligence).

♦ ♦ ♦

Define professional secrecy and privileged communications in medical practice

Asked in: Paper III Oct 2022 — RGUHS MD Forensic Medicine

Definition

- ▶ **Professional secrecy (medical confidentiality):** the doctor's moral, ethical, and legal duty to keep secret all information about a patient learned during professional work.
- ▶ Disclosing it without the patient's consent is a breach of trust and can make the doctor liable.

- ▶ **Privileged communication:** a *bona fide* (good-faith) statement made by a doctor to a lawful authority about a patient.
- ▶ It is made to protect the patient, a third party, the community, or the State.
- ▶ It is a recognised **exception** to professional secrecy.
- ▶ In short: secrecy is the rule; privileged communication is the lawful exception.

Professional secrecy

- ▶ **Nature:** it is an implied term of the doctor–patient contract.
- ▶ The patient shares intimate details only because he trusts they will stay secret.
- ▶ The legal profession has a similar rule (*legal professional privilege*), but there the privilege belongs to the client, not the lawyer.
- ▶ **Secrecy binds even when:**
 - Treatment was free or charitable.
 - The doctor was paid by the patient's parents or relatives.
 - An adult patient's illness still cannot be told to them without consent.
 - The enquirer is a near relative, employer, or a statutory/public body (except for notifiable diseases).
- ▶ **Key disclosure rules:**
 - For an adult patient, nothing may be told to parents, relatives, or spouse without consent.
 - This applies even between husband and wife.
 - For a minor or a person of unsound mind, the guardian or parents should be informed of the illness.
 - No information may be given to an insurance company without the patient's consent.
 - Information about a dead person needs the nearest relative's consent before disclosure.
 - No press conferences should be held on a patient's medical condition.
 - Foetal sex on ultrasonography must never be disclosed (**PC-PNDT Act**).
 - Post-mortem findings go only to the police, not to relatives (RTI Act 2005 rulings may require release).
 - The **MTP Admission Register** (records of pregnancy terminations) is a secret document.
- ▶ **Waiver:** the patient's express permission lifts the duty of secrecy.
- ▶ **Unjustified breach can lead to:**
 - **Criminal defamation** under Section 499/500 IPC 1860 (now **Section 356 BNS 2023**).
 - A **civil suit for damages** for mental suffering, shame, or humiliation — if disclosure was voluntary, harmful, and not in the public interest.
 - A **complaint to the State Medical Council or National Medical Commission**, which can take disciplinary action for professional misconduct.

Privileged communication

- ▶ **Definition:** a bona fide statement by a doctor to a person or authority with a legitimate interest in it.

- ▶ Because the law recognises this over-riding duty, the doctor faces **no liability in defamation or damages**.
- ▶ **Two conditions must both be met:**
 - The communication must be made in **good faith**.
 - It must go only to someone with an **interest or duty** in it — telling more than one person, or someone with no real interest, defeats the plea of privilege.
 - The doctor must **first persuade the patient** to consent to treatment or corrective action.
 - Only if persuasion fails should the doctor inform the authority.

Recognised heads of privileged communication

#	Head	Example
1	Infectious disease	Food-handler with enteric fever, or teacher with tuberculosis — persuade to stop work; if refused, tell the employer.
2	Risky-job employees	Engine-driver or pilot with epilepsy, hypertension, alcoholism, or colour-blindness — persuade to change job; if refused, tell the employer.
3	Notifiable diseases	Statutory duty to notify births, deaths, and infectious disease to public-health authorities.
4	Patient's own interest	Warn parents/guardians of suicidal tendency so the patient can be supervised.
5	Third party's interest	Warn a fiancée or spouse of a serious STD such as HIV.
6	Doctor's self-interest	Evidence about the patient's condition in a suit brought by the patient against the doctor.
7	No doctor–patient relationship	Doctor examining a claimant for the opposite party — not privileged, must testify if asked.
8	Suspected/committed crime	Must inform police/Magistrate on learning of murder, assault, rape, gunshot, or poisoning.
9	Court of law	Cannot refuse to disclose; sensitive material may go to the judge in a sealed envelope.
10	Insurance examination	The examinee's tacit consent lets the doctor report adverse findings to the company.

Medico-legal significance

- ▶ **Privileged communication vs therapeutic privilege** (a common examiner trap):
 - Privileged communication is the doctor's duty or right to **disclose** information to an interested authority.
 - Therapeutic privilege is the doctor's right to **withhold** distressing information from the patient.
 - These are opposite acts.
 - **HIV status is never withheld under therapeutic privilege** — the patient must be told, to prevent spread of the disease.
- ▶ The doctor must always try to persuade the patient and get consent first.
- ▶ Disclosing to an uninterested party turns a lawful privileged communication into an actionable breach of secrecy.
- ▶ **Failure to report a medico-legal case** (homicide, suicide, accident, gunshot, poisoning) attracts **Section 176 IPC (now Section 211 BNS 2023)**.
- ▶ **Causing evidence to disappear** attracts **Section 201 IPC (now Section 238 BNS 2023)**.
- ▶ The overarching duty to report grave offences is **Section 39 CrPC (now Section 33 BNSS 2023)**.
- ▶ A properly made privileged communication is protected by **Section 93 IPC (now Section 31 BNS 2023)**.
- ▶ Good-faith acts done for the patient's benefit are protected by **Section 88 IPC (now Section 26 BNS 2023)**.
- ▶ "Good faith" is legally defined as acting with due care and attention (**Section 52 IPC 1860, now Section 2(11) BNS 2023**).
- ▶ **Special statutes that modify secrecy:**
 - Notification under public-health law.
 - Non-disclosure of foetal sex under the **PC-PNDT Act**.
 - Secrecy of the **MTP Admission Register**.
 - Confidentiality safeguards for HIV-positive persons under the **HIV/AIDS Act 2017**.
- ▶ **Landmark case — Mr. X v. Hospital Z (1998) 8 SCC 296:* a hospital disclosed a patient's HIV-positive status to his fiancée, and the marriage was called off.
 - **Held:** the disclosure did not violate confidentiality, because it saved the fiancée's life.
 - An HIV-positive person has a duty not to marry a partner without disclosure (then **Sections 269/270 IPC, now Sections 271/272 BNS 2023** — negligent/malignant act likely to spread infection dangerous to life).
 - This is the leading Indian authority that the right to confidentiality is **not absolute**.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Flowchart** — "Secrecy vs Privileged communication": central box "Patient information" leads down to "RULE: Professional secrecy — no disclosure without consent."
- ▶ A side branch labelled "EXCEPTION: Privileged communication" leads to four boxes: "Society's interest," "Patient's interest," "Third party's interest," "Doctor's/legal interest."
- ▶ All four converge on a final box: "Disclose in good faith to the interested authority → no liability."
- ▶ Add a side condition box: "Persuade patient first."
- ▶ **Spectrum line** — **disclosure ethics**: "Paternalism" at the left end, "Therapeutic privilege (withhold information)" in the middle, "Full patient autonomy (full disclosure)" at the right end.



Ethical and Legal Aspects of AIDS

Asked in: Paper III Oct 2021 — RGUHS MD Forensic Medicine

- ▶ AIDS (Acquired Immunodeficiency Syndrome) is the advanced stage of infection by HIV (Human Immunodeficiency Virus), a retrovirus that attacks CD4 T-helper lymphocytes and causes severe immune suppression.
- ▶ The disease is sexually and blood-borne, incurable, stigmatised and often fatal.
- ▶ This creates a sharp conflict between the patient's right to confidentiality and dignity, and society's or a third party's right to be protected from harm.
- ▶ The doctor must balance these duties using medical ethics, the Supreme Court ruling in *Mr. X v. Hospital Z* (1998), and the HIV/AIDS (Prevention and Control) Act, 2017.

Basic medico-legal facts that drive the ethics

- ▶ HIV infects CD4 (T-helper) lymphocytes, which are present in semen, vaginal secretions, blood, saliva, tears and breast milk.
- ▶ Blood becomes antibody-positive 2 to 18 months after infection (the "window period").
- ▶ HIV survives in liquid blood for up to about 2 months and concentrates in brain, colon, lungs and lymphoid tissue.
- ▶ **Air-borne transmission does not occur.**
- ▶ **Routes of spread:**
 - Sexual intercourse.
 - Blood or blood-product transfusion.
 - Contaminated needles (drug-abuse sharing, shared tattoo needles).
 - Organ, tissue or semen donation.
 - Mother-to-child (vertical) transmission, including through breast-feeding.
- ▶ Diagnosis is by detecting HIV antibodies in serum on ELISA, confirmed by Western blot, or by identifying viral DNA/RNA.

- ▶ Because spread is largely behavioural, avoidable and test-detectable, a known-positive person can transmit the virus to identifiable third parties — this is what drives the ethical debate.

Core ethical principles

- ▶ **Confidentiality:** An HIV test result must stay confidential, even from healthcare staff not directly involved in the patient's care, because voluntary testing depends on trust.
- ▶ **Autonomy:** No HIV test, treatment or research may be done without the informed consent of the person or their representative.
- ▶ **Non-discrimination:** There is no public-health case for isolating, quarantining or discriminating against an HIV-positive person; they keep equal rights to education, employment, marriage and property.
- ▶ **Beneficence:** Government doctors are obliged to treat AIDS cases; refusing treatment solely for HIV status is unethical.
- ▶ **Justice (duty to warn):** Confidentiality is not absolute — if an identifiable third party (e.g., an unsuspecting sexual partner) is at real risk, the doctor's duty to warn that person can override secrecy, the ethical doctrine known as the *Tarasoff* principle.

HIV testing policy and the doctor's duties

- ▶ **Mandatory testing** is allowed only to screen donors of blood, semen, organs or tissue.
- ▶ **Voluntary testing** is used for individuals, always with pre- and post-test counselling.
- ▶ HIV testing cannot be made a precondition for employment; a fit HIV-positive worker cannot be dismissed, and status must stay confidential at the workplace.
- ▶ **Blood donation:** every unit must test negative for HIV-1 and HIV-2 before use.
- ▶ By government guidelines, the result is not disclosed to the donor — positive units are discarded and identities kept coded.
- ▶ A donor who wants his own result is referred to a counselling centre.
- ▶ A healthcare worker known to be HIV-positive faces no routine restriction if fit for duty; only for invasive, exposure-prone surgical procedures should privileges be reviewed case by case.
- ▶ The treating doctor must inform paramedical staff, mortuary staff, the pathologist and crematorium staff who will handle infected material, so universal precautions are taken, without broadcasting the patient's status further.
- ▶ An HIV-positive woman has full choice over pregnancy and childbirth after counselling; she may be advised (not coerced) against pregnancy (about one-in-three risk to the child) and told breastfeeding can transmit HIV, but cannot be sterilised or have an abortion without her informed consent.

Partner notification — the limit on confidentiality

- ▶ If a doctor knows a specific, identifiable third party (spouse, sexual partner, or needle-sharing partner) is at risk, non-voluntary disclosure of the patient's HIV status can be justified.
- ▶ Under the HIV/AIDS Act, 2017, a healthcare provider may disclose a patient's HIV-positive status to the partner — but only after counselling the patient and giving them a reasonable chance to disclose it themselves, with protection measures in place.

- ▶ The at-risk partner has a moral right to this information so they can get tested and start treatment.

Landmark judgment — **Mr. X v. Hospital Z (1998)**

- ▶ **Facts:**
 - Mr. X, a government doctor, donated blood and tested HIV-positive.
 - The hospital disclosed his status to his fiancée, and the marriage was called off.
 - He sued the hospital for breach of confidentiality.
- ▶ **Held:**
 - The disclosure did not breach confidentiality, because it saved Ms Y's life.
 - Confidentiality is not absolute — it yields when another identifiable person's life is at risk.
 - A person with a communicable disease has a duty not to marry without disclosing it.
- ▶ **Significance:**
 - A doctor may reveal HIV-positive status to a prospective spouse or sexual partner.
 - Knowingly transmitting the infection can attract criminal liability.
 - A communicable venereal disease is also a ground for divorce.

Criminal and civil liability

- ▶ **Negligent spread of a disease dangerous to life** — Section 269 IPC 1860 (now **Section 271 BNS 2023**): imprisonment up to 6 months and/or fine.
- ▶ **Malignant (malicious) spread of a disease dangerous to life** — Section 270 IPC 1860 (now **Section 272 BNS 2023**): imprisonment up to 2 years and/or fine.
- ▶ **Wrongful disclosure of HIV status** can expose the doctor to a criminal defamation charge — Section 499/500 IPC 1860 (now **Section 356 BNS 2023**) — a civil suit for damages, and disciplinary action by the State Medical Council or National Medical Commission.
- ▶ An HIV-positive person who faces discrimination may file a civil suit for compensation for violation of their fundamental rights to liberty, equality and privacy.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Flowchart — Confidentiality vs Duty to Warn:** *HIV-positive result* → *pre/post-test counselling and informed consent* → *is an identifiable third party at real risk?* → if **No**, maintain strict confidentiality (equal rights to job, education, marriage; no isolation); if **Yes**, counsel the patient to disclose → give them the chance to self-inform → if refused, make non-voluntary disclosure to the partner (duty to warn) → note *Mr. X v. Hospital Z* (1998) and the HIV/AIDS Act, 2017 as the legal basis.
- ▶ **Box — universal precautions at autopsy on an HIV body:** double tough plastic body bag with red "Biologically hazardous" tag; double gloves; waterproof apron, full-sleeve overall, cap, mask/visor, goggles, knee-length gumboots; Rokitansky in-situ dissection; specimens in 10% formalin; avoid sharps injury; report any needle-stick for seroconversion follow-up.

Medico-legal significance

- ▶ Autopsy on a known or suspected HIV body uses the universal precautions shown above.
- ▶ Rokitansky's in-situ technique (examining organs largely in place rather than removing the whole block) is preferred to limit handling of infected tissue.
- ▶ Seroconversion risk after a needle-stick is only about 0.3–0.5% — far lower than for hepatitis B — and negligible with proper precautions.
- ▶ Universal precautions apply to blood, semen, vaginal secretions, CSF, and synovial, pleural, peritoneal, pericardial and amniotic fluid.
- ▶ They do not apply to faeces, sputum, sweat, tears, urine or vomitus unless visibly bloodstained.
- ▶ **Relevant law:**
 - Section 269/270 IPC (now Section 271/272 BNS 2023) — spreading infection.
 - Section 499/500 IPC (now Section 356 BNS 2023) — wrongful disclosure.
 - HIV/AIDS (Prevention and Control) Act, 2017 — consent, non-discrimination, confidentiality and partner disclosure.

♦ ♦ ♦

Describe Legal and Ethical aspects of human organ transplantation*Asked in: Paper III Oct 2019 — RGUHS MD Forensic Medicine***Definition / Introduction**

- ▶ **Organ transplantation** is the surgical transfer of a living organ or tissue (a **graft**) from a **donor** to a **recipient** to restore lost function.
- ▶ In India it is regulated by the **Transplantation of Human Organs and Tissues Act (THOTA), 1994** (Act 42 of 1994), with two aims — regulate transplantation and prevent commercial dealing in organs.
- ▶ It replaced piecemeal state laws and gave **legal recognition to brain-stem death**, without which vital organs could not be retrieved.

- ▶ A committee headed by **Dr. L.M. Singhvi** drafted the original Act; it was amended in **2011**, with Rules in 1995 and 2014.

Types of grafts and donation

- ▶ **Autograft:** graft from one part of a person's body to another part of the same individual.
- ▶ **Allograft (homograft):** graft between two genetically different individuals of the same species (human to human).
- ▶ **Isograft:** graft between identical (monozygotic) twins.
- ▶ **Xenograft:** animal tissue grafted into a human; limited success and a risk of **zoonoses** (animal diseases transmitted to humans).
- ▶ **Live donation:** includes blood and bone-marrow transfusion; live organ donation is limited to a kidney or part of the liver.
- ▶ **Cadaveric donation:** most organs need retrieval while the heart is still beating, so a brain-stem-dead donor kept on the ventilator (a "beating-heart donor") gives the best results.
- ▶ **Transplantable organs:** heart, intestine, kidneys, liver, lungs, pancreas, thymus.
- ▶ **Transplantable tissues:** bone, cartilage, cornea, heart valves, ligaments, middle ear, skin, tendons, veins.
- ▶ Worldwide the **kidney** is the most transplanted organ, and the **cornea** the most transplanted tissue.

How soon must an organ be retrieved

Tissue / organ	Maximum interval after death
Vital organs (kidney, heart, lung, pancreas, liver)	As soon as circulation stops — ideally a beating-heart donor
Cornea	Within 6 hours
Skin	Within 24 hours
Bone	Within 48 hours

- ▶ A transplanted **cornea** is **never rejected** by the recipient body; donors can range from newborns to over 70 years.
- ▶ **Cornea is legally a tissue, not an organ**, so it can be harvested without Authorisation-Committee scrutiny — eye banks handle it.

Legal aspects — key provisions of THOTA, 1994 (amended 2011)

- ▶ **Brain-stem death** is legally recognised for organ retrieval, defined as the stage at which all functions of the brain-stem have permanently and irreversibly ceased [**Section 2(d)**].
- ▶ Any person **above 18 years** may authorise removal of his own organ or tissue during life [**Section 3(1)**].
- ▶ **Living donation is restricted to "near relatives"** [**Section 9(1)**]; an unrelated living donor needs clearance from the **Authorisation Committee** to rule out a commercial motive.

- ▶ **Near relative** originally meant seven relations (father, mother, spouse, brother, sister, son, daughter); the 2011 amendment added four more (grandfather, grandmother, grandson, granddaughter), making eleven.
- ▶ **Cadaveric donation can go to an unrelated recipient** — the donor cannot choose who receives the organ; allocation follows the registry [Section 9(2)].
- ▶ Only a **registered medical practitioner (RMP)** may remove an organ [Section 3(4)].
- ▶ Every transplant centre must be **registered** with the **Appropriate Authority**.
- ▶ The **2011 amendment** brought tissues and bone marrow under the Act, created the **Tissue Bank** and **Transplant Co-ordinator**, and introduced **swap (paired-exchange) transplants**.
- ▶ **NOTTO / SOTTO / ROTTO** (National/State/Regional Organ and Tissue Transplant Organisations) run a transparent, computerised waiting list under the **National Organ Transplant Programme (NOTP)**.
- ▶ The **Board of four experts** certifying brain-stem death: the RMP in charge of the hospital, an independent specialist and a **neurologist or neurosurgeon** he nominates, and the RMP treating the deceased [Section 3(6)].

Consent for deceased donation [Section 3(2)–(3)]

- ▶ **If the person authorised removal in life:** the authorisation must be in writing, before two or more witnesses (at least one a near relative). The person in lawful possession of the body must then give reasonable facilities for retrieval. A later **revoked** authorisation bars removal.
- ▶ **If the person objected in life:** no one can authorise removal, under any condition.
- ▶ **If the person neither authorised nor objected:** the person in lawful possession of the body may authorise removal, **unless a near relative objects** — e.g. a father may authorise, but a sister's objection blocks it.

Penalties under THOTA

- ▶ **Commercial dealing** (buying/selling organs): imprisonment up to **10 years** plus fine up to ₹1 crore (originally ₹20 lakh under Section 18(1)).
- ▶ **Removal without authority** [Section 18(1)]: up to **10 years** plus fine; applies to any assistant too — anaesthetist, nurse, paramedic.
- ▶ **Illegal dealings or contravention:** 3–7 years plus fine.
- ▶ **Unauthorised removal of organs:** up to **5 years** plus fine.
- ▶ **For a doctor** [Section 18(2)]: name struck off the medical register for **3 years** on a first offence, and **permanently** on a repeat offence.

Ethical aspects

- ▶ **Altruism:** donation must be voluntary and unpaid — a gift, never a sale.
- ▶ **Non-commercialisation:** organ trade is prohibited; unrelated living donors face strict Authorisation-Committee scrutiny to exclude trafficking.
- ▶ **Equity/justice:** allocation is by medical criteria and urgency through a computerised waiting list, not by wealth or influence.

- ▶ **Autonomy and informed consent:** the donor's consent must be valid, free and written; the deceased's wishes and family objections must both be respected.
- ▶ **Beneficence, non-maleficence and the "dead-donor rule":** retrieval must never harm a living donor or precede certified death.
- ▶ **No conflict of interest:** brain-stem-death tests must never be performed by the transplant surgeon or any member of the transplant team.
- ▶ **Screening:** living donors must be screened for **HIV** close to retrieval, using serology and nucleic-acid testing (NAT), and told of the transmission risk.
- ▶ **International anchors:** the **WMA Declaration of Sydney (1968)** covers death declaration and organ harvesting; the **Declaration of Istanbul** targets organ trafficking and transplant tourism.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Flowchart — pathway of a legal cadaveric donation:** Potential donor on ventilator → brain-stem death suspected → Board of 4 experts certifies it → consent obtained (prior authorisation, or lawful possessor with no relative objection) → co-ordinator/Appropriate Authority notified → retrieval by RMP in a registered centre → NOTTO/SOTTO allocation → transplant into recipient.
- ▶ **Classification chart:** Autograft (same individual) — Allograft (same species) — Isograft (identical twins) — Xenograft (animal to human), labelled by donor type.

Medico-legal significance

- ▶ The doctor must certify that **life is extinct**, or that **brain-stem death is certified by the four-member Board**, before any retrieval — otherwise the retrieval becomes a criminal act.
- ▶ Heart removal from a **living donor** is barred; it would attract **Section 304 IPC (now Section 105 BNS 2023)** for culpable homicide.
- ▶ A transplant from a body under medico-legal investigation needs **police/Magistrate clearance**; retrieval and autopsy may then be done together in the operating theatre (per THOTA 2014 Rules) so evidence is not lost.
- ▶ An inquest into a transplant-related unnatural death proceeds under **Section 174 CrPC 1973 (now Section 194 BNSS 2023)**.
- ▶ **Documentation** required: written witnessed authorisation, proof of donor–recipient relationship, Authorisation-Committee approval for unrelated donors, the brain-stem-death certificate, and the registry entry.
- ▶ The forensic expert's opinion on cause/manner of death, and on whether death was properly certified, is admissible under **Section 45 IEA 1872 (now Section 39 BSA 2023)**.

♦ ♦ ♦

Differences between professional negligence and infamous conduct with examples

Asked in: Paper III Oct 2021 — RGUHS MD Forensic Medicine

Definitions

- ▶ **Professional negligence (malpraxis):** absence of reasonable care and skill, or wilful negligence, by a registered medical practitioner (RMP) treating a patient, causing injury or death.
- ▶ It is an act of **commission** (doing something a prudent doctor should not) or **omission** (failing to do something a prudent doctor should), causing harm.
- ▶ It falls under the **law of torts** (a civil wrong), but gross negligence can also be a crime.
- ▶ The benchmark is **reasonable care and skill** — what an ordinarily competent doctor of the same standing would exercise.
- ▶ The standard rises with qualification (MCh super-specialist > MS > MBBS) and with the patient's helplessness (unconscious patient needs more care than a conscious one).
- ▶ A doctor does not guarantee a cure, and a mere error of judgement or a missed diagnosis, by itself, is not negligence.
- ▶ **Infamous conduct (serious professional misconduct):** conduct of an RMP that reasonable, competent colleagues would call disgraceful or dishonourable — a breach of the **Code of Medical Ethics**, not of clinical skill.
- ▶ It covers acts that carry **no punishment** under ordinary civil or criminal law, yet the Medical Council can still act on them — e.g., dichotomy (fee-splitting), an oversized signboard, or employing touts.
- ▶ It is governed by the **Indian Medical Council (Professional Conduct, Etiquette and Ethics) Regulations, 2002**, now under the National Medical Commission (NMC).
- ▶ The list of misconduct is not exhaustive — the Council can act on any act it considers disgraceful, judged case by case.
- ▶ Negligence is tried by the courts; infamous conduct is tried by the Medical Council.
- ▶ A single act can sometimes be both, but the forum, the need for damage, and the punishment all differ.

Core differences

Trait	Professional negligence	Infamous conduct
Nature	Failure of care/skill in treating a patient	Breach of the Code of Medical Ethics
Duty of care	Must be present	Need not be present
Damage to patient	Must be present	Need not be present
Tried by	Courts (civil or criminal)	State Medical Council
Standard of proof	Civil: >50% probability; Criminal: beyond reasonable doubt	Enquiry by professional peers

Trait	Professional negligence	Infamous conduct
Punishment	Fine, imprisonment, and/or compensation	Warning, or erasure of name (penal erasure)
Appeal	To a higher court	To State and Central Governments

Examples of professional negligence

- ▶ **Retained instrument:** a swab or instrument left inside the abdomen after surgery — a classic *res ipsa loquitur* case.
- ▶ **Failure to examine:** not using a stethoscope on an injured patient later found at autopsy with fractured ribs and lung congestion (*Wood vs Charing Cross Hospital*).
- ▶ **Failure to diagnose:** missing a scaphoid, femoral neck, skull, or cervical spine fracture.
- ▶ **Failure to act:** missing an intracranial haemorrhage, or ignoring an abnormal lab report.
- ▶ **Therapeutic misadventure — transfusion:** giving an incompatible blood transfusion.
- ▶ **Therapeutic misadventure — drug error:** injecting the wrong drug, causing tissue necrosis.
- ▶ **Therapeutic misadventure — sterilisation:** a failed tubal ligation resulting in an unwanted pregnancy.
- ▶ **Anaesthetic negligence:** asphyxia from an exhausted oxygen supply, or anaesthesia given by an unqualified person.

Examples of infamous conduct — the "6 A's"

- ▶ **Adultery:** improper sexual conduct arising out of the doctor–patient relationship.
- ▶ **Advertising:** an oversized signboard, or soliciting practice through the lay press.
- ▶ **Abortion:** performing or enabling an unlawful abortion.
- ▶ **Association:** covering for an unqualified practitioner, or employing touts to procure patients.
- ▶ **Addiction:** being addicted to drugs, or supplying addictive drugs (e.g., pethidine) to addicts.
- ▶ **Alcohol:** seeing patients or practising under the influence of alcohol.

Other infamous conduct includes:

- ▶ Dichotomy (fee-splitting for referrals).
- ▶ Issuing a false or misleading medical certificate.
- ▶ Breach of professional secrecy.
- ▶ Refusing emergency care.
- ▶ Conviction for an offence involving moral turpitude.

Overlap and the "4 D's"

- ▶ Some acts are **both** a crime and infamous conduct.
- ▶ A false medical certificate is a crime and an ethical violation at once.
- ▶ Demanding sexual favours for treatment can be a crime and infamous conduct together.
- ▶ In such cases, the court and the Council act simultaneously and independently.

- ▶ **The 4 D's of civil negligence** (all must coexist to claim compensation):
 - **Duty:** the doctor owed a duty of care to the patient.
 - **Dereliction:** that duty was breached.
 - **Damage:** the patient suffered harm.
 - **Direct causation:** the harm flowed directly from the breach (the proximate cause).
- ▶ For **criminal negligence**, not all 4 D's are required — but the act must be **gross**.
- ▶ **Penal erasure** — removing the doctor's name from the medical register, temporarily or permanently — is the main punishment for infamous conduct.
- ▶ It is called the "**professional death sentence**" because it strips all professional privileges.
- ▶ Ordinary negligence is punished by the courts, not by penal erasure, though the Council may still act if the same act also amounts to misconduct.

Medico-legal significance

- ▶ **Section 106 BNS 2023 (formerly Section 304A IPC 1860)** punishes death caused by a rash or negligent act — up to **5 years** for the general public, but only up to **2 years** for an RMP acting during a medical procedure.
- ▶ **Section 125 BNS 2023 (formerly Sections 336/337/338 IPC 1860)** punishes a rash or negligent act that endangers life, even without death.
- ▶ The misconduct list comes from the **Indian Medical Council (Professional Conduct, Etiquette and Ethics) Regulations, 2002**, with erasure ordered under **Regulation 8.2**.
- ▶ ***Res ipsa loquitur*** ("the thing speaks for itself") shifts the burden of proof onto the doctor — used when the injury could not normally occur without negligence and the doctor had exclusive control (e.g., a retained surgical swab).
- ▶ **Preventing negligence:** take informed written consent, keep accurate legible records, confirm diagnosis with investigations, and never examine a female patient without a chaperone.
- ▶ **Preventing infamous conduct:** follow the Code of Medical Ethics strictly — no advertising, no dichotomy, no covering for quacks, no false certificates.
- ▶ **Doctor's protection:** an error of judgement alone is not negligence, and criminal negligence must be gross before prosecution.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Two-column flowchart** contrasting the two pathways.
- ▶ Left column, headed "**PROFESSIONAL NEGLIGENCE**": Breach of duty of care → Damage to patient → Tried by Court → Standard of proof (>50% civil / beyond reasonable doubt criminal) → Punishment (compensation/fine/imprisonment) → Appeal to higher Court.
- ▶ Right column, headed "**INFAMOUS CONDUCT**": Breach of Code of Medical Ethics → Duty and damage not required → Tried by State Medical Council → Enquiry by peers → Punishment (warning/penal erasure) → Appeal to State and Central Government.
- ▶ A central box bridging both columns, labelled "**OVERLAP — e.g., false medical certificate, sexual misconduct.**"
- ▶ A second, simpler **Venn diagram**: one circle "Acts tried by Courts," one circle "Acts tried by Council," intersection labelled "criminal acts that are also infamous conduct."



Consent in Medical Practice

Asked in: Paper III Apr 2025 · Paper III Oct 2018 (2×) — RGUHS MD Forensic Medicine

Definition and introduction

- ▶ **Consent** means voluntary agreement, compliance or permission.
- ▶ It signifies that a person accepts the consequences of an act being done to them.
- ▶ Under the **Indian Contract Act 1872, Section 13**, two persons consent when they "agree upon the same thing in the same sense."
- ▶ Almost every examination, procedure, treatment or operation needs the patient's consent.
- ▶ Touching or treating a competent patient without consent is **criminal force/assault**, and also the civil wrong of **trespass to the person**.
- ▶ Consent is the practical expression of **patient autonomy** — the patient's right to self-determination.

Essentials of a legally valid consent

- ▶ **Free and voluntary**: no coercion, undue influence, threat, fraud or misrepresentation.
- ▶ **Informed and intelligent**: the patient understands what the act is for and its risks.
- ▶ **Clear**: expressed in unambiguous words.
- ▶ **Direct and personal**: given by the patient to the doctor, with no intermediary.
- ▶ **By a competent person**: correct age, sound mind, not under alcohol or drugs.
- ▶ **Specific**: written consent covers one named procedure, never a "blanket" permission.

Types of consent

Type	Meaning
Implied	Patient's conduct shows consent (attending OPD, holding out the arm) — valid only for routine examination .
Express — oral	Stated verbally, ideally before a disinterested third party (e.g. a nurse).
Express — written	Needed for anything beyond routine examination — operation, biopsy, lumbar puncture, transfusion; must be witnessed.
Informed	Given after full disclosure of the facts (see below).
Uninformed	Information withheld — illegal unless it is genuine therapeutic privilege.
Proxy (surrogate)	Given by a relative or guardian when the patient cannot consent (child under 12, unsound mind, intoxicated, unconscious).
Loco parentis	In a child emergency, a person in charge (teacher, warden) consents when parents are unavailable.
Blanket	"I authorise any procedure" — invalid , because it does not name the operation.

Informed consent

- ▶ Informed consent needs the patient to understand seven things: the nature of the condition, the proposed treatment, its likely success, the alternatives, the risks/benefits of each option, the risk of refusing treatment, and any risk specific to that patient.
- ▶ **Five components must all be present:**
 - **Disclosure:** all material facts — the disease, options, risks, benefits, anaesthesia hazards, and consequence of refusal.
 - **Comprehension:** explained in the patient's own language, with an interpreter if needed.
 - **Voluntariness:** no pressure from the doctor, staff or relatives.
 - **Competence:** of consenting age, mentally sound, not intoxicated.
 - **Actual consent:** reduced to writing, signed by the patient, and witnessed (ideally by two independent witnesses).
- ▶ **Prudent-patient rule:** disclosure is adequate if a reasonable person in the patient's position would have wanted to know that risk.
- ▶ **Informed refusal:** the doctor must explain the consequences of refusing treatment; a competent patient may still refuse, and the refusal is recorded in writing (e.g. discharge against medical advice).
- ▶ **Paternalism** is the abuse of medical knowledge to withhold information and override the patient's autonomy — it is never acceptable.

- ▶ **Extension doctrine:** if an unexpected life-threatening condition is found during a consented operation, the surgeon may extend the operation without fresh consent; this does not apply to non-essential procedures.

Exceptions — treatment lawful without full consent

- ▶ **Emergency:** an unconscious, incompetent or intoxicated patient may be treated on implied consent (Section 30 BNS 2023 / Section 92 IPC 1860).
- ▶ **Therapeutic privilege:** remote or theoretical risks may be withheld from a psychotic or severely anxious patient who would be harmed by knowing them; the doctor records the reason.
- ▶ **Waiver:** the patient expressly hands the decision to the doctor or a relative; this must be recorded.
- ▶ **Statutory compulsion:** public-health measures such as compulsory vaccination, where the law itself substitutes for consent.
- ▶ **Examination of an accused:** a registered medical practitioner may examine an accused person, using reasonable force, on the request of a police officer of sub-inspector rank or above (Section 51 BNSS 2023 / Section 53 CrPC 1973); this covers blood, semen, swabs, hair and DNA profiling.

Age, sex, mental illness and intoxication

- ▶ **Age of consent:** 12 years for a general or medico-legal examination; 18 years for surgery or any procedure that could cause harm, since a minor cannot enter a valid contract.
- ▶ **Sex:** a female patient is examined only by, or under the supervision of, a female practitioner; rape, pregnancy, delivery and abortion examinations need her own written consent; sterilization needs consent of both spouses.
- ▶ **Mental illness:** consent from a person who cannot understand the nature and consequence of the act, due to unsoundness of mind, is invalid.
- ▶ **Intoxication:** blood, urine or breath samples need written consent; if the person becomes unconscious, treatment can proceed with a guardian's consent, or on a police request.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Flow chart "Is consent valid?"** Patient → age (≥ 12 for examination / ≥ 18 for surgery) → sound mind? → not intoxicated? → free and voluntary? → informed? → written and witnessed? → **VALID** or **INVALID**. Side branch for patients who cannot consent (child under 12, unsound mind, unconscious, intoxicated) leading to proxy consent, loco parentis, or the emergency exception.
- ▶ **Box of the five components of informed consent:** Disclosure, Comprehension, Voluntariness, Competence, Actual (written, witnessed) consent.

