Principles in Management of Poisoned Patient

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General Considerations

- **One** of the **most important** aspects in **management** of poisoning is knowing **what to do** and in **what order to do it**.
- **Acute** or chronic toxicity.
- Specific methods to **reduce absorption** of the toxic agent or to **increase** its **elimination** from the body.
- **Specific antidotes** can be used to counteract the effects of **selective toxic agents**.

Steps of Treatment

- "**Treat the patient not the poison**" must always be followed.
- **Removing** an **ingested poison** from the victim's stomach **if breathing** has **stopped** or blood pressure has plummeted is **not** a **heroic attempt**.
- Assess the patient's condition and **stabilize** the **vital signs**.
- **Priority** to the **airway, breathing** and **circulation** (ABC).
- **Identify** the **toxic agent**, **route of administration**, **quantity** and **time since exposure**.
- **After this information** has been obtained, **general** and **specific methods** can be considered.

Clinical Evaluation of the Poisoned Patient

- The **first step** is to **provide** the patient with **good supportive care**.
- **Is the patient breathing**? Health care personnel may need **administer oxygen** or start **mechanical ventilation**.
- **Is the patient's blood pressure stabilized**? **Shock** is best treated with a **fluid** challenge and, if necessary, **vasopressor agent**.
- **After cardiorespiratory functions** are **supported**, the **next step** is to **obtain** a **history** of the **poisoning**.

History of Poisoning

- An **accurate history** should **include**:
  - Identification of the poison.
  - Amount and time of ingestion or length of contact.
  - Emergency first aid treatment already administered.
  - Patient's psychological profile.

- Obtaining the history is **difficult** because the **poisoned individual** may be **unconscious**, **unresponsive** or **confused**.

- **Thus**, an **accurate history** may be **impossible** to obtain.

- **Information** can be **obtained** from **relatives** or **friends** (but ??).

- **Decisions** must be **quick** about **what to do** and **where to start**.

Clinical Assessment

- **Some poisons** produce **clinical characteristics** that strongly **suggest** the **involvement** of a **particular drug** or chemical.

- With **cholinesterase-inhibiting organophosphorous insecticides**, **cholinergic effects** such as **miosis**, **excessive salivation** and **gastrointestinal hyperactivity** will **predominate**.

- **Tricyclic antidepressant** overdose, **anticholinergic effects**, such as **mydriasis**, **loss of consciousness**, **absent of bowel sounds** and **cardiac arrhythmias** will **predominate**.

- **Clinical assessment** generally **begins** with **recording** of **vital signs**, such as **respiration, blood pressure**, **heart rate**, and body **temperature**.

Clinical Assessment

- **Once emergency procedures** have been **performed**, additional **steps** can be **taken** to:

  - remove the poison.
  - delay absorption.
  - enhance excretion.
  - administer a specific antidote.

- **Blood**, **urine** and **vomitus** for toxicologic analysis.

- **Qualitative** and **quantitative assays** can **quickly identify** toxic agents.

QUICKLY DETERMINE

A. RESPIRATORY FUNCTION
- Support breathing
- Administer oxygen if necessary
- Administer naloxon for narcotic poisoning

B. CARDIOVASCULAR FUNCTIONS
- Stabilize blood pressure
- Treat shock
- Normalize heartbeat

C. CNS INVOLVEMENT
- Control convulsions

IDENTIFY POISON
- Assess quantity and time of ingestion

DECIDE

SUBSTANCE NOT TOXIC
- Give demulcents if needed
- Observe for delayed effects

SUBSTANCE IS TOXIC
- Proceed with management (e.g. dilution, emesis, etc.)

Pharmacokinetics and Toxicokinetics

- **Pharmacokinetics** is the **science** of **drug movement** through the body (**absorption**, **distribution** and **elimination**).
- **Toxicokinetics** is used to describe the **absorption**, **distribution**, and **elimination** of drugs at doses that **produce clinical toxicity**.
- **Knowledge** of the **toxicokinetics** of a **specific poison** is **beneficial** when formulating the **proper management protocol**.
- **Pharmacokinetics data** available from **reference** tables **may not** apply to **overdoses** of the **same drug**.
- **Most drugs** follow **first-order kinetics**, **some** follow **zero-order kinetics**.