Medico-legal significance

- ▶ Documented informed consent is the doctor's main defence against **criminal force/assault** (Section 129/131 BNS 2023 / Section 350/351 IPC 1860) and civil claims of **negligence and trespass**.

- ▶ A surgeon who operates in **good faith** for the patient's benefit is not liable even if the patient dies, provided consent and good faith are shown (**Section 26 BNS 2023 / Section 88 IPC 1860**).
- ▶ Consent is **not a defence** to professional negligence, or to an illegal act such as criminal abortion; blanket consent has no legal value.
- ▶ Consent given under fear, misconception, unsoundness of mind, intoxication, or by a child under 12 is **invalid** (**Section 28 BNS 2023 / Section 90 IPC 1860**).
- ▶ **Confidentiality**: a patient's information, living or dead, cannot be shared with a third party without consent (or, after death, the next of kin's consent).
- ▶ **Autopsy and organs**: a pathological autopsy or organ removal for transplant needs the guardian's or legal heirs' consent; a medico-legal autopsy ordered under **Section 194 BNSS 2023 / Section 174 CrPC 1973** needs no relative's consent.
- ▶ **Living will / passive euthanasia** must rest on informed consent by a sound adult — recognised as part of the right to die with dignity under Article 21 (*Common Cause* judgment).
- ▶ **Case law**: *Moss v. Rishworth* — no emergency existed, so parental consent was essential; *Jackovach v. Yocum* — emergency implied consent justified an amputation; *Drummond's Case* — covertly giving a sedative in food amounted to assault.



Discuss important sections of law in relation to poisons and drugs

Asked in: Paper III Jun 2024 — RGUHS MD Forensic Medicine

- ▶ **Poison law has two limbs**: regulatory statutes that control the legal handling of poisons and drugs, and penal sections that punish their criminal misuse.
- ▶ Since 1 July 2024 the criminal codes have changed: IPC → BNS 2023, CrPC → BNSS 2023, IEA → BSA 2023.

Regulatory (control) statutes

These Acts keep poisons and drugs out of the wrong hands by regulating import, manufacture, sale and possession.

Statute	Year	Core purpose
Poisons Act	1919 (amended 1958)	Import, possession and sale of poisons; licensing of dealers.
Drugs and Cosmetics Act	1940	Import, manufacture, distribution and sale of drugs; quality, purity, strength.
Drugs and Cosmetics Rules	1945	Framed under the 1940 Act; Schedules A–Y; Central Drugs Laboratory, licensing, prescription register.

Statute	Year	Core purpose
Pharmacy Act	1948	Only a registered pharmacist may compound or dispense a prescription.
Drugs Control Act	1950	Sale, supply and distribution; cash memo for every sale; price control.
Drugs and Magic Remedies Act	1954	Bans objectionable advertisements (abortion, contraception, potency, venereal disease).
Insecticides Act	1968	Import, manufacture, sale, transport and use of pesticides — the commonest poisons in India.
NDPS Act	1985	Consolidates the law on narcotic and psychotropic drugs; repealed the Opium Acts 1857/1878 and the Dangerous Drugs Act 1930.

Drugs and Cosmetics Rules 1945 — key Schedules:

- ▶ **Schedule C** — biological and special products.
- ▶ **Schedule E(1)** — poisonous substances used in Ayurvedic, Siddha and Unani medicine.
- ▶ **Schedule F** — vaccines, antisera and diagnostic antigens.
- ▶ **Schedule G** — about 65 drugs that must carry a "Caution: dangerous except under medical supervision" label.
- ▶ **Schedule H** — prescription-only drugs, labelled **Rx**; if the drug also falls under NDPS, it is labelled **NRx in red**.
- ▶ **Schedule J** — diseases (cancer, cataract, AIDS) for which no drug may be advertised as a cure.
- ▶ **Schedule X** — sedatives and hypnotics needing stricter control.
- ▶ **Schedule Y** — requirements for clinical trials and import of new drugs.
- ▶ Schedule G and H packs carry a red vertical line on the label; Schedule H and X sales must be entered in a **prescription register**.

The NDPS Act 1985 in detail

- ▶ **Narcotic drug:** coca leaf, cannabis (charas and ganja), opium, poppy straw, and all manufactured drugs.
- ▶ **Psychotropic substance:** any natural or synthetic substance listed in the Act's Schedule — over 110 substances, including LSD, THC, amphetamine and benzodiazepines.
- ▶ **Cultivation** of poppy, cannabis and coca is banned except under licence (**Section 8**).
- ▶ Opium is legally grown only in notified areas of Rajasthan, Uttar Pradesh and Madhya Pradesh, during the "opium year" (1 October–30 September).
- ▶ **Quantity ladder decides punishment** — small, intermediate, or commercial quantity:
 - **Cocaine:** 2 g small / 100 g commercial.

- **Heroin:** 5 g small / 250 g commercial.
- **Opium:** 25 g small / 2.5 kg commercial.
- **Charas:** 100 g small / 1 kg commercial.
- **Ganja:** 1 kg small / 20 kg commercial.
- ▶ **Punishment bands (Sections 19–32):** small quantity — up to 6 months or fine ₹10,000; intermediate — up to 10 years plus fine up to ₹1 lakh; commercial — 10–20 years plus fine ₹1–2 lakh.
- ▶ **Consumption (Section 27):** cocaine, morphine or heroin — up to 1 year and/or fine ₹20,000; other drugs — up to 6 months and/or fine ₹10,000.
- ▶ **Death penalty (Section 31A):** for large commercial-quantity offences (embezzlement by a cultivator, external dealing, financing illicit traffic) after a previous conviction.
- ▶ **The Prevention of Illicit Traffic in NDPS Act, 1988** allows preventive detention of suspected traffickers.

Penal sections for poisoning offences

- ▶ **S.118 BNS 2023 (S.324/326 IPC):** voluntarily causing hurt or grievous hurt by dangerous weapons or means, including poison.
- ▶ **S.123 BNS 2023 (S.328 IPC):** causing hurt by poison, or any stupefying/unwholesome drug, with intent to commit an offence — up to **10 years plus fine**. Covers drug-facilitated robbery and sexual assault.
- ▶ **S.274 BNS 2023 (S.272 IPC):** adulteration of food or drink meant for sale.
- ▶ **S.275 BNS 2023 (S.273 IPC):** sale of noxious food or drink.
- ▶ **S.276 BNS 2023 (S.274 IPC):** adulteration of drugs.
- ▶ **S.277 BNS 2023 (S.275 IPC):** sale of adulterated drugs.
- ▶ **S.278 BNS 2023 (S.276 IPC):** selling one drug labelled as a different drug.
- ▶ **S.286 BNS 2023 (S.284 IPC):** negligent conduct with a poisonous substance — up to 6 months or fine ₹5,000 or both.
- ▶ **Involuntary intoxication (S.23 BNS 2023 / S.85 IPC):** an act done while intoxicated without one's knowledge or against one's will, leaving the person incapable of judgment, is **not an offence**.
- ▶ **Voluntary intoxication (S.24 BNS 2023 / S.86 IPC):** knowledge is presumed, but intention is not.
- ▶ **Poisoning used to kill** is tried as culpable homicide (**S.100 BNS 2023 / S.299 IPC**) or murder (**S.101 BNS 2023 / S.300 IPC**), punished under **S.103 BNS 2023 (S.302 IPC)** — deliberate administration of poison itself proves the intent required.

Medico-legal significance

- ▶ Every suspected poisoning must be **reported to the police**; the treating doctor cannot decide whether the death is homicidal, suicidal or accidental.
- ▶ Reporting a cognizable offence is a duty under **S.33 BNSS 2023 (S.39 CrPC)**.

- ▶ The doctor must answer the investigating officer's questions under S.195 BNSS 2023, and answer truly at inquest under S.194 BNSS 2023.
- ▶ **Defaults are punishable:** failing to inform (S.211 BNS 2023), giving false information (S.212 BNS 2023), fabricating evidence (S.229 BNS 2023), screening an offender (S.238 BNS 2023), or omitting to report an offence (S.239 BNS 2023).
- ▶ An arrested accused may be examined without consent, where it may yield evidence, under S.51 BNSS 2023 (S.53 CrPC); reasonable force is permitted.
- ▶ Each poison should be kept in its own labelled bottle, in a separate cupboard or shelf.
- ▶ In every poisoning case, treat the patient immediately and also help the police work out how the poisoning occurred.
- ▶ **Evidence handling:** collect, seal and send viscera, vomitus, blood, urine and any container to the Forensic Science Laboratory through the investigating officer.
- ▶ Preserve medico-legal records for about **10 years**, or until the case is disposed in court.
- ▶ Report **food poisoning** to public-health authorities.
- ▶ The **National Poisons Information Centre**, AIIMS New Delhi (established 1995), gives round-the-clock telephone advice.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Flowchart** — "Law on poisons & drugs": a top box branches into two columns.
- ▶ **Column 1 — Regulatory statutes:** Poisons Act 1919 → Drugs & Cosmetics Act 1940 + Rules 1945 (Schedules C/E1/F/G/H/J/X/Y) → Pharmacy Act 1948 → Drugs Control Act 1950 → Drugs & Magic Remedies Act 1954 → Insecticides Act 1968 → **NDPS Act 1985**.
- ▶ **Column 2 — Penal sections:** S.123 (poison with intent) → S.274–278 (adulteration/sale) → S.286 (negligent conduct) → S.101/103 (murder by poison) → S.23/24 (intoxication).
- ▶ **Label box** — **NDPS quantity ladder:** three rungs, Small → Intermediate → Commercial, each with its punishment band and the cocaine/heroin/opium/charas/ganja cut-offs.



Discuss Indian Medical Council (Professional Conduct, Etiquette and ethics) Regulation 2002

Asked in: Paper III Apr 2020 — RGUHS MD Forensic Medicine

- ▶ The IMC (Professional Conduct, Etiquette and Ethics) Regulations, 2002 — the statutory Code of Medical Ethics for doctors in India.
- ▶ Framed by the Medical Council of India (MCI) under Section 33 of the Indian Medical Council Act, 1956.
- ▶ Lists RMP duties, defines **professional misconduct** (also *infamous conduct*), and lays down the disciplinary machinery for erring doctors.
- ▶ **Currency:** the MCI was dissolved in 2020, replaced by the **National Medical Commission (NMC)**; its **Ethics and Medical Registration Board (EMRB)** now regulates conduct.

- ▶ Succeeded by the **NMC RMP (Professional Conduct) Regulations, 2023**, but the exam substance (6 A's, warning notice, penal erasure) carries forward almost unchanged.

Statutory basis and structure

- ▶ Framed under **Section 33, Indian Medical Council Act 1956**, with Central Government sanction, notified in the Gazette of India, 2002.
- ▶ **Professional Conduct**: the standard of behaviour an RMP owes to patients.
- ▶ **Etiquette**: courtesy among members of the same profession — e.g. returning a patient to the referring doctor.
- ▶ **Ethics**: the moral principles of practice — autonomy, beneficence, non-maleficence, justice, confidentiality.
- ▶ The Code opens with the **declaration (oath)** at registration; later chapters cover duties to patients, to colleagues, and to the public.
- ▶ Misconduct lists sit in **Chapters 6 and 7**; penal action falls under **Chapter 8**.

Duties of a Registered Medical Practitioner

- ▶ **Care and competence**: reasonable skill and knowledge once a patient is accepted; no cure is ever guaranteed.
- ▶ Must attend the patient as long as needed, and may withdraw only after notice or a valid reason.
 - Valid reasons: own illness, patient malingering, instructions ignored, or unpaid dues — none apply in an emergency.
- ▶ **Prescribing**: legible, with the **registration number**, dosage and timing, and a warning of adverse reactions.
- ▶ **Informed consent**: disclose **material risks** that would sway a reasonable patient's decision.
- ▶ **Duty to warn**: warn the patient, family, employer or authorities if a condition or drug may endanger others (e.g. an epileptic who drives).
- ▶ **Confidentiality**: keep secret all learnt professionally; the patient may sue if disclosure causes harm and is not in the public interest.
 - Ethical to disclose if the patient consents, or if there is a real, imminent threat of harm the breach can remove.
- ▶ **Records**: true certificates only; notify births, deaths and communicable diseases to public-health authorities.
- ▶ **Research**: drug trials must follow **ICMR guidelines**; IVF or artificial insemination needs written consent of the woman, her spouse, and the donor.

Professional misconduct (infamous conduct)

- ▶ **Definition**: conduct of an RMP that professional men of good repute would call disgraceful or dishonourable — an **abuse of professional position**.
- ▶ Listed in **Chapters 6 and 7**; the list is **not exhaustive** — each case is judged on its own facts.
- ▶ **Dishonesty**: false or misleading certificates/reports, or conviction for an offence involving **moral turpitude**.

- ▶ **Advertising:** large signboards, touting through agents, soliciting via the lay press, publicly displaying fees, or publishing patient photographs without consent.
- ▶ **Association with the unqualified:** "covering" — helping an unqualified person treat or operate, or certifying a non-medical person's efficiency.
- ▶ **Commercial impropriety: dichotomy** — fee-splitting for a referral — plus gifts/travel from pharma companies, or an open shop for medicines.
- ▶ **Statutory contraventions:** breaching the Drugs and Cosmetics Act, prescribing steroids or psychotropics without indication, enabling **illegal abortion**, or violating PCPNDT norms.
- ▶ **Personal failures:** unsterile instruments, breach of confidentiality, refusing treatment on religious grounds, or not displaying the registration number.

The "6 A's" of serious professional misconduct (high-yield mnemonic):

- ▶ **Adultery** — arising out of the professional relationship.
- ▶ **Advertising** — self-advertisement, large signboards, touts.
- ▶ **Abortion** — unlawful, including sex-selective abortion.
- ▶ **Association** — with unqualified persons (covering, employing touts).
- ▶ **Addiction** — to drugs, or supplying drugs of addiction (e.g. pethidine) to addicts.
- ▶ **Alcohol** — consumption at the workplace, or treating patients while intoxicated.

Disciplinary machinery, warning notice and penal erasure

- ▶ **Warning Notice:** a Council-issued list of serious misconduct acts — a guide, not an exhaustive code.
- ▶ **Who acts:** the **State Medical Council (SMC)** runs day-to-day discipline; the apex body (formerly MCI, now NMC's EMRB) hears appeals.
- ▶ Enquiry begins on court conviction, complaint, or *suo moto*; Registrar → President → Penal & Ethical sub-committee.
- ▶ If a *prima facie* case exists, a notice of charge issues; both parties are heard and evidence taken.
- ▶ One vote decides guilt, a second decides the penalty.
- ▶ The Council has the powers of a Civil Court under the **CPC, 1908**; enquiries are **judicial proceedings** under **Sections 229, 257 and 267, BNS 2023**.
- ▶ **Penal erasure** ("the professional death sentence"): name removed, temporarily or permanently, under **Chapter 8**.
- ▶ Permanent removal ends all practice privileges for life; the name may later be **restored**.
- ▶ **Appeal:** to the **Central Government** within 30 days, or to the apex Council, whose decision is final.

Professional negligence versus infamous conduct

Trait	Professional negligence	Infamous (professional) conduct
Offence	Absence of proper care and skill, or willful negligence	Violation of the Code of Medical Ethics

Trait	Professional negligence	Infamous (professional) conduct
Duty of care	Should be present	Need not be present
Damage to person	Should be present	Need not be present
Trial by	Courts — civil or criminal	State Medical Council
Punishment	Fine or imprisonment	Erasure of name or warning
Appeal	To higher Court	To State and Central Governments

Medico-legal significance

- ▶ The 2002 Code is the **benchmark of conduct** in State Medical Council enquiries — distinct from civil or criminal negligence, tried in court (see table).
- ▶ A false medico-legal certificate, report or post-mortem opinion is both **ethical misconduct** (penal erasure) and a crime under **Section 197 IPC 1860 (now Section 234 BNS 2023)**, read with **Section 193 IPC 1860 (now Section 229 BNS 2023)**.
- ▶ The expert-witness role in court flows from **Section 45 of the Indian Evidence Act 1872 (now Section 39 of the Bharatiya Sakshya Adhiniyam, BSA 2023)**.
- ▶ Perjury or a fabricated opinion attracts **Sections 191/192 IPC 1860 (now Sections 227/228 BNS 2023)**.
- ▶ **Confidentiality** may be breached with the patient's consent, or to remove a real, imminent threat of harm — covering a notifiable disease, an unfit driver, or a suspected crime.
- ▶ The public's own duty to inform police of certain offences sits in **Section 39 CrPC 1973 (now Section 33 BNSS 2023)**.
- ▶ Breach can also mean **Consumer Protection Act, 2019** liability; a negligent death under a doctor's care attracts **Section 304A IPC 1860 (now Section 106 BNS 2023)**.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Flowchart** — "Disciplinary control over an RMP under the IMC Regulations 2002."
 - Trigger (court conviction / complaint / *suo moto*) → Registrar → President → Penal & Ethical Sub-committee → "Prima facie case?"
 - No → case dropped. Yes → Notice of charge → Hearing (both parties + evidence) → Vote 1: Guilty? → Vote 2: Penalty.
 - → Warning notice, or Penal erasure (temporary/permanent) → Publication in press → Appeal to Central Government / restoration.
- ▶ **Box diagram** — "The 6 A's." Six labelled cells: Adultery, Advertising, Abortion, Association, Addiction, Alcohol.

♦ ♦ ♦

Discuss infamous conduct with examples

Asked in: Paper III Apr 2025 — RGUHS MD Forensic Medicine

Definition and concept

- ▶ **Infamous conduct** (also called **serious professional misconduct**, **ethical negligence**, or **ethical malpraxis**) is conduct by a registered medical practitioner (RMP) that fellow doctors of good repute would call **disgraceful or dishonourable**.
- ▶ It is an **abuse of the professional position**.
- ▶ The standard is set by the **profession**, not by the patient or the public.
- ▶ It is an **ethical wrong**, tried by the **National Medical Commission (NMC)** / **State Medical Council (SMC)**.
- ▶ This makes it different from **professional negligence**, which is a **legal wrong** tried by the courts.
- ▶ **Pure infamous conduct** covers acts with **no punishment under penal law** — for example fee-splitting, an oversized signboard, or employing touts.
- ▶ Many listed acts are **both** a crime **and** infamous conduct (a false certificate, an illegal abortion) — the same act can trigger both a court case and Council proceedings.
- ▶ Governed by the **National Medical Commission Registered Medical Practitioner (Professional Conduct) Regulations 2023**, under the **NMC Act 2019** (earlier the **Indian Medical Council (Professional Conduct, Etiquette and Ethics) Regulations 2002**).
- ▶ The list of misconducts is **illustrative, not exhaustive** — an unlisted act can still be held infamous on its own facts.

The "6 A's" — commonly cited infamous conducts

"A"	Misconduct	Example
Adultery	Improper sexual relationship arising from the doctor–patient bond	Sexual intimacy with a patient, exploiting professional access
Advertising	Self-promotion for practice	Oversized signboard; soliciting patients through press interviews
Abortion	Performing or enabling an unlawful abortion	Prenatal sex determination followed by induced abortion
Association	Associating with unqualified persons	Employing touts; lending one's name to a quack ("covering")
Addiction	Addiction to narcotic drugs, or supplying them to addicts	Doctor supplying pethidine to an addict
Alcohol	Drinking at the workplace, or seeing patients while intoxicated	Examining or operating while drunk

Other examples of infamous conduct

- ▶ **Issuing a false or misleading certificate** (sickness benefit, insurance, court attendance) — also a criminal offence.

- ▶ **Dichotomy / fee-splitting** — giving or taking commission for referring a patient, or accepting gifts from chemists and drug companies.
- ▶ **Contravening the Drugs and Cosmetics Act** — for example prescribing steroids without indication, or selling Schedule H/L drugs to the public.
- ▶ **Improper signboard** — displaying one where the doctor neither lives nor practises.
- ▶ **Breach of professional secrecy** — disclosing a patient's confidences without legal justification, including publishing an identifiable patient photograph without consent.
- ▶ **Disparaging colleagues, or refusing treatment on religious grounds.**
- ▶ **Abandoning a patient** already under treatment, or being slow to respond in an emergency.
- ▶ **Performing IVF or artificial insemination without written consent** of the patient, her spouse, and the donor.
- ▶ **Claiming to be a specialist** without the qualification, or **not displaying the registration number.**

Disciplinary process and penal erasure

- ▶ Proceedings start on (1) **conviction for a cognizable offence**, (2) a **complaint**, or (3) **suo moto** action by the Council.
- ▶ The complaint goes to the President, then to the Executive/Disciplinary Committee.
- ▶ If a **prima facie** case exists, a **notice of charge** is served.
- ▶ A **hearing** is held with both sides present, evidence is taken, and the Committee decides guilt and then penalty.
- ▶ **Warning notice:** the Council may issue a forewarning describing acts that amount to misconduct — this is not itself a penalty.
- ▶ **Penal erasure:** removal of the doctor's name from the Medical Register, **temporary or permanent.**
- ▶ Permanent erasure is called the "**Professional Death Sentence**" — the doctor loses all privileges of registration and cannot practise.
- ▶ Erasure is **widely published** in the press and association journals.
- ▶ **Restoration:** the Council can reinstate a name that was temporarily removed once the period ends.
- ▶ Example of **temporary erasure:** *John Bodkin Adams* (UK) — struck off in 1957 for prescription fraud and falsifying records, reinstated in 1961.
- ▶ Example of **permanent erasure:** *Andrew Wakefield* — struck off in 2010 for fraudulent research falsely linking the MMR vaccine to autism.

Infamous conduct vs professional negligence

- ▶ **Nature:** negligence is absence of proper care and skill; infamous conduct is a **violation of the Code of Medical Ethics.**
- ▶ **Duty of care:** must be present in negligence; **not necessary** in infamous conduct.
- ▶ **Damage to the patient:** must be present in negligence; **not necessary** in infamous conduct.
- ▶ **Tried by:** negligence goes to the **courts**; infamous conduct goes to the **State Medical Council.**

- ▶ **Punishment:** negligence draws **fine or imprisonment**; infamous conduct draws **erasure or warning**.
- ▶ **Appeal:** from a court, to a higher court; from a Council decision, to the **State and Central Governments**.

Medico-legal significance

- ▶ Infamous conduct marks the **boundary between law and ethics** — the same act can be tried **both** in court **and** by the Council.
- ▶ Causing death by a rash or negligent act is punishable under **Section 304A IPC 1860 (now Section 106 BNS 2023)**; an RMP acting **during a medical procedure** faces a maximum of **2 years**, versus **5 years** for the general public.
- ▶ Issuing or signing a **false certificate** is punishable under **Section 197 IPC 1860 (now Section 234 BNS 2023)**, carrying the same punishment as giving false evidence under **Section 193 IPC 1860 (now Section 229 BNS 2023)** — up to **7 years' imprisonment and a fine up to Rs 10,000**.
- ▶ A doctor who **consumes alcohol on duty** and causes a patient's death commits **both** infamous conduct (NMC ethics) **and** a punishable act under **Section 304A IPC 1860 (now Section 106 BNS 2023)**.
- ▶ The SMC/NMC acts as a **domestic (professional) tribunal**; its erasure orders are appealable to the **State and Central Governments**.
- ▶ For a forensic physician, careful documentation, truthful certification, valid consent, and guarding professional secrecy protect against both erasure and litigation.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Flow-chart — "Infamous conduct → Disciplinary control":** *Complaint / Conviction / Suo moto → Registrar → President → Executive Committee → Prima facie case? → Notice of charge → Hearing (both parties) → Evidence + decision → Warning OR Penal erasure (Temporary / Permanent = "Professional Death Sentence") → Restoration of name.*
- ▶ **Two-column box — "Negligence vs Infamous conduct":** Legal wrong / Court / Duty + damage essential / Fine or imprisonment — versus — Ethical wrong / State Medical Council / Duty + damage not essential / Erasure or warning.

High-yield exam pointers

- ▶ Infamous conduct = serious professional misconduct = an act **disgraceful/dishonourable** to fellow professionals = abuse of professional position.
- ▶ Tried by **SMC/NMC**, not the court; synonyms — ethical negligence, ethical malpraxis.
- ▶ **6 A's:** Adultery, Advertising, Abortion (unlawful), Association with unqualified persons, Addiction, Alcohol.
- ▶ Penalty = **penal erasure** (temporary/permanent); permanent = **"Professional Death Sentence."**
- ▶ The list is **illustrative, not exhaustive** — based on **NMC RMP (Professional Conduct) Regulations 2023**.
- ▶ **Warning notice** = forewarning of misconduct, not a penalty by itself.

- ▶ In negligence, **duty + damage are essential**; in infamous conduct they are **not**.
- ▶ Quote as examples: **false certificate, fee-splitting, touts, oversized signboard, breach of secrecy**; case law — **John Bodkin Adams** (temporary erasure), **Andrew Wakefield** (permanent erasure).



Discuss medical negligence and illustrate legal concept of negligence in medical practice

Asked in: Paper III Oct 2018 — RGUHS MD Forensic Medicine

Definition

- ▶ **Professional (medical) negligence / malpraxis**: absence of reasonable care and skill, or wilful negligence, by a registered doctor causing bodily injury or death.
- ▶ Simply: doing what a prudent doctor would not do (an act of **commission**), or failing to do what a prudent doctor would do (an act of **omission**).
- ▶ Part of the **law of torts** — a civil wrong for which the patient can claim compensation.
- ▶ **Gross negligence** can also attract criminal liability.
- ▶ Judged against the **ordinary competent practitioner** (the *Bolam* standard), not the best or most expert doctor.

The four essential elements ("4 Ds")

All four must be proved for a civil claim to succeed; failure of even one defeats the claim.

- ▶ **Duty of care**: doctor–patient relationship exists once the doctor agrees to treat, or automatically in an **emergency** (treatment cannot then be refused).
- ▶ **Dereliction (breach) of duty**: the doctor departed from the accepted standard of care — by abandoning it, or by performing it unskilfully.
- ▶ **Damage**: real, foreseeable harm occurred — physical, psychological, financial, or death. No damage, no civil suit.
- ▶ **Direct causation**: an unbroken causal link (the "but-for" test) connects breach to damage; an unrelated intervening event breaks the chain.
- ▶ **Burden of proof (civil)**: the **patient** must prove all four Ds, on the **preponderance of evidence** (>50%).
- ▶ **Burden of proof (criminal)**: the burden shifts to the **State**, the standard is **beyond reasonable doubt** (~99%), and **gross negligence** with *mens rea* (guilty mind) must be shown.

Types of negligence

- ▶ **Civil negligence**: patient sues for **compensation** in a civil court or consumer forum; consent and contributory negligence are valid defences.
- ▶ **Criminal negligence**: the **State** prosecutes for **gross negligence** disregarding life/safety — fine and/or imprisonment. The same act can be tried in both civil and criminal courts, with different verdicts.

- ▶ **Contributory negligence:** both doctor and patient are at fault (e.g., patient hides symptoms). The **doctor** bears the burden of proof; courts reduce damages proportionately. Not a defence in criminal cases.
- ▶ **Composite negligence:** two or more doctors are jointly negligent, no fault of the patient; the patient can recover the full sum from any one.
- ▶ **Corporate negligence:** fault of the **hospital** itself — faulty equipment, no ICU oxygen, non-sterile theatre, incompetent staff retained.
- ▶ **Patient negligence:** fault of the patient alone (false history, refusing treatment, LAMA) — the doctor is not liable.
- ▶ **Ethical negligence (professional misconduct):** violates the Code of Medical Ethics; tried by the State Medical Council (not a court), punished by warning or erasure of name.

Civil vs criminal negligence

Trait	Civil	Criminal
Degree of negligence	Simple lack of care	Gross, disregard for life
Litigation	Patient v. doctor	State v. doctor
Tried by	Civil court / consumer forum	Criminal court
Standard of proof	Preponderance (>50%)	Beyond reasonable doubt (~99%)
Consent as defence	Yes	No
Contributory negligence	A defence	Not a defence
Punishment	Damages (compensation)	Imprisonment ± fine

Key legal doctrines

- ▶ *Res ipsa loquitur* ("the thing speaks for itself"): negligence is self-evident, so expert evidence is not needed. Three conditions:
 - The injury would not normally occur without negligence.
 - The doctor had exclusive control over the treatment.
 - There was no contributory negligence by the patient.
 - Examples: swab left in the abdomen, wrong limb operated, mismatched transfusion.
- ▶ *Novus actus interveniens* ("a new intervening act"): an unforeseeable event breaks the chain of causation — a rare defence.
- ▶ **Calculated-risk doctrine:** no liability for an inherent, unavoidable risk of accepted treatment, if proven by expert evidence; the main exception to *res ipsa loquitur*.
- ▶ *Volenti non fit injuria* ("no injury to a willing person"): after proper informed consent, the doctor is not liable for a risk the patient knowingly accepted.
- ▶ **Vicarious liability** (*respondeat superior*): the employer answers for an employee's negligence within the scope of employment — the "**deep pockets**" doctrine.
- ▶ **Therapeutic misadventure:** a bad outcome from biological variation, unrelated to care quality — not negligence if proper precautions were taken.

Tests and landmark judgments

- ▶ *Bolam* test (1957): a doctor is not negligent if their conduct matches a responsible body of medical opinion — the *ordinary competent* practitioner. Adopted in India via *Jacob Mathew*.
- ▶ *Parmanand Katara* (1989): every injured person must get immediate emergency care; a doctor cannot refuse an emergency patient.
- ▶ *IMA v V.P. Shantha* (1995): medical services fall under the **Consumer Protection Act** — a fee-paying patient is a "consumer".
- ▶ *Suresh Gupta* (2004): criminal liability needs **gross** negligence; a mere error of judgment is only civil.
- ▶ *Jacob Mathew* (2005): the leading Indian case — criminal negligence must be "gross", with *mens rea*; laid down guidelines before prosecuting a doctor.
- ▶ *Martin D'Souza* (2009) and *V. Kishan Rao* (2010): expert opinion is useful but **not mandatory** in an obvious, *res ipsa loquitur* case.

Medico-legal significance

- ▶ Death by a rash/negligent act (not culpable homicide) — **Section 106 BNS 2023** (formerly §304A IPC): general public up to **5 years + fine**; a doctor during a procedure, up to **2 years + fine**.
- ▶ Endangering life, hurt, or grievous hurt by a negligent act — **Section 125 BNS 2023** (formerly §§336/337/338 IPC); a doctor can be liable even without death.
- ▶ Court-ordered **compensation to the victim** — **Section 395 BNSS 2023** (formerly §357 CrPC).
- ▶ **Res judicata** (§337 BNSS 2023): a negligence finding already decided cannot be re-litigated; only appeal lies.
- ▶ **Limitation**: a civil suit must be filed within **2 years** (3 years for breach of a specific contract).
- ▶ **Precautions that protect a doctor**:
 - Informed written consent before witnesses; complete records ("not recorded = not done").
 - Sensitivity tests before anaphylaxis-prone drugs; anti-tetanus cover for open wounds.
 - Chaperone for female patients; refer when facilities are inadequate.
 - Never abandon a patient.
- ▶ Autopsy after alleged negligence needs a **team of doctors**, preserved drug/IV-fluid samples, and review by an impartial expert.
- ▶ **Before criminal prosecution** (*Jacob Mathew* safeguards):
 - A private complaint needs a credible opinion from another doctor.
 - The investigating officer needs an independent, preferably government, medical opinion.
 - The doctor is not routinely arrested unless necessary.
- ▶ **Consumer Protection Act**: a fee-paying patient can approach the District/State/National Commission within 2 years; free service is exempt.
- ▶ **Defences available**: absence of any of the 4 Ds, error of judgment, calculated/inherent risk, contributory negligence, *volenti non fit injuria*, therapeutic misadventure, *novus actus interveniens*, *res judicata*, limitation, and medical indemnity insurance.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **The 4 Ds flowchart:** Duty of care → Dereliction (breach) → Damage → Direct causation → Negligence established → Liability.
 - Side branch from "Direct causation": *Novus actus interveniens* → chain broken → no liability.
- ▶ **Civil vs criminal pathway:** "Doctor treats patient → negligence occurs → injury" splits into two arms.
 - Minor injury → civil court/consumer forum → compensation.
 - Gross injury or death → police complaint → State prosecutes → criminal court → §125/§106 BNS → imprisonment ± fine.

**Discuss PND Act 1994**

Asked in: Paper III Oct 2018 — RGUHS MD Forensic Medicine

Definition

- ▶ The **Pre-conception and Pre-natal Diagnostic Techniques (Prohibition of Sex Selection) Act, 1994**, called the **PC-PNDT Act**, is India's central law against sex selection and pre-natal sex determination.
- ▶ It was originally the **Pre-natal Diagnostic Techniques (Regulation and Prevention of Misuse) Act, 1994**, renamed by the 2003 amendment.
- ▶ Its purpose is to stop **female foeticide** and reverse the falling child sex ratio.
- ▶ These tests were developed to detect fetal disorders, but misuse for sex-selective abortion led Parliament to step in.
- ▶ Genuine medical use is regulated; use for sex determination or selection is completely banned.
- ▶ The registered medical practitioner (RMP) who performs or interprets these tests carries direct criminal liability.

Aim and evolution

- ▶ **1994 (original Act):** regulated only **pre-natal** techniques, used after conception.
- ▶ **2003 amendment** (Act 14 of 2003, in force from 14 February 2003): renamed the Act to also cover **pre-conception** sex-selection technologies, such as sperm-separation methods, and added stricter punishments.
- ▶ **2012 Rules amendment:** tightened monitoring of ultrasound centres and sale of portable ultrasound machines.
- ▶ **Core aims:** ban sex selection before conception and sex determination after conception.
- ▶ Ban advertisement of such facilities.
- ▶ Permit the techniques only for genuine genetic, metabolic, chromosomal or congenital indications, never for sex.

- ▶ Register and regulate every genetic centre, clinic and laboratory, and punish anyone who breaches this.

Key definitions and the three regulated facilities

- ▶ **Pre-natal diagnostic techniques** [Section 2(j)] is the umbrella term for **procedures plus tests**.
- ▶ **Pre-natal diagnostic procedure** [Section 2(i)]: taking a sample — ultrasonography, foetoscopy, or removing amniotic fluid, chorionic villi, embryo, blood or other tissue — for a laboratory.
- ▶ **Pre-natal diagnostic test** [Section 2(k)]: analysing that sample for a genetic, metabolic or chromosomal disorder, a congenital anomaly, a haemoglobinopathy, or a sex-linked disease.
- ▶ **Ultrasonography is the only test that appears in both lists** — taking it is a procedure, reading it is a test.
- ▶ Three facilities must register with the **Appropriate Authority**:
 - **Genetic Counselling Centre (GCC)** — counselling only.
 - **Genetic Clinic (GC)** — conducts the procedures (this includes a vehicle carrying a sex-determining machine).
 - **Genetic Laboratory (GL)** — receives the samples and conducts the tests.
- ▶ **Fetal-stage definitions: conceptus** [Section 2(ba)] is any product of conception from fertilisation until birth.
 - **Embryo** [Section 2(bb)] is up to eight weeks (56 days).
 - **Fetus** [Section 2(bc)] is from day 57 until birth.

When permitted, and the prohibitions

- ▶ **Permitted indications** [Section 4(2)]:
 - Chromosomal abnormalities.
 - Genetic metabolic diseases.
 - Haemoglobinopathies, such as thalassaemia and sickle-cell disease.
 - Sex-linked genetic diseases.
 - Congenital anomalies.
 - Any other condition specified by the **Central Supervisory Board (CSB)**.
- ▶ **Pre-conditions** [Section 4(3)] — at least one must be present, recorded in writing:
 - Age over **35 years**.
 - Two or more spontaneous abortions or fetal loss.
 - Exposure to a teratogenic agent (drugs, radiation, infection, chemicals).
 - Family history of mental retardation or physical deformity (e.g. spasticity).
 - Any other CSB-specified condition.
- ▶ **Consent**: written informed consent of the woman is mandatory, with a copy given to her [Section 5(1)].
- ▶ The person performing the test must **never communicate the fetal sex**, by word, sign, or any other manner [Section 5(2)].

- ▶ **Section 3:** only a registered GCC, GC or GL may perform these techniques; no one may conduct them at an unregistered place.
- ▶ **Section 3A:** bans sex selection by anyone — including an infertility specialist or team — on a woman, man, or any tissue, embryo, conceptus, fluid or gamete.
- ▶ **Section 3B:** bans selling ultrasound or other sex-detecting equipment to an unregistered GCC, GC, GL or person.
- ▶ **Section 6:** absolutely prohibits determining fetal sex, and prohibits sex selection before or after conception.
- ▶ **Registration:** every GCC, GC and GL must register [Section 18]; violation can mean cancellation or suspension [Section 20], appealable within 30 days [Section 21].
- ▶ Every clinic must maintain **Form F** for each test or procedure, open to inspection.
- ▶ **Statutory bodies:** the **Central Supervisory Board** [Section 7] and State Boards [Section 16A] set policy.
- ▶ **Appropriate Authorities** [Section 17] (e.g. District Magistrate) grant, renew or cancel registration, and hold search-and-seizure powers [Section 30].

Offences and penalties

Offence	Section	Punishment
Advertisement of sex-selection/determination facilities	S.22	Up to 3 years + fine up to ₹10,000
Sex selection/determination by a professional or clinic — first conviction	S.23	Up to 3 years + fine up to ₹10,000
Same — subsequent conviction	S.23	Up to 5 years + fine up to ₹50,000
Removal from the State Medical Register	S.23	5 years for the first offence; permanent for a subsequent one
Person seeking/abetting sex selection — first offence	S.23	Up to 3 years + fine up to ₹50,000
Same — subsequent offence	S.23	Up to 5 years + fine up to ₹1,00,000
Residual contravention (no separate penalty specified)	S.25	Up to 3 months, or fine up to ₹1,000, or both; +₹500/day if it continues after conviction

- ▶ The **pregnant woman is presumed to have been compelled** by her husband or relatives [Section 24], so she is not punished [Section 23(4)] — the person who compelled her is.
- ▶ These offences are **cognizable, non-bailable and non-compoundable** [Section 27].

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Flowchart — lawful use of pre-natal diagnostic techniques:**
 - Box 1: *Pregnant woman.*
 - Box 2: *Permitted indication present?* (chromosomal / genetic-metabolic / haemoglobinopathy / sex-linked / congenital).
 - Box 3: *Section 4(3) pre-condition met?* (age over 35 / two or more fetal losses / teratogen exposure / family history).
 - Box 4: *Written consent taken, copy given to the woman.*
 - Box 5: *Test done at a registered Genetic Clinic/Laboratory, recorded in Form F.*
 - Box 6: *Disorder detected.*
 - Box 7: *Sex of fetus NOT disclosed* (Section 5(2) / Section 6).
 - Add a red side-branch: sex determination or selection is an **offence** under Section 3A/6/22/23, leading to removal from the Medical Register.
- ▶ **Box diagram — three registered facilities:** Genetic Counselling Centre (counselling), Genetic Clinic (procedures), Genetic Laboratory (tests) — each tagged "Register with Appropriate Authority."

Medico-legal significance

- ▶ An RMP who performs, interprets, communicates or aids sex determination is criminally liable under Section 23, and can be suspended or permanently removed from the State Medical Register — far stricter than ordinary negligence.
- ▶ Careful **Form F** records, a documented indication, written consent, and a valid registration certificate are the doctor's main defence.
- ▶ A deficiency or inaccuracy in the ultrasonography record is itself treated as a contravention of Section 5/6, unless proved otherwise.
- ▶ **Sting or decoy operations** — a decoy pregnant woman sent by the Appropriate Authority — are an accepted enforcement tool.
- ▶ Even a casual remark about fetal sex, overheard or recorded, can become evidence — as can the clinic records themselves.
- ▶ **PC-PNDT vs the MTP Act:** complementary but distinct laws.
- ▶ The **Medical Termination of Pregnancy (MTP) Act 1971** (amended 2021) permits lawful abortion on defined grounds; PC-PNDT instead prohibits the sex determination that drives sex-selective abortion.
- ▶ A sex-selective abortion therefore breaches PC-PNDT even if it otherwise looks MTP-compliant.
- ▶ **Feticide under the new criminal code:**
 - Voluntarily causing miscarriage was **Section 312 IPC 1860** (now **Section 88 BNS 2023**).
 - Causing it without the woman's consent was **Section 313 IPC** (now **Section 89 BNS 2023**).
 - An act done to prevent a child being born alive was **Section 315 IPC** (now **Section 91 BNS 2023**).

- Causing the death of a quick unborn child by an act amounting to culpable homicide was **Section 316 IPC (now Section 92 BNS 2023)**.
- Sex-selective female feticide can attract these charges in addition to the PC-PNDT Act.
- ▶ The RMP's expert evidence on the test and its records is admissible under **Section 45 Indian Evidence Act 1872 (now Section 39 Bharatiya Sakshya Adhiniyam 2023)**.



Discuss reasons for rising litigations against doctors

Asked in: Paper III Oct 2016 — RGUHS MD Forensic Medicine

Definition / Introduction

- ▶ **Litigation against a doctor** means a patient or relative takes legal action alleging **medical negligence**.
- ▶ This can be a civil suit for damages, a complaint before a consumer forum, or a criminal prosecution.
- ▶ **Medical negligence** is a breach of the doctor's duty to use a reasonable degree of skill, knowledge and care, causing harm.
- ▶ Such litigation has risen steeply in India over the last three decades.
- ▶ The public has become more law-conscious, and doctors are increasingly sued for acts of omission or commission.
- ▶ The reasons are multifactorial — partly the doctor, partly the patient, and partly wider social, economic and legal forces.
- ▶ The single biggest legal driver is that medical services were brought under the **Consumer Protection Act**.

Six-fold classification of causes

Classically grouped under six heads:

Group	Key reasons
Physician-related	Poor communication, rude behaviour, disregard for patient safety, complex invasive procedures
Patient-related	Unrealistic expectations of cure, poor compliance, growing awareness of rights , lack of consent or documentation
Media-related	Biased publicity of negligence suits and the size of awards
Attorney-related	Inexperienced lawyers, contingency-fee arrangements
Economic	Rising cost of care, bills paid through insurance
Social	Mobile population (loss of the family-doctor bond), assertion of consumer rights , general rise in litigation

- ▶ The most consistent thread is a broken **doctor–patient relationship**.
- ▶ Poor rapport after a bad outcome almost always leads to a suit; good rapport usually prevents one.
- ▶ Many of these causes are **not true negligence** — they arise from misunderstanding, unmet expectation, or media-driven distrust.

The Consumer Protection Act — why suing became easy

- ▶ The Consumer Protection Act, 1986 created a fast, cheap, three-tier grievance system — the District, State and National Consumer Disputes Redressal Commissions.
- ▶ Medical services were **not** originally included in the Act.
- ▶ The Supreme Court brought doctors under it in ***Indian Medical Association vs V.P. Shantha (1995)***.
- ▶ It held that a doctor's paid service is a "**contract for service**" (skilled, autonomous), not a "**contract of service**" (master–servant), so it counts as a "service" under the Act.
- ▶ **Why litigation rose**: the forum is quick, the fee is nominal, and a **lawyer is not required**.
- ▶ **Coverage**: any doctor or hospital that **charges** for treatment is covered, including a partly-charitable hospital that charges some patients while treating others free.
- ▶ **Exempt**: doctors or hospitals giving wholly free treatment, or charging only a token registration fee.
- ▶ **Limitation period**: a complaint must normally be filed within **two years** of the alleged negligence.
- ▶ The Consumer Protection Act, 2019 replaced the 1986 Act, kept the 2-year limitation, raised the pecuniary limits of each forum, and added product-liability and e-filing provisions.
- ▶ **Criticism**: the forum allows little independent expert testimony, so it may reach a wrong conclusion — encouraging many **frivolous complaints**.

Other liability heads that widen the net

- ▶ **Civil negligence** is a suit for damages based on **duty of care, breach of that duty, and resulting damage**.
- ▶ It is judged against the standard of an ordinarily competent practitioner.
- ▶ **Criminal negligence** requires *gross* negligence showing disregard for life and safety.
- ▶ It is prosecuted under **Section 106, Bharatiya Nyaya Sanhita (BNS) 2023** (formerly **Section 304A, Indian Penal Code 1860**).
- ▶ Section 106 BNS adds a special, lighter clause for doctors: imprisonment up to **2 years and fine** for death caused by a **registered medical practitioner** during a procedure.
- ▶ **Vicarious liability** (*respondeat superior* — "let the master answer") makes an employer liable for an employee's negligence, so the doctor, partners and the **hospital** can all be sued for one incident.
- ▶ **Corporate liability** covers a hospital's own duty of care — negligent credentialing (not verifying a doctor's qualifications), defective equipment or drugs, and retaining incompetent staff.
- ▶ Large, well-resourced ("deep-pocketed") hospitals are attractive litigation targets.

- ▶ **Product liability** lets manufacturers of faulty instruments, prostheses or drugs be sued, drawing the doctor into the same chain.
- ▶ Widespread **medical indemnity insurance** (covers a doctor's legal costs and damages) both reflects and feeds this climate.

Defensive medicine and the malpractice crisis

- ▶ **Defensive medicine** means ordering every test or scan, even if barely indicated, purely to guard against a future suit.
- ▶ Example: a CT or MRI scan for a routine headache, or barium studies for routine abdominal pain.
- ▶ It is legally protective but **ethically unjustified** — it denies most patients cost-effective care to guard against a small statistical risk.
- ▶ A doctor must not slip into "**defence by denial**" — refusing a patient by claiming they are "not mine" — which amounts to abandonment.
- ▶ The **malpractice crisis** is a self-feeding loop: litigation rises → larger compensation awards → higher insurance premiums (or refusal of cover) → more defensive medicine → higher costs → poorer access to care → and back to more litigation.
- ▶ The **United States** is the classic example; India is following the same path.
- ▶ **High-risk specialties**: orthopaedics, obstetrics, anaesthesia, neurosurgery, plastic surgery, and accident medicine.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Fish-bone (Ishikawa) diagram** — "Reasons for rising litigation against doctors."
- ▶ Central spine: *Rising litigation*.
- ▶ Six branches, each with its 2–3 key reasons: Physician-related, Patient-related, Media-related, Attorney-related, Economic, Social.
- ▶ **Vicious-cycle flow box** — "Medical malpractice crisis."
- ▶ Loop: Rising litigation → Large compensation awards → Higher insurance premiums → Defensive medicine → Rising patient cost → Reduced access to care → back to Rising litigation.

Medico-legal significance

- ▶ **Protective duties for the doctor**: take **informed written consent** and keep **complete, accurate, contemporaneous medical records**.
- ▶ A bad outcome with poor records is enough to create liability; tampered records invite large awards even without real negligence.
- ▶ Build good **rappport** with the patient, and do sensitivity testing before any injection that risks anaphylaxis.
- ▶ Examine a female patient only with a third person present, keep skills updated, and never criticise another doctor before the patient.

- ▶ **Limitation period:** a civil or consumer suit must be filed within 2 years of the alleged negligence (3 years if a specific contract for care was breached).
- ▶ ***Res judicata*** bars re-litigating a matter already decided by a competent court.
- ▶ It is recognised through the double-jeopardy provision, **Section 300 CrPC 1973 (now Section 337 BNSS 2023)**.
- ▶ **Court-ordered compensation** to the victim can be awarded under **Section 357 CrPC 1973 (now Section 395 BNSS 2023)**.
- ▶ This is separate from the **state victim-compensation scheme** under **Section 357A CrPC 1973 (now Section 396 BNSS 2023)**.
- ▶ ****Jacob Mathew vs State of Punjab (2005):**** a private criminal complaint against a doctor needs a credible independent medical opinion first, and a doctor should not be arrested routinely.
- ▶ This judgment also **approved Bolam's test for India** — a doctor need only show the ordinary skill of an ordinary competent practitioner.
- ▶ ****Dr Suresh Gupta vs Govt of NCT Delhi (2004):**** *criminal liability needs gross** negligence, not a mere error of judgment.
- ▶ ****Pt. Parmanand Katara vs Union of India (1989):**** the duty to give emergency treatment and preserve life comes before legal formalities.



Discuss the defenses put forth when charged with negligence

Asked in: Paper III Oct 2017 — RGUHS MD Forensic Medicine

Definition / Introduction

- ▶ **Medical negligence (*malpraxis*)** is the absence of reasonable care and skill, or wilful negligence, by a registered medical practitioner treating a patient, causing injury or death.
- ▶ **Civil negligence:** the patient seeks compensation, decided on the *balance of probabilities* (>50% likelihood).
- ▶ **Criminal negligence:** the State prosecutes, decided *beyond reasonable doubt* (>99% certainty).
- ▶ A doctor can defend in two ways: attack the patient's proof of the four essential elements, or invoke recognised legal doctrines that negate liability or reduce compensation.

The four elements the patient must prove (the "4 Ds")

- ▶ The burden of proving negligence lies on the patient, not the doctor.
- ▶ Demolishing any one of the four elements is the simplest defense.

Element	What the patient must prove	How the doctor defends
Duty of care	A doctor–patient relationship existed	No duty owed — no relationship arose

Element	What the patient must prove	How the doctor defends
Dereliction of duty	The doctor deviated from accepted practice	Actual denial — records prove the standard was met
Damage	Actual injury, loss, or death resulted	No damage occurred, so no civil claim
Direct causation	The damage flowed directly from the breach	An intervening cause broke the chain (<i>novus actus interveniens</i>)

- ▶ **Standard-of-care defense — the Bolam test:** a doctor is not negligent if he acted according to a responsible body of medical opinion, even if some specialists disagree (*Bolam v Friern Hospital Management Committee*, 1957).
- ▶ This was upheld for India in **Jacob Mathew v State of Punjab (2005)**.
- ▶ **Error of judgement is not negligence:** choosing one acceptable treatment over another, even if it later turns out wrong, is not negligence.

The recognised legal defenses

- ▶ **Actual denial:** the doctor denies negligence and shows he met the prevailing standard.
 - Its strength depends entirely on complete, accurate, contemporaneous records.
- ▶ **No duty owed:** if the doctor never agreed to treat and there was no emergency, no doctor–patient relationship ever arose.
 - A doctor cannot refuse a true emergency (*Pt Parmanand Katara v Union of India*, 1989).
- ▶ **Calculated-risk doctrine:** the doctor took a reasonable, calculated risk within accepted practice to save the patient, and injury still resulted.
 - He must show expert evidence that the treatment carried unavoidable inherent risks — this is the main rebuttal to *res ipsa loquitur*.
 - Examples: penicillin/streptomycin reactions, vaccine reactions, vesicovaginal fistula after hysterectomy.
- ▶ **Contributory negligence (civil only):** the patient's own unreasonable conduct combines with the doctor's negligence to cause the injury.
 - Examples: an inaccurate history, not following instructions, leaving hospital against advice.
 - The burden of proof lies on the doctor, not the patient.
 - It is usually only a partial defense — the court apportions fault under the doctrine of comparative negligence.
 - He cannot plead it if he himself gave improper instructions.
 - **Last Clear Chance doctrine:** defeats this plea if the doctor had the last opportunity to avert harm.
 - **Good Samaritan doctrine:** protects a rescuer from this plea unless the help given was rash or reckless.
 - **Avoidable Consequences rule:** protects the doctor if the patient's own conduct worsened an already-caused injury.

- ▶ ***Volenti non fit injuria*** ("to a willing person, no injury is done"): a patient who gives properly informed consent, after being warned of the risk, cannot later claim damages from that risk.
- ▶ **Medical misadventure (inevitable accident)**: a bad outcome unrelated to the quality of care, from unpredictable biological variation.
 - Types: therapeutic (e.g. a rare drug reaction), diagnostic (e.g. a contrast-media reaction), and experimental.
 - A negative sensitivity test does not rule out a fatal anaphylactoid reaction; the doctor is not liable if due precautions were taken.
- ▶ ***Novus actus interveniens*** ("a new act intervening"): an unforeseen event breaks the chain of causation, so the doctor's negligence is no longer the proximate cause.
 - Example: a negligently treated patient dies because the ambulance carrying him overturns.
 - Rarely accepted by courts.
- ▶ **Emergency**: injury caused incidentally while taking drastic life-saving measures (e.g. a rib fracture during CPR) is excused.
- ▶ ***Res judicata (double jeopardy)** — *Section 337 BNSS 2023 (formerly Section 300 CrPC 1973)**: if the same negligence question between the same doctor and patient has already been decided, it cannot be re-litigated except by appeal.
- ▶ **Law of limitation**: a complaint under the Consumer Protection Act must be filed within 2 years of the negligence; a suit for breach of a contract of care may be filed within 3 years.
- ▶ **Patient negligence**: the doctor was not negligent at all, and the injury was caused solely by the patient's own conduct.

Allied defenses

- ▶ **Vicarious liability shift**: an employer or hospital held liable can recover from the actually-negligent employee by a third-party proceeding.
 - **Borrowed-servant doctrine**: shifts liability to whoever was actually directing the negligent person (e.g. the operating surgeon for a hospital nurse).
- ▶ **Products liability**: if injury arose from a faulty instrument, prosthesis, or drug, the doctor can shift responsibility to the manufacturer by proving there was no negligence in his own use of it.

What is NOT a defense

- ▶ ***Res ipsa loquitur*** ("the thing speaks for itself") is a weapon of the patient, not the doctor.
 - It lets the patient skip expert proof when the facts are self-evidently negligent (e.g. a swab left in the abdomen, wrong limb amputated).
 - The doctor must rebut it — typically with the calculated-risk doctrine.
- ▶ **Contributory negligence and informed consent are not defenses in criminal negligence** — only civil.
- ▶ **Being under the influence of alcohol or drugs while treating is no defense** and in fact aggravates liability.

Medico-legal significance

- ▶ Records are the central defense: a bad result with bad records means liability.
- ▶ Accurate, contemporaneous records and written informed consent (local language, two witnesses) support actual denial, contributory negligence, and *volenti non fit injuria*.
- ▶ When charged, contact the Medical Defence/Indemnity Society first and make no statement admitting fault.
- ▶ Never alter records — tampering invites liability even where none existed. Preserve them 3–6 years routinely, up to 25 years where litigation is likely (especially for minors).
- ▶ **Jacob Mathew (2005)** safeguards: a private complaint needs prima facie expert opinion first; the investigating officer must get an independent (preferably government) medical opinion; the doctor should not be arrested routinely.
- ▶ Causing death by negligence: **Section 106 BNS 2023 (formerly Section 304A IPC 1860)** — 5 years generally, but only 2 years and fine for a doctor negligent during a procedure.
- ▶ Act endangering life/personal safety: **Section 125 BNS 2023 (formerly Sections 336–338 IPC 1860)**.
- ▶ Victim compensation for criminal negligence: **Section 396 BNSS 2023 (formerly Section 357A CrPC 1973)**.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ Flowchart: **Duty of care** → **Dereliction of duty** → **Damage** → **Direct causation** → **Negligence proved**, with the matching defense branching off each node — no duty owed / actual denial / no damage / *novus actus interveniens*.
- ▶ Venn diagram with three circles: doctor negligent alone (medical negligence), patient negligent alone (patient negligence, doctor not liable), and both negligent (contributory negligence, liability apportioned).

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Important Acts in Relation to Poisons and Drugs

Asked in: Paper III Oct 2025 — RGUHS MD Forensic Medicine

Definition / Introduction

- ▶ A **poison** is any substance that produces ill-health or death by its action on the body — "almost anything is a poison" depending on the dose.
- ▶ India has enacted the **law on poisons and drugs** — statutes controlling manufacture, sale and abuse of such substances, and safeguarding drug quality.
- ▶ A forensic physician must know these Acts: they fix the doctor's duty to inform police, govern drug prescribing/stocking, and supply the penal sections for poisoning/adulteration.
- ▶ Since **1 July 2024**, penal law is read under the **Bharatiya Nyaya Sanhita (BNS) 2023** and procedure under the **Bharatiya Nagarik Suraksha Sanhita (BNSS) 2023**, replacing the IPC 1860 and CrPC 1973.

Important Acts (in chronological order)

- ▶ **Opium Acts, 1857 and 1878** — earliest laws; regulated poppy cultivation/opium sale, then aimed to reduce opium consumption.
- ▶ **Poisons Act, 1919** — regulates import, possession and sale of poisons; the State Government may restrict any specified poison, and licensed vendors keep a register.
- ▶ **Dangerous Drugs Act, 1930** — controlled narcotic drugs.
- ▶ **Drugs and Cosmetics Act, 1940** — controls the quality, purity and strength of drugs and cosmetics.
 - Patent/proprietary medicines must show their true formula or ingredients on the label; the Act set up the DTAB and the CDL.
 - **Section 27** penalises **adulterated drugs** (filth/harmful matter) with **1–3 years'** imprisonment plus fine, and **spurious drugs** (imitations) with **3–5 years'** imprisonment plus fine.
- ▶ **Drugs and Cosmetics Rules, 1945** — framed under the 1940 Act; sets out Schedules A–Y (see below).
- ▶ **Pharmacy Act, 1948** — only **registered pharmacists** may compound/dispense medicines on prescription (exempts a doctor's own patients).
- ▶ **Drugs Control Act, 1950** — controls sale, supply and price of drugs.
- ▶ **Drugs and Magic Remedies (Objectionable Advertisements) Act, 1954** — bans "magic remedy" ads for abortion/contraception, sexual potency, or menstrual disorders/venereal disease.
 - Penalty up to **6 months**, or **1 year** on repeat conviction.
- ▶ **Insecticides Act, 1968** — regulates insecticides; organophosphates are India's commonest fatal agricultural poison.
- ▶ **NDPS Act, 1985** — narcotic/psychotropic drug control (see below).
- ▶ **Prevention of Illicit Traffic in NDPS Act, 1988** — preventive detention of drug traffickers.
- ▶ **New Drugs and Clinical Trials Rules, 2019** — governs clinical trials and compensation.

The Drugs and Cosmetics Rules, 1945 — the Schedules

- ▶ **Schedule C:** biological and special products.
- ▶ **Schedule E1:** poisonous substances in the Ayurvedic, Siddha and Unani systems.
- ▶ **Schedule F:** vaccines, antisera and diagnostic antigens.
- ▶ **Schedule G:** about **65 drugs** labelled "dangerous except under medical supervision."
- ▶ **Schedule H:** prescription-only drugs, labelled **Rx** with a **red vertical line** (or **NRx** in red if also NDPS-controlled).
- ▶ **Schedule J:** **51 diseases** for which no drug may be advertised.
- ▶ **Schedule X:** sedatives and hypnotics under stricter, narcotic-style control.
- ▶ **Schedule Y:** rules for the conduct of clinical trials.
- ▶ Every prescription-drug supply (except Schedule X) is entered in a register with date, prescriber's and patient's details, and drug name/quantity.

The Narcotic Drugs and Psychotropic Substances (NDPS) Act, 1985

- ▶ The single most important Act in forensic toxicology for drugs of abuse.
- ▶ **Object:** consolidate control over narcotic drugs of abuse, raise trafficking penalties, and allow forfeiture of trafficking property.
- ▶ **Repeals** the Opium Acts (1857, 1878) and the Dangerous Drugs Act (1930).
- ▶ **Narcotic drug** = coca leaf, cannabis (charas/ganja), opium, poppy straw and manufactured drugs; **psychotropic substance** = over **110 scheduled substances** (LSD, THC, amphetamine, benzodiazepines).
- ▶ Cultivation of poppy, cannabis and coca needs a licence; opium is grown only in **Rajasthan, Uttar Pradesh and Madhya Pradesh**, during the "opium year" (1 Oct–30 Sep).
- ▶ **Small vs commercial quantity** (grades the punishment):
 - Cocaine — 2 g / 100 g.
 - Heroin — 5 g / 250 g.
 - Opium — 25 g / 2.5 kg.
 - Charas/hashish — 100 g / 1 kg.
 - Ganja — 1 kg / 20 kg.
- ▶ **Punishment by quantity:**
 - Small quantity — up to **6 months'** rigorous imprisonment and/or a fine.
 - Intermediate quantity — up to **10 years'** rigorous imprisonment plus a fine up to ₹1 lakh.
 - Commercial quantity — **10–20 years'** rigorous imprisonment plus a fine of ₹1–2 lakh.
- ▶ **Consumption:** cocaine/morphine/heroin — up to **1 year**; other drugs — up to **6 months**.
- ▶ **Death penalty** applies to large commercial-quantity offences after a previous conviction.

Penal sections for poisoning and adulteration offences

BNS 2023	IPC 1860	Offence
S.123	S.328	Hurt by poison with intent (10 years + fine)
S.274	S.272	Adulteration of food or drink
S.275	S.273	Sale of noxious food or drink
S.276	S.274	Adulteration of drugs
S.277	S.275	Sale of adulterated drugs
S.278	S.276	Sale of a drug as a different drug
S.286	S.284	Negligent conduct with a poisonous substance
S.23	S.85	Involuntary intoxication (not an offence)
S.24	S.86	Voluntary intoxication (an offence)

BNS 2023	IPC 1860	Offence
S.194/196 BNSS	S.174/176 CrPC	Inquest in unnatural/poisoning deaths

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Flow chart** — "Acts regulating poisons and drugs in India." A timeline branching into three labelled boxes: (1) quality/sale of medicines, (2) restriction of poisons/advertisements, (3) drugs of abuse — ending in the NDPS Act 1985. Fill each box with its Acts (name + year + one-line purpose) from the list above.
- ▶ **Schedule label-box** — Schedules C, E1, F, G, H, J, X, Y in a column, plus a sketch of a Schedule H label (Rx + red line).

Medico-legal significance

- ▶ **Duty to inform police:**
 - Every suspected or confirmed poisoning must be reported by the treating doctor, who must preserve evidence — duty under **Section 33 BNSS 2023** (formerly Section 39 CrPC 1973).
 - Plain omission to inform — **Section 211 BNS 2023** (formerly Section 176 IPC) — draws up to **1 month's** imprisonment; *intentional* withholding draws up to **6 months** under the aggravated limb, **Section 211(b) BNS**.
 - Intentional concealment of an offence (**Section 239 BNS 2023**, formerly Section 202 IPC) and negligent handling of a poison that endangers life (**Section 286 BNS 2023**, formerly Section 284 IPC) each draw up to **6 months, or a fine of ₹5,000, or both**.
- ▶ **Collection of evidence:** the doctor collects, seals and labels vomitus, gastric-lavage fluid, blood, urine and any poison bottle, and hands them to police for analysis at the **Forensic Science Laboratory (FSL)**.
- ▶ **Examination of the accused:** may be done, with reasonable force, under **Section 51 BNSS 2023** (formerly Section 53 CrPC); in a comatose patient, consent comes from an attendant, or treatment begins in good faith.
- ▶ **Dying declaration:** record it before death, certify the patient is *compos mentis* (of sound mind); admissible under **Section 26 BSA 2023** (formerly Section 32 IEA 1872).
- ▶ **Stocking and prescribing** flow from these Acts: Schedule H/X drugs only on prescription, entered in the register; NDPS drugs need a licence and NRx labelling.
- ▶ **Poison-control infrastructure:** the **National Poisons Information Centre (NPIC)** at AIIMS, New Delhi, runs the WHO's INTOX software; regional centres at Chennai and Cochin (POISINDEX) give round-the-clock advice.

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Discuss the medico legal issues related to euthanasia

Asked in: Paper III Oct 2017 — RGUHS MD Forensic Medicine

Definition / Introduction

- ▶ **Euthanasia** (Greek *eu* = good, *thanatos* = death) means causing a painless death in a person with an incurable, terminal, and painful disease.
- ▶ It is also called **mercy killing**.
- ▶ The conflict is between the patient's autonomy and right to die with dignity, and the doctor's duty to preserve life.
- ▶ In India, **active euthanasia and physician-assisted suicide are illegal** and treated as homicide or abetment.
- ▶ **Passive euthanasia with a valid living will is legal**, following Supreme Court rulings under Article 21 of the Constitution.

Classification of euthanasia

A. By the physician's act

Feature	Active (positive)	Passive (negative)
Nature of act	Commission — a positive act to kill	Omission — letting die
Example	Lethal dose of opioids, barbiturates, or potassium chloride	Switching off a ventilator, withholding food or CPR
Legal status in India	Illegal (murder or culpable homicide)	Legal, under court guidelines since 2011

- ▶ **Active euthanasia** is a deliberate act that ends suffering, such as giving a lethal drug dose. In short, it is killing.
- ▶ **Passive euthanasia** is withholding or withdrawing life support so nature takes its course. In short, it is letting die.

B. By the patient's will

- ▶ **Voluntary euthanasia**: carried out with the patient's own consent; the patient must be mentally competent.
 - Legal only in a few places — Belgium, the Netherlands, Switzerland, and some US states.
- ▶ **Involuntary euthanasia**: carried out against the patient's wishes, without consent.
 - Always unlawful everywhere.
- ▶ **Non-voluntary euthanasia**: the patient cannot express a wish at all.
 - Example: irreversible coma or a severely defective infant (Karen Ann Quinlan, Terri Schiavo).

Related concepts to distinguish

- ▶ **Physician-assisted suicide (PAS)**: the patient performs the final act; the doctor only supplies the lethal drug or the means.
- ▶ This is different from voluntary euthanasia, where the doctor performs the final act himself.

- ▶ **Assisted suicide:** giving another person information, guidance, or the means to end their own life.
- ▶ **Terminal sedation (double effect):** morphine-type drugs relieve pain but can also hasten death.
 - If given with the intent of helping the patient die, this amounts to PAS.
- ▶ **Do Not Resuscitate (DNR):** an instruction that CPR should not be attempted.
 - It is a form of passive non-treatment.
 - Valid in India only when backed by a proper advance directive or a medical-board decision.

Landmark judgments

- ▶ **Aruna Shanbaug v. Union of India (2011):** a nurse left in a permanent vegetative state for about 40 years after a violent sexual assault.
- ▶ The Supreme Court legalised **passive euthanasia** for the first time in India, under strict guidelines.
- ▶ The Court **rejected active euthanasia** by lethal injection.
- ▶ Safeguards required: a decision by close relatives or attending doctors, made in good faith and in the patient's best interest.
- ▶ Also required: **High Court approval**, a bench of at least two judges, and a report from a panel of **three doctors**.
- ▶ Before this ruling, Sections 89 and 92 IPC made all forms of euthanasia illegal.
- ▶ **Common Cause v. Union of India (2018):** a five-judge Constitution Bench held that the **right to die with dignity is part of Article 21**.
- ▶ It declared **living wills (advance directives)** legally valid.
- ▶ A competent adult may now refuse treatment in advance and choose a natural death.

Guidelines for a valid living will

- ▶ Can be made only by an **adult of sound mind**.
- ▶ Must be executed voluntarily, on informed consent, in clear terms.
- ▶ Must be **signed before a Judicial Magistrate of First Class (JMFC)**.
- ▶ Must state the circumstances in which treatment may be withdrawn.
- ▶ Must name the guardian or relative authorised to consent to withdrawal.
- ▶ The treating doctor must **verify genuineness** with the jurisdictional magistrate.
- ▶ A **hospital medical board must authorise** the actual withdrawal of treatment.
- ▶ A 2023 Supreme Court modification simplified this process — for example, attestation before a notary or gazetted officer, with a streamlined two-board mechanism.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Flowchart** — "Classification of euthanasia": root box *Euthanasia (mercy killing)* branching into two columns.
 - Column 1, **by physician's act**: Active/commission (illegal in India) and Passive/omission (legal with guidelines).
 - Column 2, **by patient's will**: Voluntary (with consent), Involuntary (against will), Non-voluntary (cannot consent — coma or defective infant).
 - Side box: **Related terms** — physician-assisted suicide, assisted suicide, terminal sedation, DNR.
- ▶ **Timeline box** — "Indian legal history": three boxes left to right.
 - Pre-2011: all euthanasia illegal (Sections 89, 92 IPC).
 - 2011, *Aruna Shanbaug*: passive euthanasia legalised with High Court and medical-board safeguards.
 - 2018, *Common Cause*: right to die with dignity under Article 21; living will validated.