Methods to Reduce or Prevent Absorption (Gastrointestinal Decontamination)

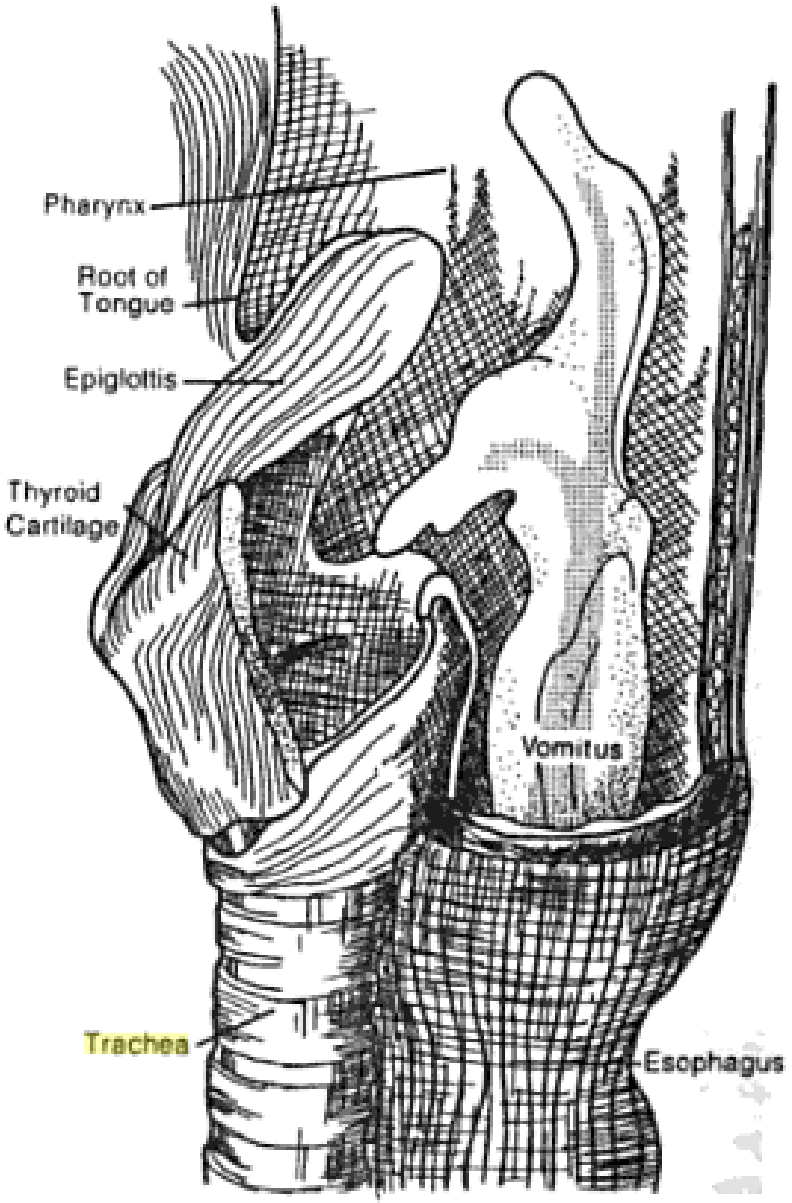
- **After** the **patient** is **stabilized**.
- **Removing** any **unabsorbed poison** from the **GI tract** and **other sites** such as the **skin**.
- **Severity** of **intoxication** is usually **proportional** to the **length of time** that an **unabsorbed** toxic agent remains in the body.

Dilution

- The initial procedure often **recommended** whenever ingestion of a poison is suspected is **dilution** with **water**.
- Generally **1-2** cupfuls for a child and **2-3** cupfuls for an adult.
- **Fluids** should **never** be **forced** (quantity comfortably swallowed).
- **Excessive** liquid may **distend** the **stomach wall**, causing premature evacuation of its contents into the duodenum.
- **Nothing** should be **administered orally** to an **unconscious** patient.
- Ingestion of **solid dosage forms**, dilution is **not recommended**.
- **Reduces gastric irritation** and **adds bulk** to the stomach (for **emesis**).

Emesis

- **First line** procedure, it can be **done at home**.
- **Ipecac syrup** should be in **all homes** (with children), but used after **consultation** with a **poison information specialist**.
- **If** the victim is **unconscious**, vomitus may be **aspirated** to the **lung** and cause **chemical pneumonitis**.
- If the poison is a **convulsant**, forced **emesis** may precipitate **seizures**.
- **Vomiting** should be **induced** only if there is **sufficient bulk** in the **stomach** to serve as a **carrier** for the **ingested poison**.



Graphic representation illustrating the manner in which vomitus can easily be aspirated into the trachea.

Conditions in which emesis should not be attempted

Do not induce vomiting if the ingested substance is a:

- convulsant
- hydrocarbon
- corrosive acid or alkali
- sharp object (e.g., needle, pin, razor blade, etc.)
- nontoxic substance

Do not induce vomiting if the patient:

- is unconscious
- has a diminished gag reflex
- has sever cardiovascular disease or extremely weakened blood vessels
- has recently undergone surgery
- is expected to deteriorate rapidly
- has a hemorrhagic diathesis (e.g., cirrhosis, varices, thrombocytopenia)
- has vomited significantly before this moment
- is under 6 months of age

Syrup of Ipecac

- **Ipecac** is derived from the **root** of ***C. acuminata***.
- The **main** active **alkaloids** are **emetine** and **cephaeline**.
- Ipecac causes **emesis** through **early** and **late phases** of **vomiting**.
- **Early vomiting** usually occurs **within 30 min**, resulting from direct **stimulant** action on the **GI tract**.
- A **second phase** occurs **after 30 min**, resulting from direct **stimulation** action on the **chemoreceptor trigger zone** that **activates** the **vomiting center** located in the reticular formation.
- If **vomiting** does **not occur** within **15 to 20 min**, the drug **should not** be **considered** as **ineffective**.

Recommended doses of ipecac syrup

Age	Quantity
6-12 months	5-10 mL
1-12 years	15 mL
Adults	30 mL

General Considerations for Using Ipecac Syrup

- Ipecac syrup **can** be **given** at **home**.
- **Because** it may **take** approximately **20-30 min** after administration to begin, **early** administration is **essential**.
- If the **ambulance** takes **30 min** to reach a home, **plus** another **20-30 min** to induce vomiting, **serious poisoning** may occur.
- **Riding** in a **vehicle** may help **promote** more rapid **emesis**.
- Induction of **emesis** is more **comfortable** than **gastric lavage**.
- Therefore, **parents** of **small children** should be strongly **advised** to keep **syrup of ipecac** at **home** and **receive** proper **instructions** from a qualified **health professional**.

Lavage

- Lavage is a process of **washing out** the **stomach** with **solutions**.
- Water, saline, sodium bicarbonate, calcium salts, tannic acid and potassium permanganate are used.
- **Indicated** when **poisons** must be **quickly** removed or **emesis** is **contraindicated**.

Gastric Lavage

Indications:

- Semiconsciousness or unconsciousness
- Loss of gag reflex
- Ipecac-induced emesis is ineffective or contraindicated
- Conscious patient ingesting large quantity of highly toxic substance (repeated charcoal administration is useful)

Contraindications:

- If the poison is corrosive
- If there are seizures

Factors determining effectiveness:

- Physical characteristics of toxic agent (e.g., solids, liquids)
- Rate of absorption of toxic agent
- Diameter of lavage tube
- Volume and rate of instillation of lavage solution

Adsorbents

- Kaolin, Cholestyramine and Pectin are **adsorbents**.
- **Activated charcoal** is used for **routine** adsorption of gastrointestinal poisons.
- **Activated charcoal** is the **most effective** agent for **gastric decontamination**.
- Should be **used** within **30 min** of ingestion.
- Is **contraindicated** if there is **gastrointestinal obstruction**.

Properties of activated charcoal

Dose

- Adult, 50-100 g
- Child, 25-50 g
- Infant, 1 g/Kg

Factors affecting efficacy

- Time since ingestion
- Charcoal:drug ratio
- Drug dose
- Stomach contents (pH, composition)

Multiple oral doses useful with:

- Carbamazepine
- Dapsone
- Digitoxin
- Nadolol
- Phenobarbital
- Phenylbutazone
- Theophylline

Binds poorly to:

- Elemental metals (lead, lithium, mercury)
- Boric acid
- Cyanide
- Electrolytes
- Ferrous sulfate
- Pesticides (malathion, DDT, *N*-methylcarbamate)
- Petroleum distillates
- Ethanol
- Methanol
- Mineral acids, alkali

Cathartics

- Should **not** be **attempted** when the **poison** is strongly **corrosive**, the patient has **electrolyte imbalance** or **bowel sounds** are **absent**.

- **Sodium**-containing **cathartics** are best **avoided** by persons with **congestive heart failure**.

- **Sorbitol cathartics** may become the **cathartic of choice**, associated with fewest electrolyte abnormalities and has the shortest gastrointestinal transit time.