Medico-legal significance

- ▶ Active euthanasia and PAS remain criminal offences.
- ▶ A doctor who administers a lethal agent can be charged with **murder**, Section 300/302 IPC 1860 (now Section 101/103 BNS 2023).
- ▶ Or with **culpable homicide**, Section 299/304 IPC (now Section 100/105 BNS 2023).
- ▶ Assisting a suicide attracts **abetment of suicide**, Section 306 IPC (now Section 108 BNS 2023).
- ▶ The victim's consent is **no defence to homicide**.
- ▶ The good-faith consent exceptions in Sections 88, 89, and 92 IPC do **not** legalise euthanasia.
- ▶ Passive euthanasia is lawful only through the prescribed route — a valid living will, or a medical-board/High-Court sanctioned decision.
- ▶ Withdrawing life support outside this process exposes the doctor to a homicide charge and professional-misconduct proceedings.
- ▶ Any death following withdrawal of life support must be carefully documented, and the doctor must issue the cause-of-death certificate.
- ▶ It may need reporting or inquest under Section 174/176 CrPC 1973 (now Section 194/196 BNSS 2023) if the death looks unnatural or doubtful.
- ▶ **Brain-stem death**, certified under the Transplantation of Human Organs and Tissues Act, is not euthanasia — the patient is already legally dead, so withdrawing the ventilator raises no euthanasia issue.
- ▶ Under **Article 21 of the Constitution**, the Supreme Court has read the right to life to include the **right to die with dignity**, but not a right to die by active means.
- ▶ **Section 115(1), Mental Healthcare Act 2017** decriminalised attempted suicide, presuming it results from severe stress. This removes penal liability from a competent patient who refuses treatment.

- ▶ **Section 309 IPC** (attempt to suicide) has **no general re-enactment in the BNS 2023**; BNS Section 226 punishes attempted suicide only when done to compel a public servant.
- ▶ Participating in active euthanasia is professional misconduct before the **National Medical Commission (NMC)**.
- ▶ Foreign cases, such as Dr Howard Martin being struck off by the UK General Medical Council, show the disciplinary risk even after a criminal acquittal.
- ▶ The ethical debate is framed by **autonomy** (the right to refuse treatment) against **beneficence and non-maleficence** (the duty to do good and avoid harm), and the **sanctity of life**.
- ▶ The Hippocratic Oath's injunction against prescribing a deadly drug is the classical objection to active euthanasia.



Discuss the Narcotic and Psychotropic Substances Act, 1985

Asked in: Paper III Oct 2022 — RGUHS MD Forensic Medicine

Definition and introduction

- ▶ The **NDPS Act, 1985** is India's principal law controlling narcotic drugs and psychotropic substances.
- ▶ **Narcotic drugs** include opium, cannabis and cocaine.
- ▶ **Psychotropic substances** are mind-altering chemicals such as amphetamines, barbiturates and benzodiazepines.
- ▶ The Act **consolidates and amends** the older, fragmented drug laws.
- ▶ It provides **stringent punishment** for illicit trafficking.
- ▶ It allows **forfeiture of property** derived from drug trafficking.
- ▶ It implements India's obligations under **international drug-control conventions**.
- ▶ It balances two goals: stopping diversion into the illicit market, while allowing drugs for **medical and scientific use**.

Background and objectives

- ▶ The Act was passed and enforced in **1985**.
- ▶ Before this, drug control relied on weak, colonial-era laws.
- ▶ **Four stated objectives:**
 - Consolidate and amend the law on narcotic drugs.
 - Make stringent provisions and strengthen control over drugs of abuse.
 - Provide for forfeiture of property derived from trafficking.
 - Implement the international convention on narcotic drugs and psychotropic substances.
- ▶ **Section 82(1) repealed three earlier Acts:**
 - The Opium Act, 1857.
 - The Opium Act, 1878.
 - The Dangerous Drugs Act, 1930.

- ▶ The Act was later amended in **1989 and 2001**.
- ▶ The **2001 amendment** linked punishment to the quantity of drug — small, intermediate or commercial.
- ▶ This ensures minor users are not punished as severely as large traffickers.
- ▶ The Poisons Act 1919, Drugs and Cosmetics Act 1940, and Pharmacy Act 1948 were **not repealed** — they still operate alongside the NDPS Act.

Key statutory definitions

- ▶ **Narcotic drug** [Section 2(xiv)]: means coca leaf, cannabis, opium and poppy straw, and includes all manufactured drugs.
- ▶ This legal definition is broader than the pharmacological one — coca leaf is a stimulant, not a true narcotic, but the law still classifies it as a "narcotic drug."
- ▶ **Cannabis (hemp)** covers charas (the resin), ganja (flowering tops), and any mixture or drink made from them.
- ▶ **Bhang** (the leaves) is traditionally exempt from these restrictions.
- ▶ **Opium** is the coagulated juice of the opium poppy, *Papaver somniferum*, or any mixture containing it [Section 2(xv)].
- ▶ **Psychotropic substance** [Section 2(xxiii)]: any natural or synthetic substance listed in the Act's Schedule.
- ▶ The Schedule lists **more than 110 substances**.
- ▶ Examples include benzodiazepines (diazepam, alprazolam, lorazepam), barbiturates (phenobarbital, pentobarbital), amphetamines, LSD, mescaline, PCP, psilocybin, methaqualone and buprenorphine.

Cultivation and legitimate use

- ▶ Cultivation of poppy, cannabis and coca plants is **prohibited except under licence for medical or scientific purposes** [Section 8].
- ▶ Licensed opium cultivation is permitted only in **Madhya Pradesh, Rajasthan and Uttar Pradesh**.
- ▶ The **opium year** runs from **1 October to 30 September**.
- ▶ Licences are granted by the **Central Bureau of Narcotics (CBN)**.
- ▶ All licensed opium must be sold to the Government.
- ▶ Government opium factories (Ghazipur, Neemuch) standardise opium to **10% morphine**.
- ▶ The Act thus runs a **dual framework** — licensed legitimate use for pharmaceutical and research purposes, alongside strict penalties for unauthorised production, possession, sale, transport or financing.

Offences and penalties — the graded quantity-based scheme

- ▶ Since the 2001 amendment, punishment rises with the **quantity of drug** involved.
- ▶ The three tiers are **small quantity, intermediate quantity, and commercial quantity**.
- ▶ The FSL analyst's report on the seized quantity decides which tier applies.

Drug	Small quantity	Commercial quantity
Cocaine	2 g	100 g
Heroin	5 g	250 g
Opium	25 g	2.5 kg
Charas / Hashish	100 g	1 kg
Ganja	1 kg	20 kg

- ▶ **General structure:** small quantity — up to about 6 months and/or fine.
- ▶ Intermediate quantity — up to about 10 years and fine.
- ▶ Commercial quantity — rigorous imprisonment 10–20 years and fine ₹1–2 lakh, with strict bail conditions.
- ▶ **Consumption [Section 27]:** cocaine, morphine or heroin — up to 1 year and/or fine up to ₹20,000.
- ▶ Consumption of any other narcotic/psychotropic drug — up to 6 months and/or fine up to ₹10,000.
- ▶ **Embezzlement of opium by a licensed cultivator [Section 19]:** rigorous imprisonment 10–20 years, fine ₹1–2 lakh.
- ▶ **External dealings in narcotic/psychotropic drugs [Section 24]:** same punishment — 10–20 years and fine ₹1–2 lakh.
- ▶ **Financing illicit traffic and harbouring offenders [Section 27A]:** same punishment — 10–20 years and fine ₹1–2 lakh.
- ▶ **Repeat conviction after a prior sentence under Sections 19, 24 or 27A (or a commercial-quantity offence) [Section 31A]:** punishable with death.
- ▶ Threshold quantities that attract this death penalty include opium 10 kg, hashish 20 kg, morphine/codeine/heroin/thebaine 1 kg each, amphetamine/methamphetamine 1.5 kg each, and cocaine/LSD/THC 0.5 kg each.

Medico-legal significance

- ▶ Schedule H drugs that also fall under the NDPS Act must be labelled "NRx" in red.
- ▶ The container must also carry a **red vertical line** on the left.
- ▶ Such drugs may be sold only on the prescription of a Registered Medical Practitioner.
- ▶ Careless prescribing without proper records can amount to facilitating diversion.
- ▶ A doctor who illegally prescribes, possesses or supplies these drugs is **liable under the Act**.
- ▶ The forensic physician may be asked to **certify intoxication** and to **collect and preserve blood or urine samples** for chemical analysis.
- ▶ The physician may also have to **give expert evidence** in NDPS trials.
- ▶ Expert evidence identifying the seized substance is admissible under **Section 45 Indian Evidence Act 1872 (now Section 39 Bharatiya Sakshya Adhiniyam 2023)**.

- ▶ Stupefying agents such as cannabis preparations (*majun*) or datura, used to facilitate robbery or sexual assault, also engage general poisoning law.
- ▶ **Section 328 IPC 1860 (now Section 123 BNS 2023)** covers causing hurt by poison or a stupefying drug.
- ▶ **Section 284 IPC 1860 (now Section 286 BNS 2023)** covers negligent conduct with a poisonous substance.
- ▶ Where an NDPS-controlled drug is involved in a crime, the general rules on intoxication apply.
- ▶ **Involuntary intoxication is a defence** — **Section 85 IPC 1860 (now Section 23 BNS 2023)**.
- ▶ **Voluntary intoxication is not a defence** — **Section 86 IPC 1860 (now Section 24 BNS 2023)**.
- ▶ Addicts are recognised as patients, not merely offenders.
- ▶ The Act favours **de-addiction and treatment** for dependent users, while reserving harsh punishment for trafficking.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Flowchart** — "Structure of the NDPS Act, 1985": a central box "NDPS Act 1985" branching into four limbs.
- ▶ **Limb 1 — Objectives**: consolidate and amend, stringent control, forfeiture of property, implement international convention.
- ▶ **Limb 2 — Substances controlled**: narcotic drugs (opium, cannabis, coca, poppy straw, manufactured drugs) and psychotropic substances (over 110 Schedule substances).
- ▶ **Limb 3 — Regulation**: licensed cultivation in MP/Rajasthan/UP, opium year 1 Oct–30 Sep, Central Bureau of Narcotics.
- ▶ **Limb 4 — Offences and penalties**: graded small/intermediate/commercial scheme; key sections 8, 19, 24, 27, 27A, 31A.
- ▶ **Ladder diagram** — "Graded punishment ladder": three ascending rungs — small quantity (up to 6 months/fine), intermediate quantity (up to 10 years and fine), commercial quantity (10–20 years and ₹1–2 lakh, with death on repeat conviction under Section 31A).



Doctrine of Res Ipsa Loquitur

Asked in: Paper III Apr 2018 — RGUHS MD Forensic Medicine

Definition

- ▶ ***Res ipsa loquitur** is a Latin maxim meaning "*the thing speaks for itself*."*
- ▶ It is a **rule of evidence in the law of torts**.
- ▶ The very nature of an injury or accident raises a presumption of negligence.
- ▶ This relieves the patient of the usual burden of proving negligence through expert medical evidence.
- ▶ It is invoked when the doctor's negligence is so glaring that it needs no specific proof.
- ▶ The patient simply states the negligent act, and the burden shifts to the doctor to disprove it.

Background — the ordinary rule of proof

- ▶ **Professional negligence** means absence of reasonable care and skill by a doctor, causing injury or death to a patient.
- ▶ It falls under the **law of torts** — a civil wrong for which the sufferer can claim compensation.
- ▶ Ordinarily the patient must prove four elements, the "**4 Ds**":
 - **Duty**: the doctor owed a duty of care.
 - **Dereliction**: the doctor breached the standard of a prudent physician.
 - **Direct causation**: the breach directly caused the injury, with no intervening cause.
 - **Damage**: actual, foreseeable harm resulted.
- ▶ The **burden of proof lies on the patient**, who must prove all four by a preponderance of evidence (more likely than not).
- ▶ This ordinarily needs **expert medical evidence** from another doctor, since the standard of care is a technical matter.
- ▶ *Res ipsa loquitur* is the key exception — it lets the patient succeed **without expert evidence**, because the negligence is self-evident.

The doctrine itself

- ▶ Meaning: the injury itself speaks for the negligence.
- ▶ The patient need not prove the standard of care, nor the specific negligent act — only that the injury happened.
- ▶ Once the three conditions (below) are shown, the **burden shifts onto the doctor** to rebut the presumption.
- ▶ It applies to **both civil and criminal negligence**.
- ▶ It is used mainly when there is **no direct evidence** of negligence.
- ▶ In practice, it is **rarely successfully invoked** by patients.

Origin

- ▶ First formulated by the English judge **Charles Pollock** (1823–1897).
- ▶ Case: ***Byrne v. Boadle*** (Court of Exchequer, 1863).
- ▶ Facts: a **barrel of flour fell** from Boadle's shop window and struck Byrne on the head.
- ▶ Held: the mere fact that the barrel fell proved negligent storage — such an event does not happen without carelessness.

Three essential conditions

- ▶ **Condition 1 — injury would not ordinarily occur without negligence.** The happening of the injury itself is evidence of someone's carelessness.
- ▶ **Condition 2 — exclusive control.** The doctor had exclusive control over the injury-producing instrument or treatment.
- ▶ **Condition 3 — no contributory negligence.** The patient did not, by his own carelessness, contribute to the injury.
- ▶ These are judged using the **common knowledge of a layman** — expert evidence is not needed.

Classical examples

- ▶ **Overdose:** prescribing an overdose of medicine that causes harm.
- ▶ **Careless poisoning:** giving poisonous medicine recklessly.
- ▶ **Missed ATS:** failing to give anti-tetanic serum after an injury, and the patient develops tetanus.
- ▶ **Burns:** from hot-water bottles, cautery applied at the wrong site, or X-ray/radiotherapy.
- ▶ **Broken needle** left in the patient (though "medical misadventure" may be pleaded as a defence).
- ▶ **Retained foreign body:** swabs, gauze, or artery forceps left behind after an operation.
- ▶ **Transfusion mismatch:** an incompatible blood transfusion given.
- ▶ **Limb damage:** loss of use of a hand or limb from prolonged splinting or a too-tight bandage/plaster.
- ▶ **Wrong-site surgery:** wrong limb amputated, wrong tooth extracted, or wrong patient operated upon.

Limits and related doctrines

- ▶ Does **not** apply where the matter is too technical for a layman's common knowledge to judge.
- ▶ **Cannot be applied against multiple defendants** when only one (unidentifiable) doctor could be responsible — e.g., a patient treated by several doctors at different times.
- ▶ If a whole operating team had control (e.g., a wrong-sided kidney removed), the **entire team** may be held liable.
- ▶ **Calculated-risk doctrine** — an important defence: if the doctor shows, with expert evidence or statistics, that the accepted treatment carried an unavoidable inherent risk, he is protected from liability.
 - Example: **Siverson v. Weber** (1962) — a vesicovaginal fistula (an abnormal opening between the bladder and vagina) after hysterectomy was held an inherent calculated risk, not negligence.
- ▶ **Doctrine of common knowledge** — a variant of *res ipsa loquitur*, for negligence obvious enough for a layman (e.g., not giving fluids in dehydration, not giving ATS after injury, not applying antiseptic to a cut).
 - Difference: under *res ipsa loquitur*, the patient need prove neither the standard of care nor the specific negligent act. Under the doctrine of common knowledge, the patient must prove the negligent act, but not the standard of care.

Illustrative case law

- ▶ ***Mahon v. Osborne* (1939): a swab was left under the liver after an abdominal operation, despite the nurse confirming the count was correct, and the patient died two months later. **Both the nurse and the surgeon**** were held liable.
- ▶ ***Valentine v. Kaiser Foundation Hospitals* (1961): **an infant lost the glans penis to gangrene after circumcision — an ancient, routine operation — so the court applied res ipsa loquitur**.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Flowchart — burden of proof in medical negligence.** Top box: "Alleged medical negligence." Left branch: ordinary rule — burden on the **patient** to prove the 4 Ds using **expert evidence**. Right branch: *res ipsa loquitur* exception — injury speaks for itself, burden shifts to the **doctor**.
- ▶ **Box diagram — three conditions of *res ipsa loquitur***, feeding into a result box: "No expert evidence needed — presumption of negligence."

Medico-legal significance

- ▶ Lets the patient's lawyer prove the case **without independent expert medical evidence** — useful since doctors are often reluctant to testify against colleagues.
- ▶ **Shifts the evidentiary burden** onto the doctor, who must then rebut it (e.g., by pleading inherent risk or the calculated-risk doctrine).
- ▶ Applies to **both civil and criminal negligence**.
- ▶ A negligent death is prosecuted under **Section 304A of the Indian Penal Code 1860 (now Section 106 of the Bharatiya Nyaya Sanhita 2023)**.
 - A registered medical practitioner performing a medical procedure faces **up to two years'** imprisonment plus fine.
 - The general public faces **up to five years** under the same section.
- ▶ The standard for criminal liability is *gross negligence* — the **Bolam standard** (whether the doctor acted per a practice accepted by a responsible body of medical opinion) sets the threshold, per *Jacob Mathew v. State of Punjab*.
- ▶ Expert medical opinion itself — the very evidence *res ipsa loquitur* dispenses with — is governed by **Section 45 of the Indian Evidence Act 1872 (now Section 39 of the Bharatiya Sakshya Adhiniyam 2023)**.
- ▶ **Defences available to the doctor:** denial with complete records, the calculated-risk doctrine, contributory negligence, emergency action, inherent risk/misadventure, *volenti non fit injuria* (assumption of risk), and the law of limitation (a consumer complaint must be filed within two years of discovering the alleged negligence).
- ▶ **Prevention:** informed written consent, meticulous records, correct swab/instrument counts, sensitivity testing, never guaranteeing a cure, and prompt referral.

♦ ♦ ♦

Enumerate various types of documentary evidence and add a note on dying declaration

Asked in: Paper III Apr 2020 — RGUHS MD Forensic Medicine

Definition

- ▶ **Evidence** is whatever the court allows to prove a fact — oral statements (**oral evidence**) or documents including electronic records (**documentary evidence**) [Section 2, BSA 2023 (Section 3, IEA 1872)].
- ▶ **Documentary evidence** is any written, printed, or electronically stored record produced before the court — certificates, medico-legal reports, the death certificate, and the dying declaration are the forms a doctor most often generates.
- ▶ A **dying declaration** [Section 26, BSA 2023 (Section 32, IEA 1872)] is the most important documentary evidence a doctor may have to record, and a recognised exception to the hearsay rule.

Classification of evidence

- ▶ **Oral evidence:** statements made before the court by a witness who personally perceived the fact [Section 55, BSA (Section 60, IEA)] — sub-types are direct, indirect/circumstantial, and hearsay.
- ▶ **Documentary evidence:** all documents, including electronic records, produced for the court [Section 2(e), BSA].
- ▶ **Material/real evidence:** physical exhibits — weapons, clothing, stains.
- ▶ Oral evidence carries **more weight** than documentary evidence because it allows **cross-examination**; a document is accepted only after its author is summoned to prove it on oath.

Types of documentary evidence

By mode of proof

- ▶ **Primary evidence:** the original document itself [Section 57, BSA] — e.g. original certificate, original case sheet.
- ▶ **Secondary evidence:** certified copies, photostat/xerox, or duplicates [Section 58, BSA] — admitted only if the original cannot be produced.

By kind of record (medico-legally important)

- ▶ **Medical documents:**
 - Medical certificates — of ill-health, fitness, insanity, age, disability, death.
 - Medico-legal reports — injury, post-mortem, age-estimation.
 - Death certificate.
 - Dying declaration.
- ▶ **FSL certificates:** viscera, weapon, DNA, fingerprint, and serology reports.
- ▶ **Electronic/digital records:** audio/video, CD/DVD, e-mail, computer data [Section 2(1)(t), IT Act 2000] — now covered under Section 2(e), BSA 2023.
- ▶ **Hospital routine entries:** admission/discharge times and vitals — admissible as an exception to oral evidence.

Medical certificates

- ▶ Accepted only when issued by a **qualified registered medical practitioner (RMP)**, who can still be summoned and cross-examined on oath.
- ▶ A sickness certificate should state the exact illness, cover **not more than 15 days** at a time, and must never be ante- or post-dated.
- ▶ Should carry the patient's signature/thumb impression, **two identification marks**, and a **duplicate retained for 2 years**.
- ▶ **False certificates are punishable:** issuing/signing one [Section 234, BNS (Section 197, IPC)] or using one known to be false [Section 235, BNS (Section 198, IPC)] — both under Section 229, BNS, up to 7 years plus fine.

Medico-legal reports

- ▶ Attached to the case file but **not admitted as evidence unless the doctor attends court and testifies on oath**.
- ▶ Must be clear, concise, complete, and legible; must record the date, time, place of examination, and who identified the subject.
- ▶ Must avoid loose wording, superlatives, and exaggeration, state relevant negative findings, and give opinions based only on facts personally observed.

NOTE — FOR REFERENCE, NOT TO BE WRITTEN IN THE EXAM

- ▶ **Definition:** a written or oral statement by a person dying from an unlawful act, about the cause of death or the circumstances of the transaction that caused it [Section 26, BSA (Section 32, IEA)].
- ▶ Classical term: *leterm mortem* — "words said before death."
- ▶ **Legal basis:** an exception to hearsay — statements by a person who is dead, untraceable, incapacitated, or otherwise unavailable are admissible [Section 26(a), BSA].
- ▶ **Maxim:** *Nemo moriturus praesumitur mentire* — "a man will not meet his Maker with a lie in his mouth."

Who may record it (in order of evidentiary value)

- ▶ The **dying person himself** — best if written and signed by him.
- ▶ The **executive magistrate** — greatest weight.
- ▶ A **doctor, police officer, or any other person** (village headman, relative) — of lesser value; must be recorded before **two witnesses** who also sign.
- ▶ An **FIR** lodged by the dying person, or a **suicide note**, can also count as a valid dying declaration [Section 26(a), BSA].

Role of the doctor

- ▶ Send for the magistrate and inform the police.
- ▶ **Record it himself** if the patient's life is in immediate danger or the magistrate is delayed.
- ▶ **Certify "compos mentis"** first, and stay present to monitor competence.
- ▶ If the patient becomes unfit, **stop at once**, declare "**non-compos mentis**," sign with date/time, and resume only when fit again.
- ▶ **No oath is administered** — the dying person is presumed truthful.
- ▶ **Record verbatim** in the declarant's own words, with **no leading questions**.
- ▶ The statement must record **fact, not opinion**.
- ▶ **Read it back**, take signatures (declarant, doctor, witnesses), then send it sealed to the magistrate; the recorder later proves it in court.

Admissibility

- ▶ Admissible in **all criminal and civil cases** involving cause of death.
- ▶ In India it is admissible if the declarant was of **sound mind**, even without expectation of death.
- ▶ **Inadmissible as a dying declaration** if the declarant **survives** — it then has only **corroborative value**, and the person gives oral evidence instead.
- ▶ **Inadmissible** if the declarant was **not of sound mind**.

Dying declaration vs dying deposition

Feature	Dying declaration	Dying deposition
Practice	Followed in India	Followed in the West (USA), not India
Nature	Recording of a statement	Full court procedure at the bedside
Recorded by	Magistrate, doctor, police, or layperson	Always a magistrate/judge
Oath	Not administered	Administered
Accused/lawyer present	Not necessary	Necessary
Cross-examination	Not allowed	Allowed
If victim survives	Becomes corroborative only	Retains its value
Legal value	Documentary; lesser	Oral; greater

Medico-legal significance

- ▶ The doctor is often the **only available recorder** of a dying declaration in an emergency.
- ▶ A correct record can identify the offender or exonerate the innocent, while a defective one can collapse a prosecution.
- ▶ Every document a doctor issues is potential documentary evidence, and the doctor may be **cross-examined on oath** to prove it.
- ▶ **Chain of custody** must be kept: each document/exhibit is labelled and every transfer receipted — "the shorter the chain, the better the sanctity."
- ▶ **Penal exposure:** giving false evidence [Section 227, BNS (Section 191, IPC)] and fabricating false evidence [Section 228, BNS (Section 192, IPC)] are punishable under Section 229, BNS (Section 193, IPC) — up to 7 years plus fine — covering a fabricated autopsy, MLC, or dying-declaration report.
- ▶ **Expert medical opinion is corroborative, not substantive** — the eyewitness gives positive evidence; the doctor gives an opinion [expert witness, Section 39, BSA (Section 45, IEA)].

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Classification tree:** "EVIDENCE [S.2, BSA]" branches into Oral, Documentary, and Material/Real.
 - Oral → Direct, Circumstantial, Hearsay.
 - Documentary → Primary [S.57] / Secondary [S.58], plus record types: certificates, medico-legal reports, death certificate, dying declaration, FSL certificates, electronic records.
- ▶ **Flow of recording a dying declaration:** Magistrate sent for/police informed → doctor certifies *compos mentis* → no oath, verbatim, no leading questions → read over, signatures (declarant + doctor + 2 witnesses) → sealed and sent to magistrate → recorder proves it in court.
 - Side note: if unfit mid-recording, declare non-*compos mentis*, sign with date/time, resume when fit.



Euthanasia

Asked in: Paper III Apr 2021 — RGUHS MD Forensic Medicine

Definition / Introduction

- ▶ **Euthanasia** (Greek *eu* = good, *thanatos* = death) means producing a painless death in a person suffering from a hopeless, incurable, terminal, and extremely painful illness.
- ▶ It is also called **mercy killing**.
- ▶ It is a deliberate act, or a deliberate omission, carried out to end life and relieve suffering.
- ▶ In India, **passive euthanasia under safeguards is lawful** (since 2011, refined in 2018).
- ▶ **Active euthanasia remains a punishable offence.**
- ▶ Related concepts asked alongside it: the living will (advance directive), physician-assisted suicide, terminal sedation, and the Do-Not-Resuscitate (DNR) order.

Classification of euthanasia

Euthanasia is classified along two independent axes — by the physician's act, and by the patient's will.

A. By the physician's act

Type	Nature	Example	Legality in India
Active (positive)	Act of <i>commission</i> — a positive act to end suffering	Giving a lethal dose (barbiturates, potassium chloride, opioids) — "killing"	Illegal
Passive (negative)	Act of <i>omission</i> — withdrawing or withholding life support	Switching off a respirator, stopping food/fluids/CPR — "letting die"	Legal, under safeguards

- ▶ Active euthanasia introduces a fresh cause of death, without which the patient would not have died at that time.
- ▶ Passive euthanasia only withdraws the artificial support and lets nature take its course.

B. By the will of the patient

- ▶ **Voluntary euthanasia:** carried out at the patient's own express, informed wish; legal in some Western countries and US states.
- ▶ **Involuntary euthanasia:** life is ended against the patient's wish, i.e. compulsorily.
- ▶ Classic example: a mortally wounded soldier, in agony and begging to be saved, is instead shot dead by a doctor who knows he cannot be saved — this is, in effect, murder.
- ▶ **Non-voluntary euthanasia:** life is ended for a patient who cannot make or express a decision, e.g. a patient in permanent vegetative coma, or a severely defective newborn (foreign cases: *Karen Ann Quinlan*, *Terri Schiavo*).

Related concepts

- ▶ **Physician-assisted suicide (PAS):** the doctor provides the information, guidance, and means (e.g. a lethal prescription), but the patient himself performs and commits the final act.
- ▶ This differs from voluntary active euthanasia, where the doctor performs the act.
- ▶ **Assisted suicide:** the broader term — any person providing the means for another to end his own life, intending that they be so used.
- ▶ **Terminal sedation:** giving morphine-type drugs that have a **dual effect** — relieving intractable pain and also hastening death.
- ▶ If the patient knowingly requests this dual effect for that purpose, it amounts to physician-assisted suicide.
- ▶ **DNR order:** a documented instruction that CPR is not to be attempted on cardiac or respiratory arrest — a recognised form of withholding treatment, similar to passive euthanasia.
- ▶ **Living will (advance directive):** a document by a competent adult, made while of sound mind, stating in advance when life-prolonging treatment should be withdrawn if he later becomes terminally ill or unable to express his wishes.

The Indian legal position

- ▶ **Article 21 of the Constitution** guarantees the **right to life**.
- ▶ The right to life does not by itself include a right to die.
- ▶ But the Supreme Court has held that the **right to die with dignity** is part of the right to life.
- ▶ ****Aruna Shanbaug v. Union of India (2011):**** a KEM Hospital nurse left in a permanent vegetative state after a 1973 strangulation assault.
- ▶ The Court, for the first time, **legalised passive euthanasia under guidelines**, but **rejected active euthanasia**.
- ▶ The withdrawal decision could be taken by the parents, spouse, close relatives, or (if none available) a close friend, or the treating doctors, done *bona fide* in the patient's best interest.
- ▶ It required **High Court approval:** a Bench of at least two judges would appoint a committee of three doctors to report on the patient's condition.

- ▶ ****Common Cause v. Union of India (2018): a five-judge Constitution Bench declared living wills / advance directives legally valid**.**
- ▶ It allowed consenting terminally ill or vegetative-state patients to opt for passive euthanasia, and reaffirmed the right to die with dignity under Article 21.
- ▶ **Living will — how it is executed (post-2018):**
 - Made by a competent, informed adult of sound mind, in clear and unambiguous terms.
 - Signed by the executor before a **Judicial Magistrate of the First Class (JMFC)**.
 - States the circumstances for withdrawal of treatment and names the guardian/relative authorised to consent.
 - The treating physician verifies its genuineness with the JMFC, and a **hospital medical board** must authorise the withdrawal.

Medico-legal significance

- ▶ **Active euthanasia by a doctor** attracts prosecution for culpable homicide or murder.
- ▶ Culpable homicide is defined at **Section 299 IPC 1860 (now Section 100 BNS 2023)**.
- ▶ It may amount to culpable homicide not amounting to murder — **Section 304 IPC (now Section 105 BNS 2023)** — or to murder — **Section 302 IPC (now Section 103 BNS 2023)**.
- ▶ **Consent is not a valid defence.** The good-faith/consent sections all expressly exclude an act *intended* to cause death.
- ▶ These are **Section 88 IPC (now Section 26 BNS 2023)**, **Section 89 IPC (now Section 27 BNS 2023)**, and **Section 92 IPC (now Section 30 BNS 2023)**.
- ▶ **Physician-assisted suicide** can attract abetment of suicide — **Section 306 IPC (now Section 108 BNS 2023)**.
- ▶ Abetment of suicide of a child, insane, or intoxicated person is **Section 305 IPC (now Section 107 BNS 2023)**.
- ▶ **Attempted suicide is decriminalised by Section 115(1), Mental Healthcare Act 2017:** a person who attempts suicide is presumed to have severe stress and is not to be tried or punished under Section 309 IPC.
- ▶ Section 309 IPC has no general successor in the BNS; only attempting suicide to compel or restrain a public servant survives, as **Section 226 BNS 2023**.
- ▶ **Passive euthanasia and DNR are lawful** when done *bona fide*, in a permanent vegetative state or terminal illness, following the Supreme Court safeguards.
- ▶ Decisions to withhold or withdraw life support must be **fully documented, witnessed, and legally compliant**.
- ▶ If life support is withdrawn without proper authorisation, the death can become a **medico-legal case requiring inquest** — **Section 174/176 CrPC 1973 (now Section 194/196 BNSS 2023)**.
- ▶ The **Hippocratic tradition opposes active killing** — "I will not prescribe a deadly drug... nor give advice that may cause his death."
- ▶ The debate is framed by the principles of **autonomy** (supporting a living will), **beneficence/non-maleficence**, and the **doctrine of double effect** (terminal sedation).

- ▶ The main criticism of legalised euthanasia is the **risk of misuse** against unwanted elderly or disabled persons.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Flowchart** — **classification of euthanasia**: top box *Euthanasia (mercy killing)*.
- ▶ One branch, by the physician's act: *Active (commission — illegal)* and *Passive (omission — legal under safeguards)*.
- ▶ The other branch, by the patient's will: *Voluntary, Involuntary, Non-voluntary*, with *Physician-assisted suicide* as a leaf under *Voluntary*.
- ▶ **Timeline** — **Indian legal milestones**: *Article 21 (right to life ≠ right to die, but includes right to die with dignity) → Aruna Shanbaug 2011 (passive legalised, active rejected) → Common Cause 2018 (living will validated) → MHCA 2017 §115 (attempted suicide decriminalised)*.



Explain about Medical indemnity insurance and its importance in medical practice

Asked in: Paper III Oct 2022 — RGUHS MD Forensic Medicine

Definition and contract mechanism

- ▶ **Medical indemnity insurance (MII)** is a contract between a doctor (or hospital) and an insurance company.
- ▶ Also called **medical malpractice insurance** or **professional indemnity insurance**.
- ▶ The doctor is the **insured**; the company is the **insurer**; the doctor's periodic payment is the **premium**.
- ▶ In return, the insurer **indemnifies** (compensates) the doctor for loss or expense from claims of professional negligence or misconduct.
- ▶ It is a contract of **indemnity** — the insurer makes good the actual loss (defence costs plus any award), not a fixed sum.
- ▶ Its importance rose sharply after ***Indian Medical Association v. V.P. Shantha** (*decided 1995, reported 1996 AIR 550*) brought doctors under the Consumer Protection Act*.
- ▶ That judgment exposed every practitioner to civil litigation and compensation claims, making MII the main risk-transfer tool in practice today.
- ▶ On any allegation of negligence, the doctor must **contact the insurer or defence society first**.
- ▶ The doctor must make **no admission** and enter no correspondence before that — an early admission can prejudice the defence.
- ▶ MII is **not legally compulsory** in India (it is compulsory in several US states).
- ▶ A doctor who is free to insure but chooses not to is said to **"go bare"** — practising with no financial backstop.

Objectives of medical indemnity insurance

- ▶ **Protect** the professional interests of the insured doctor.
- ▶ **Arrange, conduct and pay** for the doctor's legal defence when a claim is brought.
- ▶ **Arrange pre-litigation advice** and other professional/medico-legal support.
- ▶ **Indemnify** the doctor for loss or expense arising from negligence or misconduct claims.

Who can be insured, and how the premium is fixed

- ▶ Cover is available to **doctors, dentists, nurses, paramedics and dietitians**.
- ▶ Also available to complementary/holistic practitioners — acupuncturists, aromatherapists, Ayurvedic practitioners, homeopaths, yoga therapists.
- ▶ **Hospitals** can buy cover too; a hospital policy usually covers **both the institution and its staff**.
- ▶ Premium pricing is **not experience-rated** like motor insurance, where making a claim raises the premium.
- ▶ Premiums instead depend mainly on the **doctor's specialty**.
- ▶ **Obstetrics and orthopaedic surgery** attract the highest premiums because they generate the most claims.
- ▶ Premiums also depend on **geographic location** — typically urban versus rural.

Comparison with related medico-legal concepts

Concept	Who bears the loss
Medical indemnity insurance	The insurer, for the doctor's own negligence/misconduct
Vicarious liability (<i>respondeat superior</i>)	The employer (e.g. hospital), for an employee's negligence
Products liability	The manufacturer, for a defective instrument or drug
Consumer Protection Act compensation	The doctor/hospital — the exposure MII is meant to absorb

Importance in medical practice

- ▶ **Financial protection:** since *IMA v. V.P. Shantha*, doctors are "service" providers and patients are "consumers" under the Consumer Protection Act.
- ▶ A hospital giving **partial charitable service** (charging some patients, treating others free) is covered for **both** its paying and non-paying patients.
- ▶ Compensation awards can be very large — occasionally even where there was no negligence but records were found tampered with.
- ▶ MII transfers this financial risk from the doctor to the insurer.
- ▶ **Funds the defence, not just the payout:** the insurer arranges, conducts and pays for the doctor's legal defence and gives pre-litigation advice.
- ▶ This spares the doctor crippling legal costs and isolation during a stressful claim.

- ▶ **Promotes good practice:** the drive to reduce claims encourages active **risk management** — identifying, controlling and, where possible, eliminating risk.
- ▶ Good, achievable patient care means fewer damages paid and cheaper premiums.
- ▶ Meticulous, accurate, untampered **medical records** are central: "a bad result with bad records equals liability."
- ▶ **Counters the malpractice crisis:** rising litigation and liberal awards push insurers to raise premiums or refuse cover.
- ▶ Doctors then practise more **defensive medicine**, patient costs climb, and access to care falls — a self-reinforcing cycle long seen in the USA.
- ▶ Affordable, well-regulated MII helps break this cycle.
- ▶ **Defensive medicine:** ordering tests mainly to avoid a negligence suit — e.g. CT/MRI for a routine headache, barium studies for routine abdominal pain.
- ▶ This is **legally permissible but ethically unjustified**; MII availability shapes how strongly doctors feel pushed toward it.
- ▶ **Peace of mind:** by absorbing the financial shock, MII lets doctors continue practising high-risk but socially necessary specialties — obstetrics, surgery, emergency care.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **MII contract flow:** Doctor (Insured) → pays **PREMIUM** → Insurer / Medical defence society.
- ▶ Return arrow labelled **INDEMNITY** = pays/conducts the legal defence + compensates the loss.
- ▶ Third box below: **Patient** → **files claim** (CPA / civil court / Section 106 BNS), with an arrow pointing at the doctor.
- ▶ **Malpractice-crisis cycle:** five nodes in a clockwise loop — rising litigation → liberal compensation awards → insurers raise premiums or refuse cover → doctors practise defensive medicine → patient cost rises and access falls → back to rising litigation.

Medico-legal significance

- ▶ MII is the doctor's financial safeguard against malpractice litigation under the **Consumer Protection Act 2019** and civil suits.
- ▶ On any allegation, the doctor must inform the insurer or defence society **first** and make **no admission** before taking advice.
- ▶ Consumer complaints for deficient medical service are normally barred after **2 years** — Section 24A, Consumer Protection Act 1986 (now **Section 69.1, Consumer Protection Act 2019**).
- ▶ The doctor is judged by the standard of a **reasonably competent practitioner**, not the highest or lowest possible skill.
- ▶ Accurate, contemporaneous, untampered **medical records** are the single most important evidence in a negligence trial.

- ▶ MII covers only the doctor's **own** negligence — separate from **vicarious liability** (employer answers for an employee) and **products liability** (manufacturer answers for a defective device or drug).
- ▶ Death caused by a rash or negligent medical act is punishable under **Section 106 BNS 2023** (old law **Section 304-A IPC 1860**) — imprisonment up to 2 years, or fine, or both.
- ▶ Victim compensation for criminal negligence may additionally be ordered under **Section 357 CrPC 1973** (now **Section 395 BNSS 2023**).
- ▶ A **wholly free** service — no patient charged, or only a token registration fee — is immune from the CPA under **Section 2(1)(o)**.
- ▶ The landmark precedent is ***Indian Medical Association v. V.P. Shantha & Ors., 1996 AIR 550*** — the Supreme Court held medical service is a "contract for service," bringing doctors under the Consumer Protection Act.



Functions of Medical Council of India

Asked in: Paper III Apr 2021 — RGUHS MD Forensic Medicine

Definition / Introduction

- ▶ The **Medical Council of India (MCI)** was India's statutory apex body for medical education and the medical profession.
- ▶ It was constituted under the **Indian Medical Council Act, 1956 (IMC Act 1956)**.
- ▶ It set uniform standards for UG and PG medical education.
- ▶ It maintained the **Indian Medical Register (IMR)** and enforced professional conduct.
- ▶ After 63 years the MCI was **repealed and replaced by the National Medical Commission (NMC)** under the **National Medical Commission Act, 2019**.
- ▶ The NMC came into existence on **25 September 2020**.

Constitution of the MCI (background)

- ▶ The first Act regulating the profession was passed in **1933**; **Dr. B. C. Roy** became the Council's first Indian President in **1939**.
- ▶ This early Act was repealed and replaced by the **IMC Act 1956** (amended 1964).
- ▶ **Composition (Section 3)**: a mix of members nominated by the Centre and members elected from university faculties and the State Medical Registers.
- ▶ The Council elected its own **President** and **Vice-President**, and served a **five-year term**.
- ▶ The MCI was **temporarily dissolved in 2010** amid controversy — a prelude to the 2019 reform.

Functions of the Medical Council of India

The functions of the MCI are grouped under seven heads.

No.	Function	Substance
1	Maintenance of the medical register	Kept the Indian Medical Register (IMR) , the all-India register of recognised practitioners.
2	Standards of medical education	Prescribed and inspected minimum standards for UG and PG training.
3	Undergraduate (UG) medical education	Set curriculum, infrastructure and faculty norms; could recommend withdrawal of recognition.
4	Postgraduate (PG) medical education	Granted recognition to new PG/super-specialty courses.
5	Recognition of foreign qualifications	Negotiated reciprocal recognition; ran the screening test for foreign graduates.
6	Appeal against disciplinary action	Appellate authority when a State Medical Council erased a doctor's name.
7	Warning notice	Published the list of acts amounting to serious professional misconduct.

Medical register (IMR):

- ▶ Defined in **Section 2(d)** and maintained under **Section 21, IMC Act 1956** by the MCI Registrar.
- ▶ A State registration was **automatically entered** into the IMR; a State erasure **automatically removed** it.
- ▶ The IMR was the legal proof of who was a **registered medical practitioner (RMP)**.

UG education standards (Section 19A):

- ▶ Colleges needed adequate space, trained staff, laboratories, equipment and a library; the MCI **inspected every five years**.
- ▶ A deficient college was reported to the Central Government for **withdrawal of recognition**.
- ▶ Only qualifications listed in three **Schedules** (Section 2(h)) counted as "recognised":
 - **First** — Indian university qualifications.
 - **Second** — foreign qualifications recognised by the MCI.
 - **Third, Part I** — additional Indian qualifications.
 - **Third, Part II** — additional foreign qualifications, needing Indian citizenship plus the MCI screening test.

PG education (Section 20):

- ▶ **Prior MCI approval** was needed before starting any new postgraduate course.
- ▶ Assisted by a **9-member Postgraduate Medical Education Committee**.
- ▶ A course begun without prior approval was not recognised.

Recognition of foreign qualifications:

- ▶ Applied to an Indian national holding a degree not listed in Schedule 2 or Third Schedule Part II; the application was routed through the Government of India to the MCI.
- ▶ The MCI could **negotiate reciprocal recognition** with foreign Medical Councils.
- ▶ The Centre could then add the qualification to Third Schedule Part II by Gazette notification.

Appeal against disciplinary action:

- ▶ A doctor erased by a State Medical Council could **appeal to the Central Government within 30 days**.
- ▶ The Centre **conferred with the MCI**, and its decision was **binding** on the State Government and State Medical Council.

Warning notice:

- ▶ The MCI periodically issued **warning notices** listing acts of **serious professional misconduct (infamous conduct)**.
- ▶ The code was the **2002 Ethics Regulations**, framed under **Section 20A read with Section 33(m), IMC Act 1956**.
- ▶ The list was illustrative, **never complete** — each case was decided on its own facts.

The successor: National Medical Commission (current framework)

- ▶ The NMC Act, 2019 repealed the IMC Act 1956; the NMC has been operating since **25 September 2020**.
- ▶ It has **33 members**: one Chairman, ten ex-officio members, and twenty-two part-time members (nineteen from States/UTs).
- ▶ **Key NMC functions**:
 - Issues **fee guidelines for 50% of seats** in private and deemed-to-be-university colleges.
 - Grants a **limited licence to Community Health Providers (CHP)** for mid-level primary care.
 - Conducts **NEET** (with common counselling) and the **National Exit Test (NEXT)**.
- ▶ **Four autonomous boards**:
 - **UGMEB** — undergraduate recognition and curriculum.
 - **PGMEB** — postgraduate/super-specialty recognition and curriculum.
 - **MARB** — permission for new institutions, courses and seat increases; inspection and rating.
 - **EMRB** — maintains the **National Register**; regulates conduct/ethics; hears **appeals** against State Medical Council action.
- ▶ A **Medical Advisory Council** lets States and Union Territories put their views to the NMC.
- ▶ **NMC vs MCI, in short**:
 - NMC members are all appointed/nominated by the Centre; MCI members were mostly elected.
 - The NMC has **four autonomous boards**; the MCI had none.
 - The NMC has an exit exam for all (**NEXT**); the MCI tested only foreign graduates, via FMGE.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Organogram — "Regulation of the medical profession in India":**
 - Top box: **Central Government (Ministry of Health & Family Welfare)**.
 - Below it: **National Medical Commission (NMC, 2020)** — replaced the MCI's 1956 Act.
 - Four arms below the NMC: **UGMEB, PGMEB, MARB, EMRB** (EMRB maintains the National Register).
 - Side box: **Medical Advisory Council** (advisory).
 - Below the NMC: **State Medical Councils**, linked by a two-way arrow labelled "electronic synchronisation of National ↔ State Register."
 - Bottom box: **Registered Medical Practitioner (RMP) / Indian Medical Register**.

Medico-legal significance

- ▶ The register kept by the Council (IMR, now the National Register) is the **legal definition of an RMP**.
- ▶ Only a registered person may practise medicine, hold public medical office, sign statutory certificates, or give expert evidence (**Section 45 IEA 1872, now Section 39 BSA 2023**).
- ▶ An unregistered person practising medicine commits an offence.
- ▶ The Council's **disciplinary control** — from a warning notice up to penal erasure — is the profession's self-regulation.
- ▶ **Penal erasure** for serious professional misconduct is the "**professional death sentence**."
- ▶ The disciplinary enquiry has the same powers as a Civil Court (Code of Civil Procedure, 1908) and is a **judicial proceeding** under **Sections 229, 257 and 267, BNS 2023** (formerly Sections 193, 219 and 228, IPC 1860) — false evidence, a corrupt report, and insulting/interrupting a public servant in a judicial proceeding.
- ▶ **Infamous conduct vs professional negligence:**
 - Negligence is tried by **civil or criminal courts** (e.g. a rash or negligent act causing death — **Section 106 BNS 2023, formerly Section 304A IPC 1860**) and needs proof of a duty of care plus resulting damage.
 - Infamous conduct is tried by the **State Medical Council** (warning or erasure) and needs only a violation of the Code of Medical Ethics.
- ▶ The same ethics code governs medical certificates, professional secrecy, consent and giving evidence — a doctor's daily medico-legal duties.

♦ ♦ ♦

How state medical council maintain ethical code and discipline for registered medical practitioners?

Asked in: Paper III Apr 2022 — RGUHS MD Forensic Medicine

What the State Medical Council is

- ▶ The medical profession is governed by law and by a self-imposed code of ethics, enforced by the Medical Councils.
- ▶ A **State Medical Council** is an autonomous body set up under the respective State Medical Council Act.
- ▶ It maintains the **State Medical Register** and exercises **disciplinary control** over every **registered medical practitioner (RMP)** in the state.
- ▶ Its three main tools are the **warning notice**, the **disciplinary enquiry**, and **penal erasure**.

Regulatory framework — NMC, EMRB and the SMC

- ▶ The NMC is the apex body, in existence since 25 September 2020 under the **National Medical Commission Act 2019**, replacing the 63-year-old **Medical Council of India (MCI)**.
- ▶ The **Ethics and Medical Registration Board (EMRB)**, one of the NMC's four boards, is created under **Section 27, NMC Act 2019**.
- ▶ It maintains the National Register, regulates professional conduct, and promotes medical ethics.
- ▶ It also hears appeals against SMC actions (**Section 27(1)(d)** with **Section 30**) — the appellate authority above the SMC.
- ▶ State and National registers are kept electronically and synchronised, so an erasure in one state shows up nationally.
- ▶ Each SMC has members elected by registered practitioners and members nominated by the state government; the President and Vice-President are elected from among them.
- ▶ The ethical code enforced is the **Code of Medical Ethics** (IMC [Professional Conduct, Etiquette and Ethics] Regulations 2002, continued under the NMC).
- ▶ Every applicant also signs the **Declaration of Geneva** (WMA, 2017), the modern physician's oath; the **International Code of Medical Ethics** (WMA, 2006) binds them to confidentiality — disclosure needs patient consent, or a real, imminent threat of harm.

Functions of the SMC

- ▶ **Maintains the State Medical Register:** a Registrar keeps the register of every practitioner holding a recognised medical qualification.
- ▶ Enrolment needs provisional registration, internship, and the prescribed fee.
- ▶ **Renewal:** every RMP must renew registration every 5 years on payment of the prescribed fee.
- ▶ **Registration is the licence:** a person not on the State Register may not practise medicine.
- ▶ **Disciplinary control** has three express powers:
 - (A) Issue a **warning notice**.
 - (B) **Remove the name** from the register, permanently or for a fixed period, after an enquiry finds serious professional misconduct.

- (C) Restore a name that was earlier removed.

Serious professional misconduct (infamous conduct)

- ▶ Defined as any conduct of the RMP that might reasonably be regarded as **disgraceful or dishonourable**, judged by professional peers of good repute — an **abuse of the professional position**.
- ▶ Examples appear in the **Warning Notice**, but the list is **not exhaustive**; each case is decided on its own facts.
- ▶ Illustrative offences:
 - Improper conduct or association with a patient (adultery itself is decriminalised — *Joseph Shine v Union of India*, 2018 — but remains professional misconduct).
 - Conviction involving moral turpitude.
 - Issuing a false or misleading certificate.
 - Contravening the Drugs and Cosmetics Act — e.g. selling Schedule H/L drugs without authorisation.
 - IVF/artificial insemination without written consent of all parties.
- ▶ The gravest group is remembered as "**the 6 A's**":
 - Adultery arising out of the professional relationship.
 - Advertising.
 - Abortion (unlawful).
 - Association with unqualified persons.
 - Addiction to drugs.
 - Alcohol consumption at the workplace.

Disciplinary procedure of the SMC

- ▶ **Initiation** — the enquiry can start when:
 - The RMP is convicted of a cognizable offence.
 - The RMP is censured by a competent authority.
 - Conduct is found *prima facie* serious misconduct.
 - A complaint is made by any person or body.
 - The Council acts *suo motu* (on its own initiative).
- ▶ The Council has the same powers as a **Civil Court under the CPC 1908**.
- ▶ Every enquiry is a **judicial proceeding** under **Sections 193, 219 and 228 IPC 1860 (now Sections 229, 257 and 267 BNS 2023)** — so false evidence before the Council is itself punishable.
- ▶ **Steps in the enquiry:**
 - Registrar → President → Sub-committee/Executive Committee, which investigates and takes legal advice.
 - No prima facie case: complainant informed, matter closed.
 - Prima facie case found: charge-sheet issues; the practitioner must answer in writing and attend — natural justice (*audi alteram partem*).

- Hearing: both parties present, evidence led.
- The Council votes on the charge; if confirmed by majority, a second vote decides between removal and a warning.
- ▶ **Publication:** any deletion from the register is widely published in the local press and medical-association publications.

Penalties, erasure, restoration and appeal

- ▶ **Warning notice / censure:** the mildest outcome — a formal warning not to repeat the offence.
- ▶ **Penal erasure:** removal of the name for serious professional misconduct, the most severe sanction; permanent or for a specified period.
- ▶ Called the "**professional death sentence**" — it strips every privilege of registration: to practise, recover fees, issue certificates, give expert evidence, and supply dangerous drugs.
- ▶ **Non-penal removal:** also on death of the practitioner, or an entry made in error/fraud — administrative, not disciplinary.
- ▶ **Restoration:** the SMC may direct restoration of an erased name, usually after the erasure period, once satisfied of good conduct.
- ▶ **Appeal:** classically to the State and Central Governments (MCI era); now to the **EMRB** (Section 27(1)(d) with Section 30), with further recourse to the NMC and courts.

Infamous conduct vs professional negligence

Trait	Professional negligence	Infamous conduct
Nature	Absence of proper care/skill, or wilful negligence	Violation of the Code of Medical Ethics
Duty of care	Must be present	Need not be present
Damage to person	Must be present	Need not be present
Tried by	Courts, civil or criminal	State Medical Council
Punishment	Fine or imprisonment	Erasure of name or warning
Appeal	Higher court	EMRB / NMC

Medico-legal significance

- ▶ The registration the SMC controls is the legal **licence to practise**.
- ▶ An erased doctor who keeps practising is a **quack**, with no right to sue for fees, give expert evidence, or issue valid certificates.
- ▶ The same Code governs duties most litigated against the forensic expert: consent, confidentiality, certification, documentation.
- ▶ Issuing a **false medico-legal certificate** is itself listed as misconduct.
- ▶ Because the SMC enquiry is a judicial proceeding, false evidence before it attracts **criminal liability in addition** to the disciplinary outcome.

- ▶ A single act can run on two parallel tracks: a botched procedure performed while drunk can mean negligence litigation in court (civil, or criminal under **Section 304A IPC 1860, now Section 106(1) BNS 2023**) and a separate SMC infamous-conduct enquiry.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Flowchart — SMC disciplinary process:** trigger (conviction / censure / complaint / suo motu) → Registrar → President → Sub-committee investigates → prima facie? → No: closed; Yes: charge-sheet → hearing (natural justice) → vote on charge → second vote → warning or erasure → publication → appeal (EMRB → NMC) → possible restoration.
- ▶ **Tier diagram — regulatory hierarchy:** NMC (apex, with EMRB for ethics and appeals) → State Medical Council (register + discipline) → Registered Medical Practitioner (licence to practise).



Informed consent

Asked in: Paper I Apr 2021 · Paper III Apr 2019 (2×) — RGUHS MD Forensic Medicine

Definition

- ▶ **Consent** is a voluntary agreement or permission — accepting the consequences of an act done on oneself.
- ▶ It is valid only after the person understands its purpose and its risks.
- ▶ **Informed consent:** the doctor discloses the condition, the treatment, its risks, benefits and alternatives before the patient decides.
- ▶ It rests on patient **autonomy** — the right of self-determination.
- ▶ It is the opposite of **paternalism**, where the doctor decides for the patient.

Kinds of consent

Basis	Type	Meaning
Information disclosed	Uninformed	Information withheld — illegal unless therapeutic privilege
	Informed	Full information given before consent
Manner of communication	Implied	Inferred from behaviour — only for general examination
	Express	Patient states it, orally or in writing
Special	Proxy	Relative/guardian consents when patient cannot
	Blanket	One "authorise anything" form — invalid in law

Basis	Type	Meaning
	Loco parentis	Person in charge of a child consents in an emergency

- ▶ Implied consent covers only a general examination.
- ▶ Sensitive examinations — breast, per-vaginal, per-rectal — always need express consent, even with a signed OPD card.
- ▶ Express written consent, taken before the act, is required for biopsy, lumbar puncture, transfusion, tapping, anaesthesia and all operations.

Components of informed consent

- ▶ **Disclosure:** the condition, the proposed treatment and its likelihood of success, the alternatives with their risks and cost, and the material risks of the procedure.
- ▶ **Disclosure** also covers the risk of *not* being treated — the basis of informed refusal.
- ▶ **Comprehension:** explained in the patient's own language, using an interpreter if needed.
- ▶ **Voluntariness:** no influence on the decision from the doctor, staff or relatives.
- ▶ **Competence:** the patient must be of proper age, mentally sound, and not under alcohol or drugs.
- ▶ **Actual consent:** reduced to writing, signed by the patient and by independent witnesses.

Rules of consent

- ▶ Oral consent is taken before a disinterested third party, such as a nurse.
- ▶ Written consent must name one specific procedure.
- ▶ Written consent must separately cover general anaesthesia.
- ▶ Written consent must confirm the procedure was explained before signing.
- ▶ Written consent must be witnessed by another person present at signing.
- ▶ Consent must be free, voluntary, informed, direct and personal, with no fraud, undue influence or threat.
- ▶ Contraceptive sterilisation needs consent from both husband and wife.
- ▶ One spouse's consent is not needed for the other's own treatment.
- ▶ A husband cannot refuse consent to surgery protecting his wife's health.
- ▶ Consent to an illegal act, such as criminal abortion, is invalid.
- ▶ Consent is no defence to professional negligence.

Consent in special situations

- ▶ **Age:** a person over 18 years, of sound mind, can consent to harm not intended or not known to be likely to cause death or grievous hurt (**Section 25 BNS 2023 / Section 87 IPC 1860**).
- ▶ A guardian consents for a child under 12 years or a person of unsound mind, for acts done in good faith for their benefit (**Section 27 BNS 2023 / Section 89 IPC 1860**).
- ▶ In practice: 12 years for an independent general examination, 18 years for an operation.
- ▶ **Emergency:** if the patient cannot consent and no guardian is available in time, good-faith treatment for their benefit is not an offence (**Section 30 BNS 2023 / Section 92 IPC 1860**).

- ▶ Consent is implied for a comatose or intoxicated patient with no guardian available.
- ▶ The **extension doctrine** lets a surgeon extend a consented operation for an unanticipated life-threatening finding, but never for a non-essential procedure or to cause death.
- ▶ **Mental illness / intoxication:** consent from someone unable to understand the act, due to unsoundness of mind or intoxication, is invalid (**Section 28 BNS 2023 / Section 90 IPC 1860**).
- ▶ **Drunkenness:** a person must not be examined, and blood, urine or breath samples must not be collected, without written consent.
- ▶ If incapable, examination can proceed with a guardian's consent, or on a sub-inspector's request.
- ▶ **Criminal cases:** a victim cannot be examined without consent, and a court cannot compel examination against a person's will.
- ▶ In rape, and in medico-legal pregnancy, delivery or abortion cases, the woman must not be examined without her written consent.

Therapeutic privilege, informed refusal and paternalism

- ▶ **Therapeutic privilege** lets a doctor withhold a remote or theoretical risk if disclosure would make a fearful patient refuse needed low-risk treatment.
- ▶ It is justified mainly in frank psychosis or severe psycho-neurosis.
- ▶ The doctor should record the decision and reasons, obtain a confirming consultation, and inform the spouse or next-of-kin where possible.
- ▶ A fatal diagnosis may sometimes be withheld, but **HIV status must never be withheld** — the patient needs to know it to prevent its spread.
- ▶ **Informed refusal** means the doctor must also disclose the risks of refusing a test, treatment, admission or discharge.
- ▶ A valid refusal, or discharge against medical advice (LAMA), must be written and signed by the patient, doctor and a witness.
- ▶ **Paternalism** is the doctor deciding for a competent patient, denying their autonomy.
- ▶ In a conscious, mentally sound adult, paternalism is illegal and actionable as criminal force under **Section 129 BNS 2023 (Section 350 IPC)**.
- ▶ Paternalism and full autonomy sit at opposite ends of a continuum, with therapeutic privilege in between.

Medico-legal significance

- ▶ Examining, treating or operating on a competent patient without valid consent is criminal force or assault, even in good faith (**Section 129/130 BNS 2023 / Section 350/351 IPC**).
- ▶ *Drummond's Case* held that giving a drug without the person's knowledge and consent is assault.
- ▶ Consent does not protect a doctor from liability for professional negligence.
- ▶ The **Bolam test** sets the standard: a doctor is not negligent if he follows a practice accepted as proper by a responsible body of medical opinion.
- ▶ Documentation is the doctor's best defence: written, specific, witnessed consent.
- ▶ Recorded therapeutic-privilege reasoning and a written informed refusal/LAMA also protect the doctor.

- ▶ An arrested person examined under **Section 51 BNSS 2023 (Section 53 CrPC 1973)** must get a copy of the report.
- ▶ Special consents needed: both spouses for sterilisation; guardian/legal heirs for organ donation, transplant or autopsy.
- ▶ Clinical trials need voluntary informed consent (**Nuremberg Code 1947, Declaration of Helsinki 1964**).
- ▶ In *Rogers v. Lumbermen's Mutual Casualty Co.*, a surgeon extended a consented appendectomy into a hysterectomy; his pre-signed blanket form could not defend him, and the extension was held actionable.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **The autonomy–paternalism continuum:** a horizontal spectrum from "*Paternalism (doctor decides; illegal — S.129 BNS / S.350 IPC)*" on the left, through "*Therapeutic privilege*" in the centre, to "*Complete patient autonomy (full disclosure)*" on the right.
- ▶ **Flowchart — "Is the consent valid?":** Competent (age, sound mind, not intoxicated)? → Information fully disclosed? → Voluntary and uncoerced? → Express, written and witnessed? → **Valid informed consent**.
- ▶ Side branches: emergency or unconscious patient → implied consent (S.30 BNS / S.92 IPC); child under 12 or unsound mind → guardian/proxy consent (S.27/S.28 BNS).



Last clear chance doctrine

Asked in: Paper III Apr 2019 — RGUHS MD Forensic Medicine

Definition

- ▶ The **last clear chance doctrine** is an exception to the doctor's defence of **contributory negligence**.
- ▶ It applies only when **both the doctor and the patient have been negligent**.
- ▶ The doctor **loses that defence** if he had one final, realistic chance to spot the danger and prevent the harm, and failed to act on it.
- ▶ Legal responsibility shifts back to whichever party held the **last clear chance** to prevent the injury.

Where it fits in the law of negligence

- ▶ **Medical negligence** needs the "**4 Ds**": Duty of care, Dereliction of that duty, Direct causation, and Damage.
- ▶ A harmed patient falls into one of three situations.
 - Doctor alone negligent — plain **medical negligence**.
 - Patient alone negligent — **patient's own negligence**.
 - Both negligent — **contributory negligence**.
- ▶ **Contributory negligence:** unreasonable conduct or want of care by the patient (or attendant) that combines with the doctor's negligence to cause the injury.

- Examples: an inaccurate history, not following instructions, refusing treatment, leaving hospital against advice, not seeking help when symptoms persist.
- ▶ The last clear chance doctrine is one of several **limitations** on this defence, alongside **comparative negligence**, the **avoidable consequences rule**, and the **Good Samaritan doctrine**.

The doctrine explained

- ▶ **Core rule:** a patient who negligently put himself in danger can still recover damages if the doctor discovered that danger in time to prevent harm but failed to act.
- ▶ **Effect:** contributory negligence is normally a good partial defence for the doctor, but this doctrine strips it away.
 - The doctor's later failure to act becomes the **direct, proximate cause** of the harm.
 - The patient's earlier negligence stops being the operative cause in law.
- ▶ **Worked example:**
 - A doctor prescribes a drug without warning of side-effects (doctor negligent).
 - The patient develops a rash but does not report it at first (patient negligent too).
 - At the next visit the doctor actually sees the rash and still does nothing.
 - Because the doctor had the last clear chance to prevent the injury, he cannot plead contributory negligence.
- ▶ **Rationale:** this rests on **proximate cause** — the doctor's final missed opportunity, not the patient's earlier lapse, is treated as the operative cause of harm.

Comparison with related doctrines

Doctrine	Who is negligent	Key idea	Effect
Contributory negligence	Doctor and patient	Patient's own carelessness contributes to the harm	Good partial defence; damages may be reduced
Comparative negligence	Doctor and patient	Court apportions fault by quantum (e.g. 80% patient : 20% doctor)	Liability reduced in proportion
Last clear chance doctrine	Doctor and patient	Doctor had the final chance to avert harm and missed it	Doctor loses the defence; patient recovers
Avoidable consequences rule	Doctor and patient	Patient had the last chance to limit his own injury and missed it	Doctor escapes liability for the self-aggravated part
Good Samaritan doctrine	Rescuer/doctor in an emergency	Assisting a person in danger is not contributory negligence unless reckless	Rescuer protected

- ▶ **Mirror pair:** the last clear chance doctrine works **against the doctor**; the avoidable consequences rule works **against the patient** — the same idea seen from the other side.

- ▶ Example of the avoidable consequences rule: a doctor leaves a wound unbandaged and without antibiotics but advises the patient to keep it clean and return in a week.
 - The patient instead applies cow dung to it, develops pus, and never returns.
 - Here the doctor is shielded, because the patient could have avoided the worsening but did not.

Medico-legal significance

- ▶ Deciding whether the doctor had the "last clear chance" decides whether his contributory-negligence defence survives, and so whether the patient is compensated.
- ▶ It shapes good clinical practice: the doctor must document warnings, act on every abnormal finding he actually notices, give clear instructions, and arrange follow-up.
- ▶ A doctor who sees a developing complication and ignores it cannot later blame the patient.
- ▶ **Burden of proof** for contributory negligence lies entirely on the **doctor** who pleads it.
- ▶ A doctor also cannot plead contributory negligence if he himself failed to give proper instructions to the patient.
- ▶ Contributory negligence — and therefore the last clear chance doctrine — is a good defence only in **civil** cases, never in criminal cases.
- ▶ Civil claims proceed under the law of tort and the **Consumer Protection Act** (the patient as "consumer").
- ▶ Criminal negligence by a doctor is prosecuted under **Section 106(1), Bharatiya Nyaya Sanhita (BNS) 2023** (formerly **Section 304A, Indian Penal Code (IPC) 1860**).
 - This provision punishes causing death by a rash or negligent act with imprisonment up to five years plus fine.
 - It carries a special **two-year** ceiling when the act is done by a registered medical practitioner performing a medical procedure.
- ▶ Other concepts the doctrine interacts with: *volenti non fit injuria*, the doctrine of calculated risks, *res ipsa loquitur*, *novus actus interveniens*, and **composite negligence** (two or more doctors negligent, no patient negligence, so damages are not apportioned to the patient).

High-yield exam pointers

- ▶ Last clear chance doctrine = an **exception to the defence of contributory negligence**, applied **against the doctor**.
- ▶ Applies only when **both** doctor and patient are negligent.
- ▶ Effect: a doctor with the last realistic chance to avert harm, who fails to use it, **loses the defence** — the patient recovers.
- ▶ **Avoidable consequences rule** = the mirror version, applied against the **patient**.
- ▶ **Good Samaritan doctrine** protects a rescuer unless the help given was reckless or rash.
- ▶ **Comparative negligence** apportions damages by fault (classic 80:20 example).
- ▶ Burden of proof of contributory negligence rests on the **doctor**.
- ▶ Contributory negligence is a defence **only in civil cases**, never in criminal cases.

- ▶ Criminal-negligence statute: **Section 304A IPC 1860, now Section 106 BNS 2023**, with a 2-year sub-clause for a registered medical practitioner.
- ▶ Often examined together with *res ipsa loquitur*, *novus actus interveniens*, composite negligence, and the "4 Ds" of negligence.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Flowchart:** *Patient suffers harm* → *Doctor negligent?* + *Patient negligent?* (both yes) → *Contributory negligence arises* → three branches:
 - Court apportions damages → **Comparative negligence** (e.g. 80:20).
 - Did the **doctor** have the last chance and fail? → **Last Clear Chance Doctrine** → doctor loses defence, patient recovers.
 - Did the **patient** have the last chance and fail? → **Avoidable Consequences Rule** → doctor not liable for the self-aggravated part.
- ▶ **Venn diagram — three situations of negligence:** doctor negligent only (medical negligence, doctor liable); patient negligent only (doctor not liable); overlap zone (contributory negligence, modified by last clear chance / avoidable consequences / Good Samaritan).



Medico-legal duties of Registered Medical Practitioner in case of suspected poisoning

Asked in: Paper III Jun 2024 — RGUHS MD Forensic Medicine

Definition / Introduction

- ▶ A **Registered Medical Practitioner (RMP)** faces two duties in every suspected-poisoning case.
- ▶ **Medical duty:** resuscitate and treat the patient first.
- ▶ **Legal duty:** help the police/Magistrate decide whether the poisoning was **accidental, suicidal or homicidal**.
- ▶ Every suspected poisoning is a **medico-legal case (MLC)** — the doctor cannot decide the manner and must collect/preserve evidence.
- ▶ Failure to fulfil the legal duties is punishable under the **Bharatiya Nyaya Sanhita (BNS) 2023** and **Bharatiya Nagarik Suraksha Sanhita (BNSS) 2023**, which replaced the IPC and CrPC from 1 July 2024.