Cathartics used in poison treatment

Cathartic	Dose	
	Child	Adult
Magnesium sulfate 10%	250 mg/kg	5-10 g
Magnesium citrate	4 mL/kg	250-300 mL
Sodium sulfate 10%	250 mg/kg	15-20 g
Sodium sulfate/sodium phosphate	20 mL	40 mL
Sorbitol	1.5 g/kg	1.5 g/kg (50 mL)

Whole Bowel Irrigation

- A procedure used to **cleanse** the **entire gastrointestinal tract** before **surgery**.
- The **solution** most **commonly used** is a **sodium sulfate** and **polyethylene glycol** electrolyte solution.
- The **solution** is **not absorbed** and does **not lead** to fluid or **electrolyte imbalance**.
- It helps to **decrease** the **absorption** of salicylates, lithium, ampicillin, iron, zinc and cocaine.
- **Safe** in **children**.

Demulcents

- Many **plants** and **chemicals** cause **oral** and **gastric** mucosal **irritation** but **no serious toxicity**.
- **Management** of these acute ingestions may include **ice cream**, **milk** or other **soothing demulcent** to **reduce irritation**.
- **Egg whites** have been given for **corrosive intoxication**.
- When **treatment** is **not needed**, but the patient or parent demands that "**something be done**!". Thus, a **demulcent** frequently **serves** as important **placebo therapy**.

Topical Decontamination

- **Chemicals** can be **absorbed** through the **skin** causing systemic **toxicity**.
- **After** dermal **exposure**, all **contaminated clothing** should be **removed**.
- **Skin** must thoroughly **flushed** with **water** and **washed** with **mild soap**.
- **No creams** or **bandages** should be **placed** over contaminated area.
- Substances **absorbed** through the **cornea** of the eye can **cause permanent damage**.
- **Irrigation** with **lukewarm water** must be **immediately** done and **continued** for at least **15-20 min**.
- The victim should **immediately** seek **medical care** after irrigation.

METHODS TO INCREASE ELIMINATION OF TOXIC AGENTS

- Factors that when methods to **enhance elimination** are **applicable**:

  - Patient presents with **obvious signs** and **symptoms** of **toxicity**.
  - Patient's status **deteriorates despite** good **supportive care**.
  - **Amount** of toxic agent **ingested** is likely to produce **significant toxicity** or **death**.
  - **Blood concentration** of the toxic agent absorbed is likely to produce **significant toxicity** or **death**.
  - **Normal routes** of detoxification of the toxic agent are **impaired**.
  - Patient ingested **significant quantity** of an **agent** that is **metabolized** to a **toxic metabolite**.

Forced Diuresis and pH Alteration

- **Forced diuresis** is **useful** when **compounds** or **active metabolites** are **eliminated** by **kidney**, and then enhances their excretion.
- **Although** many **diuretic** agents have been **recommended**, either **mannitol** or **furosemide** was **generally used**.
- The **use** of these drugs in **overdoses** was accompanied with **complications**, such as **pulmonary** and **cerebral edema**.
- **Twofold increase excretion**.

Forced Diuresis and pH Alteration

- **pH manipulation** is to **enhance renal excretion** of a compound by **increasing** the **amount** of the **ionized form** in the **kidney**.

- **Increased elimination** of **weak acids** occurs when **urinary pH** is more **alkaline**, and **increased elimination** of **weak bases** occurs when **urinary pH** is **nonacidic**.

- **Alkaline diuresis** is by using of **sodium bicarbonate** to **increase** urinary **pH**, and **enhance** the **excretion** of **weak acids**, such as salicylates, phenobarbital and 2,4-dichlorophenoxyacetic acid.