Medical duties — life first

- ▶ **Resuscitation comes first** — treatment always precedes legal formality.
- ▶ Follow the **ABCD** of resuscitation:
 - **Airway** — clear it of secretions/vomit, intubate if needed.
 - **Breathing** — support with supplemental oxygen.
 - **Circulation** — maintain with IV fluids.
 - **Depression** — correct CNS depression.

- ▶ Place an unconscious patient in the **recovery position** so the tongue does not obstruct the airway.
- ▶ **Decontaminate**: move an inhaled case to fresh air, or apply a loose proximal ligature (release every 10 min) for an injected poison.
- ▶ Perform **gastric lavage** where indicated.
- ▶ **Corrosive poisoning is the only absolute contraindication to lavage** (except carbolic acid) — risk of perforation.
- ▶ **Give a specific antidote when available**:
 - **Organophosphates**: atropine plus pralidoxime.
 - **Opioids**: naloxone.
 - **Heavy metals**: BAL, EDTA, penicillamine or DMSA (chelating agents).
- ▶ Use enhanced elimination (forced alkaline diuresis, haemodialysis, activated charcoal) when justified.
- ▶ Give supportive care and assess for **suicidal intent** early.
- ▶ **Preserve evidence while treating** — save vomitus, the first lavage return and urine before discarding.

Legal duties — assisting the law

The core legal duty is helping the police/Magistrate establish the manner of poisoning, since the doctor cannot decide it himself.

- ▶ **Inform the police** in every suspected or confirmed poisoning — accidental, suicidal or homicidal, whether government or private practitioner.
- ▶ **In suspected homicidal poisoning, confirm the suspicion before giving any opinion**:
 - Check the route, quantity and time of exposure.
 - Note any change in the food/drink's colour, taste or smell, and whether others were affected too.
 - Record statements from those present, and consult a senior colleague **in strict confidence**.
- ▶ **Take valid consent**:
 - A child over 12 can consent himself.
 - Below 12, or if mentally ill, the guardian consents.
 - If comatose or a fatal dose was taken, an attendant consents — or treat in good faith to save life.
- ▶ **Prepare the MLC report in 3 copies** (police, patient, hospital) and write "**MLC**" in bold on the file.
- ▶ **Record two identification marks and a thumb impression** for court identification.
- ▶ **Collect, label and seal evidence for FSL analysis**:
 - Vomitus and gastric-lavage fluid.
 - Blood, urine and faeces.
 - Soiled clothing or bedsheet.
 - Any container or bottle of the poison.

- ▶ Hand the sealed samples to police with the officer's signature — this maintains the **chain of custody**.
- ▶ **Arrange a dying declaration if the patient is likely to die:**
 - Call the Magistrate to examine the patient and certify he is **mentally fit** ("**compos mentis**").
 - The doctor may record and sign it himself if the Magistrate is unavailable.
- ▶ **On death:** never issue a death certificate — inform the police and send the body for autopsy.
- ▶ **In food poisoning,** additionally collect the suspected food for FSL analysis and notify the **public-health authorities**.
- ▶ Give the **final opinion on cause of death only after the FSL report** is received.
- ▶ **Maintain records:** medico-legal records are retained for 10 years or until the case is disposed of in court.

Doctor's duties at autopsy in fatal poisoning

- ▶ Study the inquest report and clinical records.
- ▶ Take history from relatives, including **occupational history** — a farmer is most often poisoned by organophosphates.
- ▶ **Open the skull first** to detect smell in the brain (alcohol, cyanide, ether, chloroform, phenol, cresol, camphor) — opening another cavity first can mask it.
- ▶ **Pupils:**
 - **Miosis** (constriction): carbolic acid, opioids, organophosphates, barbiturates.
 - **Mydriasis** (dilation): datura/atropine, cocaine, cyanide.
- ▶ **Post-mortem hypostasis colour:**
 - Cherry-red — carbon monoxide.
 - Bright red — cyanide.
 - Brown — nitrites/methaemoglobinaemia (an abnormal haemoglobin that cannot carry oxygen).
- ▶ **Preserve the viscera in five glass containers** — never plastic, since volatile poisons diffuse through it.
- ▶ Fill each about two-thirds full, label, seal with the departmental wax seal, and dispatch with the FSL forwarding letter and a post-mortem report copy.

#	Viscera / sample	Preservative
1	Stomach + contents, upper 30 cm small intestine	Saturated common-salt solution
2	Liver (~500 g) + half of each kidney + spleen	Saturated common-salt solution
3	Blood (~10 mL)	Sodium fluoride + potassium oxalate
4	Urine (~30 mL)	Thymol grains + sodium benzoate

#	Viscera / sample	Preservative
5	Preservative control sample	Sent to exclude contamination

- ▶ **Never use rectified spirit** for alcohol, phosphorus or paraquat poisoning — use saturated salt solution instead.
- ▶ **Sodium citrate** replaces the blood preservative for suspected oxalic acid, ethylene glycol or carbon monoxide.

Medico-legal significance

- ▶ **Duty to inform police of an offence** — **Section 33 BNSS 2023** (formerly Section 39 CrPC 1973): covers murder (**Section 103 BNS**) and culpable homicide (**Section 105 BNS**), but the doctor reports *every* manner of poisoning since he cannot decide which it is.
- ▶ **Non-reporting** by a person legally bound to inform: **Section 211 BNS 2023** (formerly Section 176 IPC 1860) — up to 1 month, or fine, or both.
- ▶ **Giving or fabricating false evidence** in a judicial proceeding: **Section 229 BNS 2023** (formerly Section 193 IPC 1860) — up to 7 years plus fine.
- ▶ **Causing disappearance of evidence** to screen the offender — e.g. deliberately not collecting/preserving samples: **Section 238 BNS 2023** (formerly Section 201 IPC 1860).
- ▶ **Intentional omission to inform** an offence: **Section 239 BNS 2023** (formerly Section 202 IPC 1860).
- ▶ A doctor summoned during a **police inquest** (**Section 194 BNSS 2023**, formerly Section 174 CrPC 1973) must give all case information (**Section 195 BNSS 2023**, formerly Section 175 CrPC 1973).
- ▶ The **dying declaration** is admissible under **Section 26 BSA 2023** (formerly Section 32 IEA 1872).
- ▶ The doctor's toxicological opinion is admissible as **expert evidence** under **Section 39 BSA 2023** (formerly Section 45 IEA 1872).
- ▶ The doctor forms part of the **tripod of proof** in fatal poisoning, with the police officer and the chemical examiner (FSL) — proving poisoning "beyond reasonable doubt."

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ Flowchart — "Medico-legal duties of an RMP in suspected poisoning": start with *patient with suspected poisoning* → *treated as an MLC*, splitting into two branches.
- ▶ **Medical branch:** resuscitate (ABCD) → decontaminate/lavage → give antidote → supportive/psychiatric care.
- ▶ **Legal branch:** inform police → consent + MLC report (3 copies) → ID marks + thumb impression → collect/seal evidence (chain of custody) → dying declaration → death: no certificate, inform police + autopsy → food poisoning: notify public health → final opinion after FSL report.
- ▶ Both branches converge on a final box: "*Final opinion on cause/manner of poisoning.*"
- ▶ **Labelled diagram — viscera-preservation bottles:** five glass containers, each labelled with its contents and preservative (per the table above).
- ▶ Add a callout for the wax-sealed lid and signed label, showing the chain of custody.



Narcoanalysis and its legal validity in India

Asked in: Paper III Apr 2021 — RGUHS MD Forensic Medicine

Definition and principle

- ▶ **Narcoanalysis** is interrogation of a suspect after deliberately inducing **narcosis** — a drug-induced, sleep-like, semiconscious state.
- ▶ Narcosis relaxes higher mental control so that concealed information may be elicited.
- ▶ It is one of three **Deception Detection Tests (DDTs)**, alongside the **polygraph** and **EEG-based memory tests**.
- ▶ The EEG-based test is **brain fingerprinting / brain mapping** — Farwell's P300/MERMER technique.
- ▶ India's own variant is **BEOS (Brain Electrical Oscillation Signature)**, developed by C R Mukundan in 2003.
- ▶ The drug is loosely called a "**truth serum**" — a misnomer, since it is not a serum and does not guarantee truth.
- ▶ The term *narcoanalysis* was coined by J. Stephen Horsley (UK, 1943).
- ▶ Its legal validity in India is governed by ***Selvi v. State of Karnataka*** (2010), which bars involuntary testing.

Mechanism

- ▶ Lying needs **conscious imagination** to invent and sustain a falsehood; telling the truth needs no such effort.
- ▶ A carefully titrated IV **barbiturate** produces a **hypnotic trance** with temporary loss of mental control.
- ▶ This causes **increased suggestibility**, weakened self-censorship, and blunted emotional response.

- ▶ In this disinhibited state the subject is **less able to hide or fabricate** information.
- ▶ The effect resembles alcohol-induced disinhibition — *in vino veritas* ("in wine, there is truth").
- ▶ The drug removes inhibition but **not self-control** — the subject can still lie or **confabulate** (unknowingly produce false memories and present them as real).
- ▶ This is why a **high rate of false negatives** (a guilty person failing to confess) is a recognised limitation.

Drugs used ("truth serums")

- ▶ **Sodium pentothal / amytal** (thiopentone) — the classic truth serum — given as a 2.5–5% solution IV, at a rate not exceeding 1 mL, until the desired stage is reached.
- ▶ **Scopolamine hydrobromide** — 0.5 mg subcutaneously, then 0.25 mg every 20 minutes (average 3–6 injections) until the subject is fit for questioning.
- ▶ **Combination regimen** — secobarbital 0.1 g first, then 45 minutes later morphine 15 mg plus scopolamine 0.5 mg (IV or SC).
- ▶ These drugs **depress the central nervous system, lower blood pressure and slow the heart rate**.
- ▶ The dose must be individualised to the subject's age, sex and general health.
- ▶ A wrong or excess dose can cause **coma or sudden death**.

Procedure and prerequisites

- ▶ Conducted in a **government hospital**, and only after a **court order**.
- ▶ **Consent of the subject is mandatory** (post-*Selvi*).
- ▶ Reserved for **serious offences** — homicide, sexual offences, cases of national interest — not for routine investigation.
- ▶ **Team:** an anaesthetist (administers and monitors the drug), a psychiatrist, a forensic psychologist (interrogates and writes the report), an audio-videographer, and nursing staff.
- ▶ The **entire interrogation is recorded on audio and video**.

Indian experience — cases

- ▶ **First used in India** in the Godhra carnage probe (2002).
- ▶ Came under scrutiny during the **Telgi stamp-paper scam** (2003).
- ▶ Used in the **Aarushi Talwar** (2008) and **Nithari** (2006) investigations.
- ▶ Other reported instances: Mumbai serial blasts (1993), Bhima Koregaon case (2018), Unnao rape case (2019), Shraddha Walkar case (2022).

Legal validity — *Selvi v. State of Karnataka* (2010)

- ▶ Grounded in the **right against self-incrimination**, Article 20(3) of the Constitution — no accused can be compelled to be a witness against himself.
- ▶ Reinforced by **Section 180(2) BNSS 2023** (formerly **Section 161(2) CrPC 1973**) — police cannot compel a person to answer questions that expose him to a criminal charge.
- ▶ The Supreme Court held that **no DDT — narcoanalysis, polygraph or BEOS — can be administered without consent**.

- ▶ Compulsory testing violates **Article 20(3)** and the right to life and personal liberty under **Article 21**, and amounts to **cruel, inhuman or degrading treatment**.
- ▶ **Even with consent, the test result itself is not admissible as substantive evidence** — in the Court's words, "the subject does not exercise conscious control over the responses during the administration of the test."
- ▶ **Information subsequently discovered** with the help of a voluntary test **can be admitted**, under the discovery-of-fact rule now in **Section 23 Bharatiya Sakshya Adhiniyam (BSA) 2023** (formerly **Section 27 Indian Evidence Act 1872**).
- ▶ The Court adopted the **NHRC Guidelines on Administration of Polygraph Test (12 November 1999)** as binding procedural safeguards.
- ▶ DDT results are **corroborative, not conclusive** — they guide investigation but cannot by themselves prove guilt or innocence.

Medico-legal significance

- ▶ **Consent is the cardinal safeguard** — the doctor must verify a valid court order and recorded, informed consent before participating.
- ▶ Under the NHRC/*Selvi* safeguards, the subject may **refuse the test** and has **access to a lawyer**.
- ▶ **Consent is recorded before a Judicial Magistrate**.
- ▶ The subject must be told the statement is **not a confession to the Magistrate** — it only carries the status of a statement made to police.
- ▶ Recording must be done by an **independent agency** (e.g., a hospital), in the lawyer's presence, with full medical and factual documentation.
- ▶ **Doctor's duties:** screen for contraindications (cardiac, respiratory or hepatic disease, drug hypersensitivity), titrate the dose to the subject's build, monitor continuously, and document the session on audio-video.
- ▶ Forced use of "truth drugs" is regarded as **torture under international law**.
- ▶ Under the **WMA Declaration of Tokyo (1975)**, a doctor **must not participate in torture or coercive interrogation**.
- ▶ A drug-assisted interview remains acceptable in **consensual therapeutic psychiatric evaluation** — a distinct clinical use.
- ▶ **Evidentiary status:** narcoanalysis output is corroborative only — it may guide investigation and lead to admissible derivative evidence, but is not itself proof of guilt.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Flowchart — "Narcoanalysis: administration to admissibility":**
 - Court order.
 - Informed written consent, recorded before a Judicial Magistrate.
 - Team assembled — anaesthetist, psychiatrist, forensic psychologist, audio-videographer, nurse.
 - IV barbiturate, titrated dose.
 - Hypnotic trance / disinhibition.
 - Interrogation, audio-video recorded.
 - Report by forensic psychologist.
 - Branch: test statement itself is inadmissible (no conscious control) versus a fact subsequently discovered is admissible (§23 BSA / §27 IEA).
- ▶ **Comparison panel — three Deception Detection Tests:**
 - **Polygraph:** records blood pressure, pulse, respiration, galvanic skin response — fear/emotion-based.
 - **Narcoanalysis:** IV barbiturate leading to disinhibited speech.
 - **Brain mapping / brain fingerprinting:** EEG cap, Farwell's P300/MERMER and the Indian BEOS variant — detects stored memory, not emotion.



Professional Secrecy

Asked in: Paper III Oct 2017 — RGUHS MD Forensic Medicine

Definition / Introduction

- ▶ **Professional secrecy** (also called **confidentiality**) is the registered medical practitioner's (RMP's) legal, ethical and contractual duty to keep secret everything he learns about a patient during professional work.
- ▶ It is an **implied term of the doctor–patient contract**.
- ▶ A patient tells the truth only if he trusts it will stay secret, so secrecy protects the accuracy of the history itself.
- ▶ An unjustified breach exposes the doctor to civil damages, criminal defamation and disciplinary action.
- ▶ Its lawful counterpart is **privileged communication** — situations where the doctor may or must disclose without liability, because a higher duty overrides secrecy.

Basis, scope and nature of the obligation

- ▶ **Basis:** an implied contract term plus an ethical duty under the Hippocratic Oath, the Declaration of Geneva, and the NMC/MCI Code of Ethics.
- ▶ Breach without lawful excuse is **professional misconduct**.

- ▶ **Scope:** covers everything the doctor learns — diagnosis, prognosis, history, investigation findings, even the fact of consultation itself.
- ▶ **The privilege belongs to the patient, not the doctor** — only the patient can waive it.
- ▶ It **persists after death** and **after the relationship ends**, even when treatment was free or within a family.

Situations where the doctor must NOT disclose

- ▶ An adult patient's illness must not be told to relatives without his consent, even if they are paying the fees.
- ▶ For a **minor** or a person of **unsound mind**, the guardian/parents should be told the nature of the illness.
- ▶ No reply should be given to a third party's enquiry, even a near relative, without the patient's consent.
- ▶ **Husband and wife:** one spouse's condition must not be revealed to the other without consent.
 - **Exception:** if the condition is itself a ground for **divorce or nullity of marriage** — unsoundness of mind, venereal disease, leprosy, or impotence — it may be disclosed to the other spouse as privileged communication.
- ▶ No press conferences about a celebrity patient.
- ▶ No disclosure to an insurer about a **former** patient without consent.
- ▶ A case may be reported in a medical journal, but the **patient's identity must be concealed**.
- ▶ **Foetal sex** on ultrasound must never be disclosed — a statutory prohibition under **Section 5(2), PC-PNDT Act 1994**.
- ▶ **Post-mortem findings** go only to the police/court, not even to the closest relatives (subject to disclosure under the RTI Act 2005 per Central Information Commission rulings).

Privileged communication — the exception to secrecy

- ▶ A **privileged communication** is a *bona fide* (genuine, good-faith) statement by the doctor to a **proper authority with a corresponding interest or duty** in receiving it.
- ▶ It is made because the doctor's duty to protect the community, the State, or a third party overrides secrecy.
- ▶ **Safeguard 1:** it must be told only to the one person with a genuine interest or duty — telling more than one person, or someone with no direct interest, and the **plea of privilege fails**.
- ▶ **Safeguard 2:** the doctor should **first try to persuade the patient** to agree, disclosing only if persuasion fails, and even then only the minimum necessary.
- ▶ When properly made, the doctor is **not liable to damages**.

Situation	Example
Interest of society	Epileptic/alcoholic driver or pilot; VD in a public-pool user — inform the authority if persuasion fails.
Infected food-handler/employee	Cook with enteric infection, or nurse with TB — inform the employer if they refuse to stop work.

Situation	Example
Notifiable disease	Statutory duty to notify births, deaths and specified infectious diseases.
Patient's own interest	Warn guardians of suicidal tendency so the patient can be watched.
Doctor's self-interest	Evidence about the patient in a negligence suit the patient has brought.
Third-party examination	Examined for an employer/insurer — examinee's <i>tacit consent</i> lets the finding go to them.
Medico-legal case	Every medico-legal case (gunshot, poisoning, homicide) reported to police, irrespective of the patient's wish.
Grave offence (§33 BNSS)	Narrower statutory duty to report <i>enumerated</i> grave offences forthwith to a Magistrate.
Court of law	Must answer when directed; sealed-envelope answer allowed, but disclosure cannot be refused .
Waiver	The patient's express permission to disclose.

Confidentiality and HIV/AIDS — the third-party-interest exception

- ▶ A doctor normally keeps a patient's HIV-positive status secret.
- ▶ But he may disclose it to a **prospective spouse or sexual partner at real risk**, because the duty to that identifiable third party overrides confidentiality.
- ▶ A married partner's HIV status may likewise be told to the spouse, who may then seek divorce under the Hindu Marriage Act 1955.
- ▶ **Landmark case: *Mr "X" v. Hospital "Z"* (1998) 8 SCC 296** — the hospital disclosed X's HIV status to his fiancée, and the marriage was called off.
- ▶ The Supreme Court held this did **not** violate confidentiality, since it protected the fiancée's life.
- ▶ The duty not to knowingly spread an infection dangerous to life — §§269/270 IPC 1860, **now** §§271/272 BNS 2023 — casts a corresponding duty on the HIV-positive person.
- ▶ Later judgments have qualified the *obiter* (non-binding side) remarks on the "right to marry".

Medico-legal significance

- ▶ **Wrongful breach = triple jeopardy:**
 - **Civil** — if disclosure was voluntary, harmful and not in the public interest, the patient may sue for **damages**.
 - **Criminal defamation** — §§499/500 IPC 1860 (**now** §356 BNS 2023).
 - **Disciplinary** — the State Medical Council/NMC may treat it as **professional misconduct** and strike the practitioner off the register.
- ▶ **Failing to disclose when legally bound is also an offence:**
 - Omission to inform a public servant — §176 IPC (**now** §211 BNS 2023).
 - Causing disappearance of evidence — §201 IPC (**now** §238 BNS 2023).

- ▶ **Some statutes override secrecy** — notifiable diseases, births/deaths, and the grave offences under §33 BNSS 2023 (formerly §39 CrPC 1973), which requires forthwith reporting of enumerated grave offences (murder, kidnapping, offences against the State, and similar) to a Magistrate.
 - **Grievous hurt** (BNS §§116/117) and **criminal abortion** (BNS §§88–92) are **not** in this list — their reporting rests on the general medico-legal-case duty, not §33 BNSS.
- ▶ **Other statutes reinforce secrecy:**
 - PC-PNDT §5(2) — foetal sex must never be disclosed.
 - MTP Act §5A(1) — patient's name kept secret, register confidential for five years.
 - Mental Healthcare Act 2017 §23(1) — confidentiality right for a person with mental illness.
- ▶ **Unifying principle:** secrecy is the rule, protecting the individual; privileged communication is the lawful exception, protecting a wider, identifiable interest — valid only when made *bona fide* to someone with a genuine interest or duty.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Flowchart** — "Confidentiality and its exceptions": central box **Professional Secrecy**.
- ▶ **Left branch** — **Rule: do NOT disclose:** major's relatives; third parties; spouse; press/insurer; journal (hide identity); foetal sex (PC-PNDT §5(2)); PM findings (police only).
- ▶ **Right branch** — **Exception: Privileged Communication:** society; food-handler; notifiable disease; patient's interest; doctor's self-interest; third-party exam; medico-legal case → police; grave offence → Magistrate (§33 BNSS); court (sealed envelope); HIV → spouse (*X v Hospital Z*); waiver.
- ▶ **Side-note:** "Persuade first; disclose the minimum, only to one with a real interest."



Record of evidence

Asked in: Paper III Oct 2018 · Paper III Apr 2018 (2×) — RGUHS MD Forensic Medicine

Definition

- ▶ **Recording of evidence** is the court-supervised process of taking a witness's oral testimony, writing it down, and getting it authenticated.
- ▶ For a doctor it starts when he is sworn in the witness box.
- ▶ It ends when he reads and signs his **deposition** (the written record of his testimony).
- ▶ Under the **Bharatiya Sakshya Adhiniyam (BSA) 2023**, "evidence" covers both oral evidence (permitted witness statements) and documentary evidence (documents, including electronic records, put before the court).
- ▶ A doctor gives **corroborative expert opinion** — he is a witness of fact, not "a witness of the truth."

Forms of evidence

- ▶ **Oral evidence:** statements made before the court.

- Must be **direct** — from someone who actually saw, heard, or perceived the fact [Section 55, BSA 2023 (Section 60, IEA 1872)].
- **Direct evidence:** testimony about a fact actually in issue.
- **Indirect / circumstantial evidence:** facts from which the court draws an inference, e.g. the accused was seen near the scene with a weapon [Section 4, BSA 2023 (Section 6, IEA 1872)].
- **Hearsay:** what the witness heard from someone else, not personally perceived; generally inadmissible.
- ▶ **Documentary evidence:** medical certificates, medico-legal reports, the dying declaration, and laboratory/FSL reports.
 - It becomes evidence only **after the doctor attends court and proves it on oath**.
- ▶ **Material evidence (exhibits):** clothing, weapons, viscera, swabs, and trace material.
 - Must have an intact, documented **chain of custody** from collection to court.
- ▶ **Exceptions, where the maker need not be present in person:**
 - The **dying declaration** [Section 26, BSA 2023 (Section 32, IEA 1872)].
 - An opinion in a standard treatise, if its author is dead or unavailable to testify [Section 55, BSA 2023].
 - A magistrate-attested deposition from a lower court, read into evidence in a higher court [Section 326, BNSS 2023 (Section 291, CrPC 1973)].

Preliminaries before evidence is recorded

- ▶ The witness attends on a **summons/subpoena** [Sections 63–71, BNSS 2023 (Sections 61–69, CrPC 1973)].
- ▶ Non-attendance without justification invites fine, warrant, or prosecution [Section 208, BNS 2023 (Section 174, IPC 1860)].
- ▶ **Conduct money** (a travel fee) is paid in **civil** cases when the summons is served.
- ▶ In **criminal** cases no conduct money is paid up front, but travel and daily allowance (TA/DA) can be claimed later [Section 350, BNSS 2023 (Section 312, CrPC 1973)].
- ▶ An **oath or affirmation** is compulsory before any evidence is recorded [Indian Oaths Act 1969].
- ▶ The operative oath wording is "...the truth, the whole truth, and nothing but the truth."
- ▶ A person with no religious belief may "solemnly affirm" instead — the law treats affirmation as equivalent to an oath [Section 2(23), BNS 2023 (Section 51, IPC 1860)].
- ▶ A child below 12 years need not take an oath but may still depose.

Order of recording evidence

- ▶ The statutory sequence is fixed [Section 143, BSA 2023 (Section 138, IEA 1872)]: examination-in-chief, then cross-examination, then re-examination, then questions from the court if needed.

Stage	Conducted by	Leading questions
Examination-in-chief [S.142 BSA (S.137 IEA)]	Lawyer of the side that called the witness	Not allowed, unless court permits or witness is hostile

Stage	Conducted by	Leading questions
Cross-examination [S.142 BSA (S.137 IEA)]	Lawyer of the opposite (defence) side	Allowed [S.146 BSA (Ss.141–143 IEA)]
Re-examination	Lawyer of the side that called the witness	Not allowed; no new matter without leave

- ▶ A **leading question** suggests its own answer or invites "yes/no" — e.g. "Was the cut 3 cm long?" instead of "What was the length of the cut?"
- ▶ After re-examination, the **Judge may put any question, at any stage**, and may recall any witness essential to a just decision [Section 168, BSA 2023 (Section 165, IEA 1872); Section 348, BNSS 2023 (Section 311, CrPC 1973)].
- ▶ A **hostile witness** (one whose court statement contradicts his earlier statement) may, with the Judge's leave, be cross-examined — including by leading questions — by the very side that called him.

How the evidence is written down

- ▶ It is recorded as a **connected narrative**, not word-for-word question and answer [Sections 310 & 311, BNSS 2023 (Sections 275 & 276, CrPC 1973)].
- ▶ At the close of testimony the **deposition is read over to the witness (translated if needed) and handed to him**.
- ▶ He **signs the bottom of every page** and just below the last paragraph, and **initials every correction** [Section 313, BNSS 2023 (Section 278, CrPC 1973)].
- ▶ He must not leave the court without the Judge's permission.

Recording a dying declaration

- ▶ The **dying declaration** is a dying person's statement about the cause of death or the circumstances leading to it [Section 26, BSA 2023 (Section 32, IEA 1872)].
- ▶ Best recorded by a **Magistrate**; if none is available, the doctor records it before two witnesses.
- ▶ **No oath is administered** — a dying person is presumed to speak the truth.
- ▶ It is recorded **in the declarant's own words**, without leading questions.
- ▶ It is then read over and signed or thumb-marked by the declarant, the doctor, and the witnesses, and sent to the magistrate in a sealed cover.
- ▶ Contrast the **dying deposition** — recorded on oath before the accused or his lawyer, who may cross-examine.
- ▶ The dying deposition carries higher evidentiary value but is **not practised in India**.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Flow chart** — "Order of recording of evidence": a vertical chain of boxes —
Summons/Subpoena → Oath/Affirmation → Examination-in-chief (no leading questions) → Cross-examination (leading questions allowed) → Re-examination (no new matter) → Questions by the Judge → Deposition read over → Witness signs each page.
- ▶ Label the arrows with their governing sections: S.143 BSA (order), S.146 BSA (leading questions), S.313 BNSS (signing).
- ▶ **Branching box** — "Types of evidence": three branches — *Oral (Direct / Circumstantial / Hearsay), Documentary (certificates, reports, dying declaration, FSL report), Material exhibits (with chain of custody).*

Medico-legal significance

- ▶ The doctor enters the box as an **expert witness** [Section 39, BSA 2023 (Section 45, IEA 1872)].
- ▶ He first proves the report was **prepared and signed by him**, then narrates his findings (time of examination, injuries, weapon, time and cause of death).
- ▶ He gives his opinion to "**reasonable medical certainty**."
- ▶ He must carry the **complete record** — original notes, post-mortem/wound report, photographs with a scale, X-rays, toxicology and blood-grouping reports, a copy of the death certificate, diagrams, and chain-of-custody receipts, arranged chronologically.
- ▶ Opinion must stay **within his field of competence** — avoid superlatives, avoid being dogmatic, and admit "I do not know" when true.
- ▶ A medical report is **not evidence until the doctor testifies on oath** — careless wording helps the defence in cross-examination.
- ▶ **Perjury** is wilfully giving false evidence on oath.
- ▶ It covers "giving false evidence" [Section 227, BNS 2023 (Section 191, IPC 1860)] and "fabricating false evidence" [Section 228, BNS 2023 (Section 192, IPC 1860)].
- ▶ It is punishable with imprisonment up to 7 years, plus fine [Section 229, BNS 2023 (Section 193, IPC 1860)].
- ▶ Medico-legal case (MLC) and post-mortem records must be **retained** — MLC records have no fixed time limit — because they may be needed in court years later.

♦ ♦ ♦

Section 53 CrPC — Medical Examination of the Accused by a Medical Practitioner at the Request of a Police Officer*Asked in: Paper III Oct 2022 — RGUHS MD Forensic Medicine***Definition / Introduction**

- ▶ Section 53 CrPC 1973 is now Section 51 BNSS 2023 (codes changed 1 July 2024).
- ▶ It lets a **registered medical practitioner (RMP)** examine a person **arrested on a charge of an offence**.

- ▶ The examination happens **at the request of a police officer**.
- ▶ The RMP may use **reasonable force** if there are reasonable grounds the exam will reveal evidence of the offence.
- ▶ This section **overrides the usual consent rule** for an arrested accused.
- ▶ It still respects the accused's **fundamental right against self-incrimination**.
- ▶ This is the single most important section of its kind for a forensic physician.
- ▶ **Companion sections:**
 - Section 53A CrPC (now Section 52 BNSS) — person accused of rape.
 - Section 54 CrPC (now Section 53 BNSS) — routine exam of any arrested person.

CrPC → BNSS quick map (marks are scored here)

Legacy CrPC	New BNSS 2023	Subject
Section 53	Section 51	Exam of accused at police request (new: report to IO without delay)
Section 53A	Section 52	Exam of person accused of rape
Section 54	Section 53	Exam of any arrested person
Section 164A	Section 184	Exam of rape victim (written consent; report within 7 days)

Essential ingredients for a lawful examination

- ▶ All of these must be true together:
 - The person must already be **arrested**.
 - A mere suspect who has only come to hospital cannot be examined without consent.
 - The request must come from a **police officer of sub-inspector rank or above** (or someone acting in good faith under his direction).
 - There must be **reasonable grounds** that the exam will give evidence of the offence.
 - Only **reasonable force** may be used to restrain someone who resists.
 - A **female accused** may be examined only by, or under the supervision of, a **female RMP**.
 - The RMP must **forward the report to the investigating officer without delay** — an express duty added by the new clause (3) of Section 51 BNSS.

Why consent is not required — and where it still is

- ▶ Ordinarily a person is free to refuse an examination that could produce evidence against him.
- ▶ Section 53 CrPC / Section 51 BNSS is the **statutory exception** for an arrested accused.
- ▶ Public interest in solving crime outweighs the accused's refusal, so the RMP may proceed, using reasonable force if needed.
- ▶ A refusal can itself lead to an **adverse inference** — the court may treat it as pointing toward guilt.
- ▶ A victim is different — **she can never be examined without consent**.

- ▶ In rape, the survivor is examined under Section 164A CrPC (now Section 184 BNSS) only with **written informed consent**.
- ▶ **Drunkenness**: blood, urine or breath cannot be taken from a suspected drunk without written consent, though once arrested this can proceed under Section 53/51 BNSS.
- ▶ If the person is unconscious or incapable, examination and treatment proceed in his own interest.

The constitutional limit — Article 20(3) and the Selvi judgment

- ▶ Section 53 CrPC / Section 51 BNSS only authorises **physical/material evidence** — blood, semen, hair, nail clippings, swabs, DNA samples, injury findings.
- ▶ It does **not** authorise **testimonial evidence** — statements or answers drawn from the accused's own mind — taken by compulsion.
- ▶ **Article 20(3) of the Constitution** bars compelling an accused to be a witness against himself.
- ▶ **Section 161(2) CrPC (now Section 180(2) BNSS)** protects him from answering questions that could expose him to a criminal charge.
- ▶ **Narcoanalysis** ("truth serum"), **polygraph** (lie detector) and **brain-based tests** (brain fingerprinting, brain mapping, BEOS/BEAP) all compel self-incriminating statements, so they **contravene Article 20(3)**.
- ▶ Forcing truth drugs on a subject is treated as a form of **torture** under the Declaration of Tokyo.
- ▶ In **2010**, the Supreme Court in *Selvi v. State of Karnataka* held that narcoanalysis, polygraphy and brain fingerprinting/BEOS **cannot be forced** on any suspect.
- ▶ These tests need **voluntary consent**; results obtained involuntarily are **inadmissible**.
- ▶ The "reasonable force" allowed under Section 53/51 BNSS stops at the body's physical samples — it never extends to the mind.

Why the accused is examined in sexual offences

- ▶ Examination of the accused can reveal **signs of struggle** — bite marks, fingertip bruises, abrasions, scratches — and a build matching the victim's account.
- ▶ **Seminal or blood stains** on the accused corroborate the survivor's account.
- ▶ The survivor's **vaginal epithelial cells** (with her blood group/DNA) may be recovered from **penile and urethral swabs**, best collected early before the accused can wash.
- ▶ The **Lugol's iodine test** on the glans turns brown from deposited vaginal glycogen, and can stay positive for up to about **4 days**.
- ▶ This evidentiary value is why an arrested accused can be examined without consent under **Section 53A CrPC (now Section 52 BNSS)**.
- ▶ Under **Section 114A IEA (now Section 120 BSA)**, in aggravated or custodial rape the **burden of proving consent shifts to the accused**.
- ▶ This reverse-onus rule followed the **Mathura custodial-rape case** (*Tukaram v. State of Maharashtra*, 1979) and the 1983 amendment.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Flowchart** — "Lawful medical exam of an accused under Section 53 CrPC / Section 51 BNSS": person arrested on a charge → request from a police officer (sub-inspector or above) → reasonable grounds the exam affords evidence? → RMP examines (no consent needed; reasonable force if resisting) → female accused examined only by/under a female RMP → collect material evidence (blood, semen, swabs, hair, nail clippings, DNA) → report forwarded to the IO without delay.
 - Side-box: testimonial tests (narcoanalysis, polygraph, brain fingerprinting/BEOS) are **not permitted** without consent — Article 20(3).
- ▶ **Comparison strip** — "Accused vs Victim": Accused (arrested) — Section 53/53A CrPC = Section 51/52 BNSS — consent not required, force permitted. Victim — Section 164A CrPC = Section 184 BNSS — written informed consent mandatory.

Medico-legal significance

- ▶ Record the **date, time and place** of examination.
- ▶ **Identify the accused** through the escorting constable and note identification marks.
- ▶ Explain the right to refuse where consent still applies — **mandatory for a non-arrested suspect**.
- ▶ **Begin without delay**, because signs fade fast.
- ▶ Examine clothing, body and genitals for **injuries, stains, hair, fibres and trace evidence**.
- ▶ Collect nail scrapings, swabs and blood under a documented **chain of custody**.
- ▶ The report goes to the arrested person or his nominee.
- ▶ Under **Section 51(3) BNSS**, it also goes to the investigating officer without delay.
- ▶ A refusal permits an adverse inference and reasonable force for **material samples only** — never forced testimonial tests.
- ▶ A person presenting as a "victim" may in fact be a perpetrator; the doctor still labels the case an MLC on its merits.
- ▶ But **examining** a non-arrested person always needs that person's consent.

High-yield exam pointers

- ▶ **Section 53 CrPC 1973 = Section 51 BNSS 2023**; new clause (3) = report to IO without delay.
- ▶ **Consent is not needed for an arrested accused** (refusal → adverse inference); it is **mandatory** for a victim or any non-arrested suspect.
- ▶ "**Examination**" includes blood, semen, swabs, sputum, sweat, hair, nail clippings and DNA profiling.
- ▶ Authorises **material evidence only** — narcoanalysis, polygraph and brain fingerprinting/BEOS still need voluntary consent.

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Types of medical evidence and their medico-legal importance

Asked in: Paper III Apr 2025 — RGUHS MD Forensic Medicine

Definition

- **Evidence** means everything the court accepts to prove a fact — witness statements (**oral evidence**) and documents, including electronic records (**documentary evidence**) [Section 2, Bharatiya Sakshya Adhiniyam (BSA) 2023 (Section 3, Indian Evidence Act, IEA, 1872)].
- The BSA 2023 replaced the IEA 1872 from **1 July 2024**.
- **Medical evidence** is what a **registered medical practitioner (RMP)** contributes — as an oral expert witness, or through certificates and reports.
- Its key feature: medical evidence is only **corroborative** — it supports or refutes eyewitness testimony but never itself proves guilt or innocence.

Classification of evidence

- Evidence is classified two ways — by its **form** and by its **probative route**.

Basis	Type	Meaning
Form	Oral	witness statements in court; must be direct [Section 55, BSA (Section 60, IEA)]
Form	Documentary	documents, including electronic records, for court inspection [Section 2, BSA]
Route	Direct	eyewitness testimony of a fact personally perceived
Route	Circumstantial	subsidiary facts from which the court infers the fact in issue [Section 4, BSA]
Route	Hearsay	a fact not personally witnessed — generally inadmissible
Weight	Expert (medical)	opinion drawn from observed facts [Section 39, BSA (Section 45, IEA)] — corroborative only
Weight	Common (eyewitness)	fact perceived by the witness's own senses — positive evidence

- What the doctor personally saw (an injury, a sign) is fact; his interpretation of it is opinion, and ranks as expert evidence.
- Documentary evidence splits into **primary** — the original document [Section 57, BSA] — and **secondary** — certified copies [Section 58, BSA]. Primary is preferred.

Oral (medical) evidence

- Oral evidence is testimony given on oath in court about facts under inquiry.

- ▶ It must always be **direct** — given by the person who perceived the fact, or holds the opinion [Section 55, BSA (Section 60, IEA)].
- ▶ A doctor gives it across examination-in-chief, cross-examination and re-examination.
- ▶ **Oral evidence outranks documentary evidence** because it can be cross-examined; a document is admitted only once proved on oath.
- ▶ If evidence refers to a physical object (a weapon, clothing), the court may call for that object [Section 60, BSA].

Exceptions — when oral testimony is dispensed with:

- ▶ **Dying declaration** — statement of a person who is dead or cannot be found [Section 26, BSA].
- ▶ **Textbook opinion** — a standard treatise, if its author is dead or cannot be summoned [Section 55 proviso, BSA].
- ▶ **Deposition in a lower court** — evidence recorded before a magistrate, admissible in a higher court [Section 326, BNSS (Section 291, CrPC)].
- ▶ **Government experts' reports** — chemical examiner, serologist, FSL director, etc., admissible without personal attendance [Section 329(4), BNSS].

Documentary (medical) evidence

- ▶ **Medical certificates** — of illness, fitness, insanity, age or disability, issued only by a qualified RMP; valid for **not more than 15 days**, never ante- or post-dated.
 - Issuing a false certificate [Section 234, BNS] is punished like false evidence — up to 7 years plus fine [Section 229, BNS].
- ▶ **Medico-legal reports** — injury, age-estimation, post-mortem and drunkenness reports, plus the cause-of-death certificate (Form 4/4A); proved only on oath.
- ▶ **Death certificate** — free for a patient attended in the last illness; never issue it without examining the body.
- ▶ **Dying declaration** — an oral or written statement of a dying person about the cause of death [Section 26(a), BSA] (detailed below).
- ▶ **FSL certificates** — chemical, DNA, fingerprint, serology and semen-analysis reports.
- ▶ **Electronic records** — digital data, images, audio/video, CDs, e-mail — expressly documentary evidence [Section 2, BSA].

Dying declaration vs dying deposition

- ▶ A **dying declaration** is a statement (oral or written) of a person dying from an unlawful act, about the cause of death.
- ▶ It rests on the maxim *Nemo moriturus praesumitur mentire* — "a dying person is presumed not to lie" — a recognised exception to hearsay.
- ▶ **Doctor's role:** certify the declarant is *compos mentis*, record the statement verbatim, ask **no leading questions**, give **no oath**, and take a signature or thumb impression.
- ▶ If the patient turns unfit mid-statement, stop, document "non compos mentis" with time and date, and resume only on recovery.
- ▶ An FIR lodged by a dying person, or a suicide note, can each qualify as a dying declaration.

- ▶ If the declarant survives, the declaration becomes only corroborative and the person must then give oral evidence.
- ▶ A **dying deposition** is a statement on oath recorded by a magistrate, with the accused/lawyer present and cross-examination allowed — a "court at the bedside."
- ▶ It carries higher evidentiary value but is **followed in Western countries, not in India**.

The doctor as expert witness

- ▶ An **expert witness** draws conclusions from observed facts in a technical subject [Section 39, BSA (Section 45, IEA)] — e.g. a doctor, ballistics, fingerprint or DNA expert.
- ▶ A **common witness**, in contrast, deposes only to facts personally perceived.
- ▶ An expert may opine on facts proved at trial, common knowledge, and hypothetical questions.
- ▶ Opinions use guarded terms like "**reasonable medical certainty**" or "*consistent with*", not dogmatic assertions.
- ▶ **Medical evidence never by itself proves guilt or innocence — it is only corroborative;** conviction can still rest on it if direct evidence is weak but medical evidence is trustworthy.
- ▶ If two doctors disagree (treating doctor vs autopsy surgeon), the accused gets the **benefit of the doubt** — the doctor "is not a witness of truth."
- ▶ An expert may consult textbooks to refresh memory; an adopted passage becomes his own evidence.

Medico-legal significance

- ▶ The doctor most often appears as an **expert witness**, and must know which contributions are oral and which documentary.
- ▶ Documentary evidence is proved only by oral testimony on oath.
- ▶ Every medico-legal document must be **clear, concise, complete, legible, factual, free of superlatives**, with date, time, place and identifiers, since the defence can cross-examine the doctor on it.
- ▶ **Chain of custody** must be maintained for every exhibit: label with name, time, date, nature and ID number, and get a receipt on every transfer — "the shorter the chain, the better the sanctity."
- ▶ The doctor must stay within reasonable medical certainty and his field of competence, and never become an advocate for either side.
- ▶ Giving wilfully false evidence is **perjury** [Sections 227 & 228, BNS], punishable up to 7 years [Section 229, BNS]; a false certificate is separately punishable [Section 234, BNS].

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Classification tree** — root box "EVIDENCE [Section 2, BSA]" branching to "ORAL" and "DOCUMENTARY."
 - Under ORAL: "Direct [Section 55, BSA]", "Circumstantial [Section 4, BSA]", "Hearsay (inadmissible)."
 - Cross-link a box "Expert/Medical evidence — corroborative [Section 39, BSA]."
 - Under DOCUMENTARY: "Primary [Section 57, BSA]", "Secondary [Section 58, BSA]", "Certificates / Reports / Dying declaration / FSL & electronic records."
- ▶ **Flow box "Doctor in court"** — Examination-in-chief → Cross-examination → Re-examination → Questions by Judge; side note: oral evidence permits cross-examination, so it outranks documentary evidence.

**Vicarious liability and its related doctrines**

Asked in: Paper III Apr 2021 — RGUHS MD Forensic Medicine

Definition

- ▶ **Vicarious liability** (Latin *vicarius* = substituted) means one person is held liable for the wrongful act of another.
- ▶ Typically an **employer is held liable for the negligence of an employee**, even though the employer took no part in the act.
- ▶ In medicine this usually makes a **hospital or a senior doctor** answerable for the negligence of a junior, resident, intern, or nurse.
- ▶ Related doctrines include *respondeat superior*, *borrowed servant*, *captain of the ship*, *deep pockets*, *res ipsa loquitur*, *contributory*, *composite*, *corporate negligence*, and *novus actus interveniens*.

Vicarious liability — the core doctrine

- ▶ An employer is liable for an employee's negligence if the act occurred **in the course and scope of employment**.
- ▶ It works through the maxim *respondeat superior* — the wrong of the servant is treated in law as the wrong of the master.
- ▶ **Three conditions must ALL be satisfied:**
 - There must be an **employer–employee relationship**.
 - The act must occur **within the scope of employment**.
 - The act must occur **while on duty**.
- ▶ The patient usually sues **both** the employer and the employee, since the employee may not be able to pay damages.
- ▶ If the employer pays compensation, it may later bring a **"third-party proceeding"** to recover the amount from the negligent employee.

Respondeat superior, captain of the ship, deep pockets

- ▶ *Respondeat superior* ("let the master answer") is the **principle**; vicarious liability is the **liability** it creates.
- ▶ It applies whenever the superior had the **right, ability, or duty to control** the wrongdoer.
- ▶ **Captain of the ship doctrine**: the operating surgeon, like a ship's captain, has overall control of the OT team, so the team's negligence is attributed to him — essentially the same as *respondeat superior*.
- ▶ **Doctrine of deep pockets**: the hospital, having more money than an individual doctor, is held liable so the patient gets adequate compensation, and hospitals are pushed to hire good staff and supervise them properly.

Who IS vicariously liable

- ▶ A **principal doctor** is liable for his assistant's negligence, and for his non-medical staff too.
- ▶ A **senior doctor/HOD** is liable for a junior, resident, or intern's negligence under his supervision — e.g., liable for a swab left in the abdomen even if the house surgeon actually left it.
- ▶ A **hospital** is liable for the negligence of its doctors and staff, whether full-time, part-time, resident, visiting, or temporary — including residents and interns on normal duty.
- ▶ **Partners** in practice are each liable for the other's negligence.
- ▶ **Independent co-attending doctors** are liable for another's negligence they notice (or should have noticed) and let continue unchallenged.
- ▶ A doctor who refers a patient to an **incompetent** doctor is liable — the *doctrine of negligent choice*.
- ▶ A doctor who writes an **illegible prescription**, or dictates one **over the phone**, is liable if the pharmacist dispenses the wrong drug as a result.
- ▶ The **surgeon** is liable if a swab, sponge, or instrument is left inside the body after an operation.

Who is NOT vicariously liable

- ▶ A **surgeon is not liable for an anaesthetist's** independent negligence — an exception to the co-attending-doctors rule.
- ▶ A doctor is **not liable for an independent qualified nurse** acting outside his direct supervision.
- ▶ A doctor referring a patient to a **competent** doctor, or referring an **already-injured** patient onward, is not liable.
- ▶ A doctor who writes a **clear, legible** prescription that is wrongly dispensed is not liable.

Borrowed servant doctrine

- ▶ When one employer **temporarily borrows** an employee from another, the **borrowing employer becomes vicariously liable** for the employee's negligence during that period.
- ▶ The lending employer temporarily gives up control; the borrowing employer gains control, supervises directly, and can give orders.
- ▶ **Example**: a hospital nurse assisting at an operation becomes the surgeon's "borrowed servant" during surgery, but remains the hospital's servant otherwise.

- ▶ Liability lasts **only as long as** the employee is under the borrowing employer's direct supervision; once returned, the original employer is liable again.
- ▶ **Worked example:** if hospital H's resident R is negligent while working for private specialist S (who hired the OT and R's services), S — **not H** — is **vicariously liable**, since R was under S's direct supervision.

Related doctrines (comparison table)

Doctrine	Meaning	Effect
Corporate negligence	Negligence of the hospital itself — faulty equipment, non-sterile OT, incompetent staff retained	Hospital liable directly; distinct from vicarious liability
Composite negligence	Patient harmed by the combined negligence of two or more persons	Patient can claim the whole sum from any one; that person may seek contribution from the others
Contributory negligence	Patient's own carelessness adds to the doctor's negligence	A civil (not criminal) defence; compensation reduced
Res ipsa loquitur	"The thing speaks for itself" — negligence so obvious no expert evidence is needed	Shifts the burden onto the doctor; applies to civil and criminal cases
Doctrine of common knowledge	A variant of res ipsa loquitur for lay-obvious omissions (no anti-tetanus serum, no fluids in dehydration)	Patient need only prove the act, not the standard of care
Calculated risk doctrine	The method used carried unavoidable, expert-supported risks	A defence against a negligence claim
Novus actus interveniens	An unrelated later act breaks the chain of causation	Liability may shift to the later actor (rarely accepted)
Volenti non fit injuria	Patient demanded treatment despite being warned	Doctor not liable
Bolam test	A doctor is not negligent if he follows a responsible body of medical opinion	Standard of the "ordinary skilled man"; upheld in <i>Jacob Mathew</i> and <i>Martin D'Souza</i>

Medico-legal significance

- ▶ Explains why the **hospital is impleaded alongside the treating doctor** in most negligence suits — the deep-pockets rationale secures the patient's compensation.
- ▶ Places a clear **supervisory duty** on seniors and HODs for residents' and interns' acts — mandating protocols, swab/instrument counts, and careful delegation.
- ▶ Underpins **medical indemnity insurance** for both institutions and individual doctors.
- ▶ Criminal negligence causing death is punished under **Section 106(1), Bharatiya Nyaya Sanhita (BNS) 2023** (formerly **Section 304A, Indian Penal Code (IPC) 1860**): the general term is now 5

years, but 2 years is retained for a registered medical practitioner performing a medical procedure — a new doctor-specific carve-out.

- ▶ Rash/negligent hurt (§337 IPC), grievous hurt (§338 IPC), and endangering life (§336 IPC) are now consolidated as **Section 125 BNS 2023**.
- ▶ Civil negligence claims fall under the **law of torts** and the **Consumer Protection Act 2019** (2-year limitation).
- ▶ The standard of care applied is the **Bolam test**, upheld in India by *Jacob Mathew v State of Punjab*.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Vicarious liability triangle:** **Employer** (hospital/principal/senior) at the apex, **Employee** (resident/intern/nurse/assistant) at base-left, **Patient** (injured) at base-right.
- ▶ **Arrows:** *respondeat superior* (Employer → liable); *negligent act in scope of employment* (Employee → Patient); *sues both* (Patient → Employer + Employee); *third-party proceeding to recover* (Employer → Employee).
- ▶ **Footnote:** "3 conditions — employer–employee relationship, scope of employment, while on duty"; "deep pockets = hospital pays."
- ▶ **Borrowed servant box:** Lending employer (control surrendered) → Borrowed servant → Borrowing employer (direct supervision = liable); note that liability reverts once the servant returns.



Vicarious liability

Asked in: Paper II Apr 2020 · Paper III Oct 2017 (2×) — RGUHS MD Forensic Medicine

Definition

- ▶ **Vicarious liability** (Latin *vicarius* = substituted) means one person is held legally liable for the wrongful act of another.
- ▶ In medicine, an **employer** — a senior doctor, partnership, or hospital — answers for the negligence of an **employee**.
- ▶ This applies only when the negligent act happened **in the course of, and within the scope of, employment**.
- ▶ It is one of the recognised exceptions to the general rule that only the actual wrongdoer is liable.

Underlying maxims and doctrines

- ▶ **Respondeat superior** ("let the master answer") is the governing maxim.
- ▶ It holds the employer liable whenever he had the **right, ability, or duty to control** the wrongdoer.
- ▶ *Respondeat superior* is the **principle**; vicarious liability is the **liability it creates**.
- ▶ **Qui facit per alium facit per se** ("he who acts through another acts himself") is the classical tort basis for the same idea.

- ▶ **Captain of the ship doctrine:** the operating surgeon is treated as commanding the whole team, and so is liable for it.
- ▶ **Doctrine of deep pockets:** the hospital/employer usually has more funds than the individual doctor.
 - This ensures the injured patient actually gets compensated.
 - It also pressures employers to hire the best available talent.

Preconditions — all three must be present

- ▶ **Employer–employee relationship:** a master–servant relationship must exist.
- ▶ **Within the scope of employment:** the employee was doing the work he was appointed to do.
- ▶ **While on the job:** the act happened during employment, not on a personal errand ("frolic of his own").

When someone IS vicariously liable

- ▶ **Senior doctor** is liable for a junior doctor, resident, intern, or assistant working under him.
- ▶ **Hospital** is liable for its doctors and staff, whether full-time, part-time, resident, or visiting.
 - Even doctors who are not technically hospital servants act as its agents while treating patients.
- ▶ **Partners** are each liable for the other's negligence, even without personal involvement.
- ▶ **Co-attending doctors:** each is liable for negligence of the other that he observed (or should have observed) and let continue.
- ▶ **Negligent referral:** knowingly referring a patient to an incompetent doctor makes the referring doctor liable (**doctrine of negligent choice**).
- ▶ **Illegible or telephonic prescription:** if this causes the pharmacist to dispense the wrong drug, the doctor is liable.
- ▶ **Retained surgical item:** a swab, sponge, or instrument left inside the patient makes the **surgeon** liable.
- ▶ **Supervisory control:** a physician with the right to direct a hospital employee's specific act is liable for that employee's negligence.

When someone is NOT vicariously liable

- ▶ **Surgeon and anaesthetist:** the surgeon is not liable for the anaesthetist's independent negligence.
- ▶ **Independent qualified nurse:** if she acts independently, not under the doctor's direct supervision, the doctor is not liable.
- ▶ **Referral to a competent doctor:** the referring doctor is not liable.
- ▶ **Referral of an already-injured patient:** the new doctor or hospital is not liable for the earlier doctor's negligence.
- ▶ **Clear, legible prescription:** if the pharmacist still dispenses the wrong drug, the doctor is not liable.

Borrowed servant doctrine

- ▶ An employee can serve more than one employer at different times.
- ▶ When one employer **temporarily lends** an employee to another, the **borrowing employer** becomes vicariously liable.
- ▶ The lending employer surrenders control; the borrowing employer gains control and can give direct orders.
- ▶ Liability shifts back to the original employer once the employee returns.
- ▶ **Classic example:** a theatre nurse is the surgeon's "borrowed servant" during an operation, but the hospital's servant otherwise.
- ▶ **Worked example:** Resident R normally works for hospital H. Specialist S hires H's theatre and R's services, and R is negligent while working for S. H is not liable — S is, because R was under S's direct supervision at the time.

Liability, compensation, and recovery

- ▶ The employer and employee can be **sued together**, since the employee may lack funds to pay.
- ▶ The court can order the **employer to pay compensation** to the patient.
- ▶ The employer can then recover this money from the negligent employee through a separate **"third-party proceeding."**

Worked examples

- ▶ A hospital hires an untrained surgeon at low wages; he operates negligently and injures the patient — the **hospital is held vicariously liable**.
- ▶ A resident and the Head of Department (HOD) operate together and a swab is left behind; the **HOD is held vicariously liable**, even though the resident left it, because supervision was the HOD's duty.

Medico-legal significance

- ▶ One of the "important concepts related to medical negligence," alongside *res ipsa loquitur*, contributory negligence, corporate negligence, and the **Bolam test**.
- ▶ Decides **who is sued and who pays** in a malpractice suit — central to hospital and corporate liability.
- ▶ Explains why doctors and hospitals need **professional indemnity insurance**.
- ▶ Most vicarious-liability claims against hospitals are litigated under the **Consumer Protection Act, 2019**, since medical service for consideration makes the patient a "consumer."
- ▶ **Criminal negligence** by a doctor causing death was **Section 304-A IPC 1860**; it is now **Section 106(1) BNS 2023**.
 - BNS 106(1) raises the general punishment from 2 to 5 years' imprisonment.
 - It adds a doctor-protective limb: only up to 2 years' imprisonment where a **registered medical practitioner** was performing a medical procedure.
 - The *Jacob Mathew v. State of Punjab* (2005) safeguards — gross negligence plus a prior competent-medical opinion before prosecution — still apply.

- ▶ **Res judicata** (double jeopardy) bars re-litigating the same negligence question once a competent court has decided it — **Section 300 CrPC 1973, now Section 337 BNSS 2023**.
- ▶ A negligence suit must be filed within the **law of limitation** — 2 years generally, 3 years if a specific doctor–patient contract was breached.
- ▶ The doctrine reminds the senior/employer to **select, supervise, and audit** subordinates carefully.

High-yield exam pointers

- ▶ Vicarious = substituted; liability for the **act of another**, under **respondeat superior**.
- ▶ Key doctrines to name: **captain of the ship** (surgeon) and **deep pockets** (ensures compensation).
- ▶ **Three preconditions**: employer–employee relationship + scope of employment + while on the job.
- ▶ **Liable**: senior for junior; hospital for its doctors; partners for each other; referral to an incompetent doctor; retained swab → surgeon.
- ▶ **Not liable**: surgeon for independent anaesthetist; doctor for independent nurse; referral to a competent doctor; clear prescription mis-dispensed by pharmacist.
- ▶ **Borrowed servant**: the borrowing employer is liable while he has direct supervision.
- ▶ Employer and employee are sued together; employer recovers later via a **third-party proceeding**.
- ▶ Statutes to cite: **Consumer Protection Act 2019**; criminal negligence = **Section 304-A IPC 1860 (now Section 106(1) BNS 2023)**; res judicata = **Section 300 CrPC 1973 (now Section 337 BNSS 2023)**.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Respondeat superior triangle**: *Patient* at the apex, arrows down to *Negligent employee* and *Employer*; a bridging box listing the 3 preconditions; a return arrow *Employer* → *Employee* labelled "third-party proceeding"; side caption "doctrine of deep pockets."
- ▶ **Borrowed servant sketch**: *Hospital H (lending employer)* → dotted arrow "control surrendered" → *Specialist S (borrowing employer)* → solid arrow "direct supervision" → *Employee (Resident R)*; footnote: S is liable while R is under his control, H becomes liable again once R returns.



Warning Notice

Asked in: Paper III Apr 2018 — RGUHS MD Forensic Medicine

Definition

- ▶ A **warning notice** is the published list of acts of commission or omission that amount to **serious professional misconduct**.
- ▶ It is published by the **National Medical Commission (NMC)** — formerly the **Medical Council of India (MCI)** — and by each **State Medical Council (SMC)**.
- ▶ If a registered medical practitioner (RMP) is found guilty of any listed act after due enquiry, it is serious professional misconduct, also called *infamous conduct in a professional respect*.

- ▶ The notice warns the profession in advance, so no practitioner can later plead ignorance.
- ▶ **Second meaning:** a "warning" is also the formal admonition a council can give to an individual doctor.
- ▶ A warning is the **lesser** of the council's two disciplinary penalties; the greater penalty is **erasure** of the name from the register.

The two meanings, and the notice's scope

- ▶ **Meaning 1 — the published code:** the document listing examples of serious professional misconduct.
- ▶ This list is part of the **Code of Medical Ethics** (the *Indian Medical Council (Professional Conduct, Etiquette and Ethics) Regulations, 2002*, now continued under the NMC).
- ▶ **Meaning 2 — the penalty:** once a charge of misconduct is proved, the council votes to either erase the name or warn the practitioner.
- ▶ A warning is the milder outcome — used when misconduct is established but not grave enough for erasure.
- ▶ The list gives **examples** only — it is expressly **not exhaustive**; the council can still act on unlisted misconduct.
- ▶ **Each case is decided on its own facts and merits**; the notice guides but does not bind the council.
- ▶ Its purpose is **preventive and educative** — it puts every RMP on notice before misconduct occurs.

Offences listed as serious professional misconduct

Category	Example
Improper relationship	Improper association with a patient
Moral turpitude	Conviction for an offence involving moral turpitude or a criminal act
False certification	Issuing a false or misleading certificate (sickness, insurance, court, etc.)
Drug-law violation	Breaching the Drugs and Cosmetics Act (improper psychotropic prescribing, selling Schedule H/L drugs)
Aiding quackery	Certifying an unqualified person as competent in modern medicine
Improper advertising	Self-advertisement, oversized signboards, signboard at a chemist's shop
Dichotomy	Fee-splitting — commission for referring patients
IVF without consent	Performing IVF/artificial insemination without written consent of patient, spouse and donor
Unethical research	Clinical trials or research violating ICMR guidelines

Category	Example
Non-display of registration	Not displaying the registration number on clinic, prescriptions, certificates

- ▶ These offences are also crystallised as the "6 A's":
 - Adultery (arising from the professional relationship)
 - Advertising
 - Abortion (unlawful)
 - Association with unqualified persons
 - Addiction to drugs
 - Alcohol (consumption at the workplace)

Disciplinary control — where the warning fits

- ▶ The council's disciplinary control has **three powers**:
 - (A) issue the warning notice.
 - (B) remove (erase) a practitioner's name from the register.
 - (C) direct restoration of a name that was removed.
- ▶ **Penal erasure** is sometimes called the "*professional death sentence*" — it strips all privileges of a registered practitioner.
- ▶ A **warning** is the lesser outcome that sits below erasure.

Procedure leading to a warning or erasure

- ▶ Proceedings can start from any of these:
 - Conviction of the RMP for a **cognisable offence**.
 - **Censure** by a competent authority regarding professional character.
 - A **complaint**.
 - **Suo motu** action by the council itself.
- ▶ The council has the **same powers as a Civil Court** under the **Code of Civil Procedure (CPC), 1908**.
- ▶ Its enquiries are **judicial proceedings**.
- ▶ On a complaint, the Registrar places it before the President, who refers it to the Executive Committee or a Sub-committee.
- ▶ **No prima facie case**: the complainant is informed and the matter is closed.
- ▶ **Enquiry ordered**: a notice specifying the charge is issued; the doctor must give a written answer and attend — the enquiry proceeds even if the doctor does not respond.
- ▶ Both sides may appear at the hearing, with legal advisers if they wish.
- ▶ After hearing the evidence, the council **votes** on whether the charge is proved.
- ▶ If proved, it **votes again** — to decide between erasure and a warning.
- ▶ An erasure is **widely published** in the local press and in medical-association publications.

Medico-legal significance

- ▶ Because the council can act beyond the listed examples, an RMP must follow the **spirit** of ethical practice, not just avoid the named acts.
- ▶ The listed offences most relevant to forensic practice are:
 - False or misleading certificates (death, injury, age/fitness, court attendance).
 - Violation of the Drugs and Cosmetics Act or improper prescribing of psychotropics.
 - Aiding quackery.
 - Unethical human research in breach of ICMR guidelines.
- ▶ Punishment for infamous conduct is **erasure or a warning**; the trial is by the **State Medical Council**; appeal lies to the **State and Central Governments**.
- ▶ This is unlike professional negligence, which is tried by civil/criminal courts with a fine or imprisonment, and appeal to a higher court.
- ▶ A name that is erased can later be **restored**; a warned doctor stays on the register and keeps the right to practise.
- ▶ The council's enquiries being judicial proceedings, giving or fabricating false evidence in them was punishable under the **Indian Penal Code (IPC) 1860**, now under **Sections 229, 257 and 267 of the Bharatiya Nyaya Sanhita (BNS) 2023**.
- ▶ A conviction for an offence involving **moral turpitude** under the **IPC 1860 (now BNS 2023)** is itself a listed ground of misconduct.
- ▶ The governing framework is the **Indian Medical Council (Professional Conduct, Etiquette and Ethics) Regulations, 2002** (the Code of Medical Ethics), now operating under the **National Medical Commission Act, 2019**.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Flowchart — "Complaint to Warning or Erasure":**
 - *Source of proceeding* (conviction / censure / complaint / suo motu) → *Registrar to President* → *Executive/Sub-committee considers*.
 - Branch: **no prima facie case** → **complainant informed, closed** | **prima facie case** → **notice of charge to RMP**.
 - → *Hearing (both sides, legal advisers)* → *vote on facts*.
 - Branch: **charge not proved** → **acquittal** | **charge proved** → **second vote on penalty**.
 - Final branch: **WARNING (do not repeat)** | **ERASURE (published in press)** → **appeal to State/Central Government** → **restoration possible**.
- ▶ **Two-box contrast:** Box 1 — *"Warning Notice = published list of misconduct (preventive)."*
Box 2 — *"Warning = disciplinary penalty, lesser than erasure (punitive)."*

High-yield exam pointers

- ▶ **Warning Notice** = illustrative, not exhaustive, published list of serious professional misconduct; **"warning"** = the lesser penalty versus **erasure**.
- ▶ Three disciplinary powers: (A) issue warning notice, (B) erase/remove name, (C) restore name.

- ▶ Remember the "6 A's": Adultery, Advertising, Abortion (unlawful), Association with unqualified persons, Addiction, Alcohol.
- ▶ Punishment for infamous conduct = **erasure or warning; trial by SMC; appeal to State and Central Government** — unlike negligence, tried by civil/criminal courts with appeal to a higher court.
- ▶ Governing law today: **National Medical Commission Act, 2019** plus the **IMC (Professional Conduct, Etiquette and Ethics) Regulations, 2002**.



What are the Exceptions for professional secrecy? Enumerate and describe briefly

Asked in: Paper III Apr 2022 — RGUHS MD Forensic Medicine

Definition: Professional secrecy (confidentiality) is the doctor's implied ethical and contractual duty not to disclose a patient's information to a third party without consent. The exceptions are the recognised situations where disclosure without consent is either permitted or legally required. The chief exception is **privileged communication** — a *bona fide* (good-faith) disclosure to a proper authority, made because some competing interest outweighs the duty of secrecy.

The default duty (what the exceptions override)

- ▶ **Basis:** an implied term of the doctor-patient contract, reinforced by medical ethics and the NMC/MCI Code of Conduct.
- ▶ **Why it matters:** a patient gives a true, complete history only if confident it will stay secret.
- ▶ **Consent is the key.** Without the patient's consent, information must not go to the press, a spouse, a relative, or even to the parents of a **major** (adult) patient who are paying the fees.
- ▶ **Minors and the mentally ill** are different: their condition may be told to the legal guardian.
- ▶ **Post-mortem findings** go only to the police, not to relatives, subject to Right to Information Act 2005 rulings.
- ▶ **Free treatment does not weaken the duty.**

Exception 1 — Privileged communication (the main exception)

- ▶ **What it is:** a good-faith statement by a doctor to a person with a genuine corresponding interest, made because that interest outweighs secrecy.
- ▶ **Effect:** it is a **complete defence** — the patient cannot win a suit for breach of confidentiality.
- ▶ **Three essentials:** made in good faith, made to the proper/competent authority, and confined to the relevant facts only.
- ▶ **Ten recognised heads:**
 - **Society's interest:** a patient with venereal disease insists on using a public pool, or a colour-blind person keeps driving a public-service vehicle — inform the pool manager or transport authority.
 - **Patient's own interest:** a suicidal patient — warn the family to keep watch.

- **Third party's interest:** an HIV-positive man about to marry — warn the prospective bride. The Supreme Court upheld this in *Mr X v. Hospital Z* (1998).
- **Doctor's own interest:** self-defence in a negligence suit — the doctor may disclose the illness treated.
- **Court of law:** a doctor summoned as a witness must answer; he may hand a sealed note to the judge but cannot refuse to answer.
- **Notifiable diseases:** legally bound to notify the public-health authority.
- **Suspected or committed crime:** must inform the nearest police station or magistrate.
- **Employer (fitness for work):** an infectious cook or waiter, or a driver with epilepsy, alcoholism, hypertension, or colour-blindness who will not stop working, may be reported to the employer or transport authority.
- **Insurance medical examination:** the patient gives tacit consent, so the doctor may report adverse findings to the insurer.
- **Waiver:** the patient's express permission removes secrecy.

Exception 2 — Disclosure presumed when sent for examination

- ▶ **Idea:** the patient is taken to have anticipated disclosure by submitting to an examination arranged by someone else.
- ▶ **A master sends a servant** for a check, for example to detect typhoid-carrier status before hiring him as a cook — the doctor may inform the master.
- ▶ **The Government sends an employee** to assess fitness or disability — the doctor may inform the Government.
- ▶ **An insurer sends a prospective client** to detect a life-threatening disease — the doctor may report adverse findings.
- ▶ **Exception to this exception:** if the doctor had examined the same person *before* the policy, incidentally, he must not report it — there was no expectation of disclosure then.
- ▶ **Persons in custody** — police custody, undertrial prisoners, or convicts — findings may be reported to the appropriate authority.