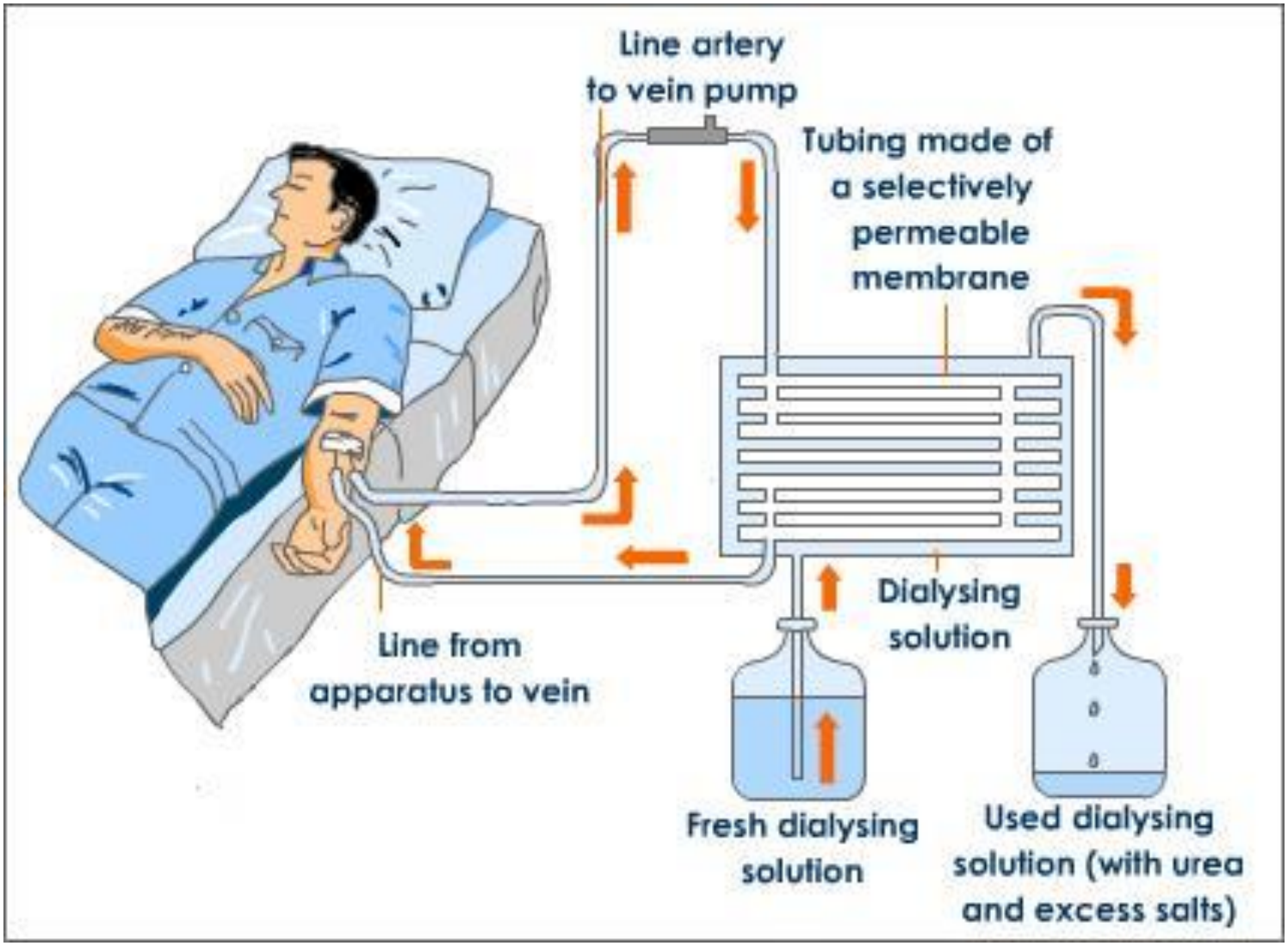
- **Acid diuresis** is by administration of **ammonium chloride** to **enhance** the **excretion** of **weak bases**, such as amphetamines, pencyclidine and quinidine.

Dialysis and Hemoperfusion

- **Limited** and **not routinely** performed for every **toxic ingestion**.
- Used as **adjuncts** to **management** of **severely** intoxicated patient.
- Should **never replace** the use of more **specific method** or **antidote**.
- **Treatment** of acute ingestion of **cytotoxic poisons**, such as **cyanide**.
- **Dialysis** is governed by the **laws** of **osmosis**.
- **Dialysis solution** can be **adjusted** according to the **poison ingested** (e.g., highly protein-bound, highly lipid soluble, weak acid, etc.).
- **Hemoperfusion** more effective than **peritoneal** and **hemodialysis**.

Peritoneal Dialysis

Hemodialysis



Specific Antidotes

- **Specific antidotes** may be **classified** into **four** categories: chemical, receptor, dispositional and functional.

- *Chemical antidotes* **react** with **toxic chemical** producing **compound** of **lesser toxicity** or **less absorbed** than the parent compound.

- *Receptor antidotes* **compete** with the **poison** for **receptor site**.

- *Dispositional antagonism* involves **alteration** of **absorption**, **distribution**, **metabolism** or **excretion** of toxic agents to reduce the amount available to tissues.

- *Functional antagonists* **act** on one **biochemical system** to produce **effects** that are **opposite** from those produced on another system.


THEME