Exception 3 — Statutory (mandatory) disclosures

- ▶ **Notifiable diseases:** must notify the public-health authority, under the Epidemic Diseases Act 1897, state public-health rules, and the Integrated Disease Surveillance Programme.
- ▶ **Medico-legal cases:** must report homicide, suicide, accident, or poisoning to the police; failure attracts liability.
- ▶ **Court orders / subpoena:** must disclose on the direction of a competent court — privilege does not apply against the court itself.
- ▶ **Special statutes:** birth and death registration, the PC-PNDT Act, Medical Termination of Pregnancy reporting, and narcotic/poisoning intimation all compel limited disclosure.

Medico-legal significance

- ▶ Every privileged disclosure needs all three essentials together: good faith, proper authority, and relevant facts only. A wider or malicious disclosure loses this protection and can found a defamation suit.
- ▶ **HIV/AIDS is the model exception.** Non-voluntary disclosure may be made confidentially to healthcare workers involved in the patient's care, and to the spouse or sexual/needle-sharing partner at risk of transmission.
- ▶ An HIV-positive person who knowingly marries and infects the partner may be liable under **Section 269 IPC 1860 (now Section 271 BNS 2023)** and **Section 270 IPC 1860 (now Section 272 BNS 2023)**.
- ▶ Wrongful breach of secrecy can be prosecuted as **defamation** under **Section 499 IPC 1860 (now Section 356 BNS 2023)**, punishable under **Section 500 IPC 1860 (now Section 356 BNS 2023)** with simple imprisonment up to two years, or fine, or both.
- ▶ Beyond the criminal case, the patient may also bring a **civil suit** for damages, and complain to the State Medical Council or NMC, which can discipline the doctor up to erasure from the register.
- ▶ A doctor's own good-faith disclosure for the patient's benefit is itself protected under **Section 93 IPC 1860 (now Section 31 BNS 2023)** — for example, warning a patient of his HIV status and he then self-harms.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Flow diagram — "Professional secrecy and its exceptions":** centre box *Professional secrecy (default duty)*, with one arrow to *Consent / Waiver → may disclose*, and a second branch *Privileged communication* fanning into six boxes — Society's interest, Patient's interest, Third party's interest, Doctor's own interest, Court of law, and Statutory (notifiable disease / crime / employer). Bottom label: *Bona fide + proper authority + relevant facts = complete defence*.
- ▶ **Two-column chart — "Professional secrecy vs Privileged communication":** rows for Definition, To whom owed, Consent needed, Direction of disclosure, and Legal effect.

♦ ♦ ♦

Precautions to avoid medical negligence charges

Asked in: Paper III Apr 2022 — RGUHS MD Forensic Medicine

Definition

- ▶ **Medical negligence** is a breach of the duty of care a doctor owes a patient, by an act of omission or commission.
- ▶ It falls below the standard of a reasonably competent practitioner and causes harm.
- ▶ To prove it, the patient must establish all "4 Ds": **Duty** of care, **Dereliction** (breach), **Direct causation**, and **Damage**.
- ▶ Negligence can bring civil liability (compensation), criminal liability (imprisonment), and disciplinary action (erasure from the Medical Register).

- ▶ Every doctor should therefore practise **prophylactically** — conduct practice so that reasonable care and skill can later be *proved*.
- ▶ The common thread of every precaution is good communication plus **contemporaneous** (recorded at the time, not written up later) documentation.

The standard applied

- ▶ The law expects only a **reasonable degree of skill, knowledge and care** — neither the highest nor the lowest (the *Bolam* standard).
- ▶ A doctor is liable only if conduct fell below this reasonable standard.
- ▶ A mere **error of judgment**, or a **difference of opinion** between experts, is **not** negligence.
- ▶ The goal of every precaution is to stay demonstrably within this accepted standard, and to preserve the evidence that proves it.

General precautions (practice-wide)

- ▶ **Keep updated:** use standard, accepted treatment procedures.
- ▶ Attend **continuing medical education** and medico-legal seminars.
- ▶ **Maintain meticulous records:** complete, accurate, legible, timely, and detailed.
 - Remember: "*a bad result with bad records equals liability*" — the record matters more at trial than the actual standard of care given.
- ▶ **Build good rapport** with patients, relatives, and staff.
 - Most suits start from a breakdown in communication, not from a bad outcome alone.
- ▶ **Never criticise a colleague**, especially in the patient's hearing — such remarks are used as proof of error.
- ▶ **Use only ordinary skill and care**, and never attempt a procedure beyond one's own competence.
- ▶ **Select and supervise assistants carefully.**
 - This limits *vicarious liability* (an employer's responsibility for a subordinate's negligent act) and corporate liability.
- ▶ **Check equipment regularly**, use safety installations, and perform routine clinical audit.

Before starting treatment

- ▶ **Obtain informed, written consent**, witnessed by two independent witnesses.
 - Explain the anaesthesia and the operative procedure fully.
 - Take **both spouses' consent** if an operation on either may cause sterility.
- ▶ **Avoid blanket consent** — explain likely steps in advance, especially any with permanent effects (e.g. possible hysterectomy in a young unmarried woman).
- ▶ **Never guarantee a cure.**
- ▶ **Neither exaggerate nor minimise** the patient's condition.
- ▶ Give **immunisation** where needed — tetanus toxoid in all open wounds.
- ▶ Perform **sensitivity testing** before any drug that can cause anaphylaxis (penicillin, sera, biologicals).

- ▶ **Anaesthesia** must be given only by a qualified person, after a proper pre-anaesthetic work-up, and the patient watched until fully recovered.

During treatment

- ▶ **Confirm the diagnosis** with laboratory tests.
 - Take X-rays for bone/joint injury, or whenever the diagnosis is doubtful.
 - Proceed to CT or MRI if doubt remains.
 - In suspected cancer, complete all investigations without delay.
- ▶ **Chaperone rule:** never examine a female patient unless a third person (female chaperone) is present.
- ▶ **Prescribe safely:**
 - Write legibly, and identify the drug before giving it, especially by injection.
 - Know the side-effects, contraindications, and interactions.
 - Never prescribe over the telephone.
 - Never prescribe a drug without a proper therapeutic indication.
- ▶ **Never abandon the patient.**
 - Do not leave a patient unattended in labour; arrange a qualified substitute before going on leave.
 - Claiming the patient is "not yours" amounts to **abandonment**.
- ▶ **Seek consultation or a second opinion** where appropriate, and **transfer** the patient promptly if facilities are inadequate.
- ▶ **Never experiment** on a patient without their informed consent.

After treatment / after an adverse event

- ▶ Give proper **post-operative care** and clear post-treatment instructions.
- ▶ **Never admit fault**, and never put such an admission in writing.
- ▶ If an untoward result occurs, **address it openly**: explain the problem to the patient and family, reassure them it will be corrected by further care or referral, and consider not charging for the corrective care.
- ▶ Report any death during or after anaesthesia/operation **to the police** for inquiry, and routinely review all morbidity and mortality cases.

Medico-legal significance

- ▶ Documentation is the doctor's **primary defence** — the case sheet, signed consent, and investigation reports decide civil, criminal, and Medical Council proceedings.
- ▶ **Criminal liability needs gross negligence**, not merely an error of judgment.
- ▶ Death by medical negligence is punished under **Section 304A IPC 1860 (now Section 106(1) BNS 2023)**.
 - Up to **2 years** imprisonment plus fine for a registered medical practitioner acting in a medical procedure.

- Up to **5 years** for anyone else — BNS created this lower, doctor-specific punishment for the first time.
- ▶ **Compensation** may additionally be ordered under **Section 357 CrPC 1973 (now Section 395 BNSS 2023)**.
- ▶ **Res judicata (claim preclusion)**: once negligence is finally decided between doctor and patient under **Section 300 CrPC 1973 (now Section 337 BNSS 2023)**, it cannot be re-litigated on the same facts.
- ▶ **Vicarious/corporate liability**: careful selection and supervision of staff limits liability for another's act; hospitals owe an independent duty of competent credentialing.
- ▶ **Professional indemnity insurance** is a prudent financial precaution against any award.
- ▶ Supreme Court safeguards protect the doctor:
 - A private complaint needs a **credible expert opinion** supporting the charge first (*Jacob Mathew v. State of Punjab*, 2005).
 - The Investigating Officer must obtain an **independent, preferably Government, medical opinion** before proceeding; **no routine arrest**.
 - Courts and consumer forums should refer the matter to a competent expert or committee before issuing notice.
- ▶ Relevant evidence at trial can include a **dying declaration** (**Section 32 IEA, now Section 26 BSA 2023**) or **expert opinion** (**Section 45 IEA, now Section 39 BSA 2023**).

Defences available if a charge is nonetheless made

- ▶ **Denial** — backed by complete, contemporaneous records.
- ▶ **Calculated-risk doctrine**: a reasonable, calculated risk taken to save life is not negligence.
 - It limits *res ipsa loquitur* (Latin, "the thing speaks for itself" — negligence presumed from the injury alone).
- ▶ **Contributory negligence** — patient's own want of care contributed; valid only in civil, not criminal, cases.
- ▶ **Emergency** — drastic life-saving measures (e.g. rib fracture during cardiac massage) fall under calculated risk.
- ▶ **Law of limitation** — a Consumer Protection Act complaint must be filed within **2 years**; up to **3 years** for breach of a specific contract.
- ▶ **Medical misadventure** — a bad outcome from individual biological variation, unrelated to the quality of care.
- ▶ **No duty owed** — the doctor never agreed to treat the patient.
- ▶ **Novus actus interveniens** — an unforeseen intervening act breaks the chain of causation.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **The 4 Ds of negligence:** four linked boxes — **Duty of care** → **Dereliction** → **Direct causation** → **Damage** — with a side-note "all four must be proved by the patient; precautions break this chain at every step."
- ▶ **Negligence-prevention wheel:** a central hub "Reasonable care & skill" with spokes to Consent, Records, Rapport, Standard procedures, Confirm diagnosis, Chaperone, No experimentation/abandonment, Consultation/referral, Indemnity & audit.

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Witness and evidence*Asked in: Paper III Apr 2019 — RGUHS MD Forensic Medicine***Definition**

- ▶ A **witness** gives evidence before a court, on oath, about facts within his knowledge; **evidence** is anything lawfully placed before it to prove or disprove a fact in issue.
- ▶ Evidence includes **oral evidence** (statements witnesses are permitted or required to make) and **documentary evidence** (documents, including electronic records, produced for the court's inspection) — **Section 2(e), Bharatiya Sakshya Adhiniyam (BSA) 2023**.
- ▶ **BSA 2023** replaced the Indian Evidence Act (IEA) 1872 from 1 July 2024.
- ▶ Jeremy Bentham called witnesses "*the eyes and ears of justice*."
- ▶ An autopsy report or wound certificate has no value until it is **proved** in the witness box.
- ▶ Medical evidence is **corroborative, not conclusive; the doctor is not a witness of truth**.
- ▶ His evidence is only an *opinion* — it alone cannot establish guilt or innocence.
- ▶ **Standard of proof: criminal** — "*beyond reasonable doubt*"; **civil** — the lower "*preponderance of evidence*" (over 50% probability).

Classification of evidence

- ▶ **Oral evidence** is more important because it permits cross-examination.
 - **Direct:** a fact actually perceived by the witness's own senses.
 - **Circumstantial (indirect):** the court draws a reasonable inference from related facts.
 - **Hearsay:** what someone else told the witness — generally *not admissible*.
- ▶ **Documentary evidence:**
 - **Primary:** the original document itself [Section 57, BSA (Section 62, IEA)].
 - **Secondary:** certified copies or photocopies [Section 58, BSA (Section 63, IEA)].
 - **Medical/FSL/electronic records:** MLC certificates, autopsy/wound reports, dying declarations, DNA reports.
- ▶ **Oral evidence must be direct** [Section 55, BSA (Section 60, IEA)] — testimony of the person who actually saw, heard or perceived the fact.

- ▶ A **deaf-mute witness** may testify by writing, signs, or through an interpreter; the statement must be videographed [Section 125, BSA (Section 119, IEA)].

Exceptions to oral evidence

- ▶ **Dying declaration:** admitted when the person is dead, untraceable, or unable to give evidence [Section 26(a), BSA (Section 32, IEA)].
- ▶ **Expert treatise:** a standard textbook may be produced if its author is dead or cannot be called without unreasonable delay [Section 55 proviso, BSA (Section 60 proviso, IEA)].
- ▶ **Lower-court deposition:** a medical witness's deposition, recorded and attested by a magistrate, is admissible in a higher court [Section 326, BNSS (Section 291, CrPC)].
- ▶ **Government scientific-expert reports** (Chemical Examiner, FSL Director, Serologist) are admissible without the expert attending court [Section 329, BNSS (Section 293, CrPC)].

Types of witness

- ▶ **Common (ordinary) witness:** deposes only facts he actually saw or heard, and cannot draw conclusions ("first-hand knowledge rule").
- ▶ **Expert witness** [Section 39, BSA (Section 45, IEA)]: specially trained (e.g. doctor, ballistics expert, DNA expert) and can draw opinions from observed facts.
- ▶ **Hostile (adverse) witness** [Section 157, BSA (Section 154, IEA)]: contradicts his own earlier police statement, deposing against the side that called him.
 - The judge declares him hostile on the calling lawyer's request.
 - After that, leading questions are allowed even in examination-in-chief.
- ▶ **Competency to testify** [Section 124, BSA (Section 118, IEA)]: everyone is competent unless tender age, extreme old age, or disease prevents rational answers.

Criterion	Common witness	Expert witness
Legal basis	Section 124, BSA	Section 39, BSA
Who	Saw/heard the fact	Skilled in a technical field
Draws opinion	No	Yes (incl. hypothetical)
Volunteer a statement	No	Yes
Responsibility	Less	High

The expert (medical) witness — scope of opinion

- ▶ May give opinion on facts proved at trial, common knowledge, and **hypothetical questions** — even without first-hand case knowledge.
- ▶ Opinion should be a "**reasonable medical certainty**" — findings are "consistent with" a mechanism, not proof excluding other causes.
- ▶ The doctor is an expert witness **to the court**, not to the party who summoned him.
- ▶ If two experts conflict, the court favours the opinion agreeing with direct evidence, and the **accused gets the benefit of the doubt**.

Summons and attendance

- ▶ **Summons (subpoena):** a signed, sealed order compelling attendance [Sections 63–71, BNSS (Sections 61–69, CrPC)].
 - **Subpoena ad testificandum:** compels attendance to testify.
 - **Subpoena duces tecum:** requires production of documents [Section 94, BNSS (Section 91, CrPC); Section 165, BSA (Section 162, IEA)].
- ▶ **Conduct money** (civil cases only) is paid at summons time for attendance expenses; if unpaid, the doctor still attends and informs the magistrate.
- ▶ **Criminal cases:** no conduct money upfront, but travelling/daily allowance may be claimed afterwards [Section 350, BNSS (Section 312, CrPC)].
- ▶ **Non-attendance** without justification is punishable [Section 208, BNS (Section 174, IPC)] — up to one month's imprisonment or fine, or both; warrants may also issue.

Oath and order of examination

- ▶ **Oath/affirmation** is compulsory — *"the truth, the whole truth, and nothing but the truth"* (an atheist "solemnly affirms" instead).
 - A **child below 12 years** need not take an oath [Section 4(1), Oaths Act 1969].
 - **Refusing to take oath** is punishable [Section 213, BNS (Section 178, IPC)].
- ▶ **Order of examination** [Section 143, BSA (Section 138, IEA)]:
 - **Examination-in-chief** [Section 142, BSA (Section 137, IEA)] — by the calling side; no leading questions.
 - **Cross-examination** [Section 142, BSA (Section 137, IEA)] — by the opposite side; leading questions allowed [Section 146, BSA (Sections 141–143, IEA)].
 - **Re-examination** — by the calling side, to clarify; no new matter without the court's leave.
 - The **judge** may question at any stage and recall any witness [Section 168, BSA (Section 165, IEA); Section 348, BNSS (Section 311, CrPC)].
- ▶ A **leading question** suggests its own answer — e.g. "Was the cut 3 cm long?" versus "What was the length of the cut?"
- ▶ **Perjury** (wilful false evidence on oath) [Section 227, BNS (Section 191, IPC)] is punished under **Section 229, BNS** (Section 193, IPC) with up to 7 years' imprisonment and fine.
- ▶ A hostile witness may be prosecuted for perjury.

Medico-legal significance

- ▶ The forensic physician most often appears as an **expert witness**, proving the MLC record, autopsy report, or dying declaration.
- ▶ **Before court, carry all original documents, in order:**
 - Summons, MLC record, autopsy report, death certificate.
 - Case sheets, photographs (with scale), X-rays.
 - Chemical/serology/DNA lab reports.

- ▶ Carry receipts proving the **chain of custody** of every exhibit, each item labelled with name, date/time, nature and identification number.
- ▶ **In the box:** stay impartial, calm and courteous; address the judge as "Sir/Madam" or "Your Honour," in simple language, no superlatives.
- ▶ State opinion as "*In my opinion...*" — never "*I think*" — and answer only what is asked, admitting honestly when a question is beyond your expertise.
- ▶ Never argue, turn hostile, or leave the box without the court's permission.
- ▶ **Brouardel's dictum:** "*No victim to avenge, no guilty person to convict, no innocent person to save — testify within the limits of science.*"
- ▶ **Also punishable:** issuing a false certificate [Sections 234/235, BNS (Sections 197/198, IPC)].

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Flowchart — order of examination:** Summons → oath → examination-in-chief (no leading questions) → cross-examination (leading questions allowed) → re-examination (clarification only) → judge's questions → deposition signed. Branch: contradicts earlier statement → declared hostile → leading questions allowed in chief.
- ▶ **Box diagram — classification of evidence:** EVIDENCE → ORAL (Direct / Circumstantial / Hearsay) and DOCUMENTARY (Primary / Secondary — medical certificates, autopsy reports, dying declaration, DNA reports).



Euthanasia and the recent trends

Asked in: Paper III Apr 2020 — RGUHS MD Forensic Medicine

Definition

- ▶ **Euthanasia** (Greek *eu* = good, *thanatos* = death), also called **mercy killing**, is a painless death given, out of compassion, to a person with an incurable, terminal, extremely painful disease.
- ▶ In India the law has moved from total prohibition to court-approved **passive euthanasia**, backed by a **living will** (advance directive).

Classification — by the physician's act

Feature	Active euthanasia	Passive euthanasia
Nature	Act of commission ("killing") — patient would not have died without it	Act of omission ("letting die") — nature takes its course
Method	Lethal doses of drugs (barbiturates, potassium chloride, opioids)	Turning off a respirator, stopping food/medication, withholding CPR
Legality in India	Illegal	Legal since 7 March 2011 (<i>Aruna Shanbaug</i>), under safeguards

- ▶ **Terminal sedation (doctrine of double effect):** morphine given to a dying patient relieves pain but may also hasten death — lawful because the *primary intent* is pain relief, not killing.

Classification — by the patient's will

- ▶ **Voluntary euthanasia:** carried out at the request of a mentally competent patient.
 - Legal in Belgium, the Netherlands, Switzerland, and some US states (Oregon, Washington).
 - Two forms: euthanasia *by the doctor*, or **physician-assisted suicide**, where the patient performs the final act with means the doctor provides.
- ▶ **Involuntary euthanasia:** carried out against the patient's will (e.g., a mortally wounded soldier killed to end his suffering despite wanting to live) — universally regarded as murder.
- ▶ **Non-voluntary euthanasia:** the patient cannot express any wish — e.g., irreversible coma or a severely defective infant; classic examples are *Karen Ann Quinlan*, *Nancy Cruzan*, *Terri Schiavo* (USA), and *Aruna Shanbaug* (India).

Related concepts

- ▶ **Assisted suicide:** giving another the information, guidance, and means to end their own life — by a doctor, it is **physician-assisted suicide**.
- ▶ **Living will / advance directive:** a document made in advance by a sound-minded adult, directing that life support be withheld/withdrawn if they later become terminally ill or enter a permanent vegetative state — the legal instrument that now operates passive euthanasia in India.
- ▶ **DNR (Do-Not-Resuscitate) order:** an instruction not to attempt CPR if the heart stops — a limited, treatment-specific form of withholding, allied to passive euthanasia; its usual setting is a *persistent vegetative state* (PVS), wakefulness without awareness.
- ▶ **Historical pointers:**
 - Hippocrates opposed euthanasia: *"I will not prescribe a deadly drug to please someone, nor give advice that may cause his death."*
 - **King George V** was euthanised by *Lord Dawson* with cocaine and morphine.
 - **Aruna Ramachandra Shanbaug**, a nurse strangled at KEM Hospital (1973), spent nearly 40 years in a vegetative state — her case is India's route to legalising passive euthanasia.

Recent trends — the evolving Indian legal position

- ▶ **Pre-2011 — total prohibition.** All euthanasia was illegal in India.
 - The old consent defences protected only acts *not intended to cause death*; a doctor performing euthanasia faced culpable-homicide/murder and abetment charges (exact sections under Medico-legal significance).
- ▶ ***2011 — Aruna Shanbaug v. Union of India, (2011) 4 SCC 454.***
 - A two-judge Bench (Justices *Katju* and *Misra*) legalised **passive euthanasia**, under strict safeguards, keeping active euthanasia illegal; with no statute in place, the ruling became the law of the land until Parliament legislated.
 - Withdrawal of life support could be decided by close relatives or treating doctors acting in good faith (*bona fide*), subject to mandatory **High Court** approval under its *parens patriae* jurisdiction (court acting as guardian).

- The Chief Justice formed a Bench of two judges, who sought a report from a **committee of three doctors**, notified relatives and the State, then decided.
- ▶ **2018 — Common Cause (A Regd. Society) v. Union of India, (2018) 5 SCC 1.**
 - A five-judge Constitution Bench held that the **right to die with dignity** is part of the **right to life** under **Article 21**, and for the first time recognised the **living will / advance directive** as legally valid.
 - **Original living-will procedure required:**
 - Execution by a sound-minded adult, on informed consent, signed before a **Judicial Magistrate of First Class (JMFC)**.
 - A named guardian to invoke withdrawal, verified by the treating physician, then authorised by a **hospital medical board**.
- ▶ **2023 — Supreme Court simplifies the Common Cause procedure (order dated 24 January 2023),** because the 2018 safeguards proved unworkable — almost no living wills were actually registered.
 - Attestation before a Judicial Magistrate was replaced by attestation before a **notary or gazetted officer**, with two witnesses.
 - The dual-board system was streamlined into a **Primary Medical Board** (treating hospital) and a **Secondary Medical Board** (with a district CMO nominee), with fixed **timelines**.
 - The magistrate's role shifted from prior approval to record-keeping only.

Medico-legal significance

- ▶ **Active euthanasia remains a crime in India.**
 - Murder/culpable homicide — Sections 299, 300, 302, 304 IPC 1860 (now Sections 100, 101, 103, 105 BNS 2023); abetment of suicide if the patient acts — Section 306 IPC (now Section 108 BNS 2023).
- ▶ **The consent defences do not legalise active euthanasia.**
 - Section 88 IPC / **Section 26 BNS** excuses only acts *not* intended to cause death — so does not apply.
 - Sections 89 and 92 IPC (now **Sections 27 and 30 BNS**) — child/insane person's benefit, and emergency without consent — give no protection either.
- ▶ **Attempted suicide is effectively decriminalised.**
 - Section 309 IPC has **no general re-enactment in the BNS 2023**; the only residual provision, **Section 226 BNS**, punishes attempting suicide only to compel/restrain a public servant.
 - **Section 115, Mental Healthcare Act 2017** presumes "severe stress" in anyone attempting suicide, barring trial/punishment — so a competent patient refusing treatment commits no offence.
- ▶ **Article 21** guarantees the right to live; the Supreme Court read the "right to die with dignity" into it in *Common Cause* (2018), but Article 21 alone does not create a right to active euthanasia or suicide.
- ▶ **A doctor's duties when a living will/passive euthanasia is invoked:**

- Confirm the patient is terminally ill or in a permanent vegetative state, and verify the advance directive's validity.
- Constitute and document the Primary and Secondary Medical Boards, ensuring the family/surrogate decision is *bona fide* and in the patient's best interest.
- Never perform a lethal act — that would convert lawful withdrawal into unlawful active euthanasia.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Classification tree: root box Euthanasia (mercy killing).**
 - Branch 1 (*by act*): **Active** (commission — killing) vs **Passive** (omission — letting die).
 - Branch 2 (*by will*): **Voluntary** (doctor-performed / physician-assisted suicide), **Involuntary** (against will), **Non-voluntary** (cannot decide).
 - Side box: assisted suicide, living will, DNR order, terminal sedation (double effect).
 - Legality bar: *Active = illegal in India; Passive = legal since 2011/2018, under safeguards.*
- ▶ **Timeline: Pre-2011 (all illegal) → 2011 Aruna Shanbaug (passive legalised) → 2018 Common Cause (living will recognised) → 2023 modification (procedure simplified).**

Recent advances [RA]

- ▶ **UK — assisted-dying legislation advancing.** The *Terminally Ill Adults (End of Life) Bill* (England and Wales) — physician-assisted dying for competent adults with under six months to live — passed Commons Third Reading (20 June 2025), now before the Lords, unlikely in force before 2029.
 - A 2026 survey found 64.5% of UK/Ireland medical students considered assisted dying justifiable, but only 7.6% knew all the eligibility criteria — a training gap. [PMID 42383174]
- ▶ **Canada — widening MAiD eligibility.** Medical Assistance in Dying (legal since 2016) was widened in 2021 to patients whose death is *not* reasonably foreseeable ("Track 2"), reviving safeguard concerns. [PMID 42321717]
- ▶ **Organ/tissue donation after euthanasia (ODE) is now an established stream.**
 - An Ontario eye-bank review recorded 475 MAiD eye donors over five years, but first-person consent for ocular donation was documented in only 35%. [PMID 40698781]
 - Solid-organ transplantation, including liver transplants, after MAiD has now been reported. [PMID 41995629]
 - A 2026 international (ESOT "Bucharest") consensus stresses that donor death must be certified *before* organ procurement, preserving the dead-donor rule. [PMID 42326389]
- ▶ **Euthanasia for psychiatric illness remains the most contested frontier** — live in the Netherlands, Belgium, and Canada — a caution for India. [PMID 42161322]
- ▶ **Palliative sedation re-examined against euthanasia** — continuous deep sedation is not *intended* to end life, keeping the double-effect distinction lawful in Indian practice. [PMID 37428181]
- ▶ **India — MoHFW draft Guidelines for Withdrawal of Life Support (September 2024).** These translate the 2023 Supreme Court simplification into practice: define terminal illness, reaffirm

the right to refuse treatment, and route withdrawal through the **Primary and Secondary Medical Boards**; active euthanasia remains illegal. [MoHFW 2024]



Write about Organ Transplantation Act 1994

Asked in: Paper III Apr 2020 — RGUHS MD Forensic Medicine

Definition / Introduction

- ▶ The **Transplantation of Human Organs Act, 1994 (THOA)** is India's main law on organ and tissue transplantation.
- ▶ Renamed the **Transplantation of Human Organs and Tissues Act (THOTA)** after the 2011 amendment.
- ▶ Act No. 42 of 1994; Rules framed in 1995; amended in 2011 (notified 27 September); further Rules in 2014.
- ▶ Two objects: regulate removal, storage and transplantation of organs for **therapeutic purposes**, and **prevent commercial dealing** in human organs.
- ▶ Its biggest legal achievement: **first statutory recognition of brain-stem death as legal death** in India, letting doctors lawfully retrieve vital organs from ventilator-maintained donors.

Background and need for the law

- ▶ Before 1994, no single nationwide law existed — only scattered state laws.
- ▶ Examples: *The Bombay Corneal Grafting Act, 1957*, *The Maharashtra Kidney Transplantation Act, 1982*, and *Delhi's Eyes Act and Ear Drums and Ear Bones Act, 1982*.
- ▶ Brain-stem death had no legal recognition, so vital organs could not be lawfully removed even from brain-dead patients.
- ▶ Unethical organ trade (the "kidney bazaars" of the early 1990s) was rampant and needed a nationwide law to stop it.
- ▶ A committee headed by **Dr L.M. Singhvi** prepared the report; Parliament passed the Act in 1994.

Aims and guiding principles

- ▶ Promotes deceased (cadaveric) donation by recognising brain-stem death and mandating reporting.
- ▶ Set up authorities for transparent, equitable allocation — now the **NOTTO** (national), **SOTTO** (state) and **ROTTO** (regional) network.
- ▶ Rests on five ethical principles:
 - **Altruism**: donation must be voluntary and unpaid.
 - **Non-commercialisation**: organ trade is prohibited.
 - **Equity**: allocation is based on medical need.
 - **Transparency**: documentation and oversight.
 - **Utility**: maximise benefit from scarce organs.

Key statutory definitions

Term	Meaning	Section
Brain-stem death	All functions of the brain stem have permanently and irreversibly stopped	S.2(d)
Human organ	Any body part with a structured arrangement of tissues that the body cannot replace once wholly removed	S.2(h)
Tissue	A group of cells (except blood) performing one function; brings bone marrow under the Act (2011 addition)	S.2(oa)
Near relative	Originally 7 (parents, spouse, siblings, son, daughter); 2011 added grandparents/grandchildren — now 11	S.2(i)

Salient features and operative provisions

► Section 3 — who may remove organs:

- Removal is allowed only for therapeutic purposes, by authorised persons.
- **Living donor:** any person above 18 years may authorise removal of his own organ/tissue in writing, during life.
- **Donation after death:** a person above 18 may authorise removal after death, in writing, before two or more witnesses.
- At least one witness must be a near relative, and a revoked authority cannot be acted on.
- If the deceased had objected during life, no one may authorise removal.
- If the deceased had neither authorised nor objected, the **person in lawful possession of the body** may authorise removal — unless a near relative objects.
- Only a **Registered Medical Practitioner (RMP)** may remove organs [S.3(4)].

► Certifying death before retrieval [S.3(5)]: the doctor must confirm life is extinct; if the patient is on life support and brain-stem death is suspected, a board of experts must certify it first.

► Brain-stem death certification board — 4 doctors:

- The doctor in-charge of the hospital.
- An independent specialist from a panel approved by the Appropriate Authority.
- A neurologist or neurosurgeon.
- The RMP treating the patient.
- A **transplant surgeon must never be on this board** — this avoids conflict of interest.
- Each doctor tests separately, and testing is repeated after an interval to rule out observer error.

- ▶ **Section 9 — restrictions on living donors:** living donation is normally restricted to **near relatives**.
 - Donation between unrelated persons (out of affection/attachment, or other special reasons) needs prior approval of the **Authorisation Committee**, whose job is to rule out a commercial motive.
- ▶ **Swap (paired-exchange) transplantation:**
 - Introduced by the 2011 amendment.
 - If a near-relative donor is incompatible, two such donor-recipient pairs may exchange donors, with Authorisation Committee approval.
- ▶ **Appropriate Authority [S.13]:** appointed by Central and State Governments.
 - Grants, renews, suspends or cancels registration of hospitals and tissue banks.
 - Enforces standards, inspects premises, investigates complaints.
- ▶ Every hospital doing transplants, and every tissue bank, must be registered under the Act.
- ▶ The 2011 amendment also brought in **tissue banks** and **transplant co-ordinators** (hospital staff managing donation/transplant logistics).
- ▶ **Cadaver (deceased) donation [S.9(2)]:**
 - Can go to unrelated recipients.
 - The donor's family **cannot nominate** a specific recipient.
 - The organ goes to whoever is next on the medical waiting list, ensuring equitable allocation.
- ▶ **Anti-commercialisation** — buying, selling, or any commercial dealing in human organs is absolutely prohibited and criminalised. This is the heart of the Act.

Penalties for violations

- ▶ **Removing an organ without authority:** imprisonment plus fine.
- ▶ Applies to anyone who assists, not just the doctor — anaesthetist, nurse, paramedical staff.
- ▶ A doctor is also struck off the medical register: **3 years** for a first offence, **permanently** for a repeat one. [S.18]
- ▶ **Commercial dealing in organs** is the most serious offence.
- ▶ It carries imprisonment up to **10 years** with a heavy fine (reported as up to ₹20 lakh, enhanced up to ₹1 crore after 2011).
- ▶ The 2011 amendment enhanced penalties across the board and tightened scrutiny of unrelated donations.

DIAGRAMS TO DRAW — IMAGE SUGGESTIONS

- ▶ **Flowchart** — "Pathway of legal organ donation under THOTA": Potential donor → Living donor (>18 yr) or Deceased donor → Written consent (2 witnesses, ≥1 near relative) → If on life support: brain-stem death certified by board of 4 doctors (no transplant surgeon) → Near relative? Yes → RMP retrieval; No → Authorisation Committee approval / Swap → Allocation via NOTTO/SOTTO waiting list → Transplant in registered hospital.
- ▶ **Retrieval-window bars** — "Tissue viability after death": Cornea (within 6 h, up to 12 h) · Skin (24 h) · Bone (48 h) · Vital organs — heart/liver/kidney (retrieved soon after circulatory arrest in a beating-heart donor).

Medico-legal significance

- ▶ **Brain-stem death as legal death:** turning off the ventilator on a certified brain-stem-dead person is **not** the cause of death — the original injury/disease is, which matters when an assailant claims "the doctors killed the victim."
- ▶ The doctor must diagnose and document brain-stem death **before** discontinuing ventilation.
- ▶ **Doctor's duties:** keep meticulous documentation of consent and certification, and confirm Authorisation Committee clearance for unrelated or swap donations.
- ▶ **Screening:** donors must be screened for transmissible infection close to the time of retrieval — HIV (antibody testing plus nucleic acid testing for earlier pickup) and hepatitis.
- ▶ **Cornea** is legally a **tissue, not an organ** — retrievable up to about 12 hours after death (ideally within 6 hours), with consent, through registered eye banks.
- ▶ The cornea is **immunologically privileged** — largely shielded from immune attack — so rejection after transplant is rare.
- ▶ **Interface with criminal law:** in medico-legal or unnatural deaths, organs may be retrieved only after inquest under **Section 174/176 CrPC 1973 (now Section 194/196 BNSS 2023)** and autopsy requirements are satisfied.
- ▶ Causing a donor's death through improper removal can attract culpable homicide or murder charges — **Section 299/300 IPC (now Section 100/101 BNS 2023)**.

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