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)

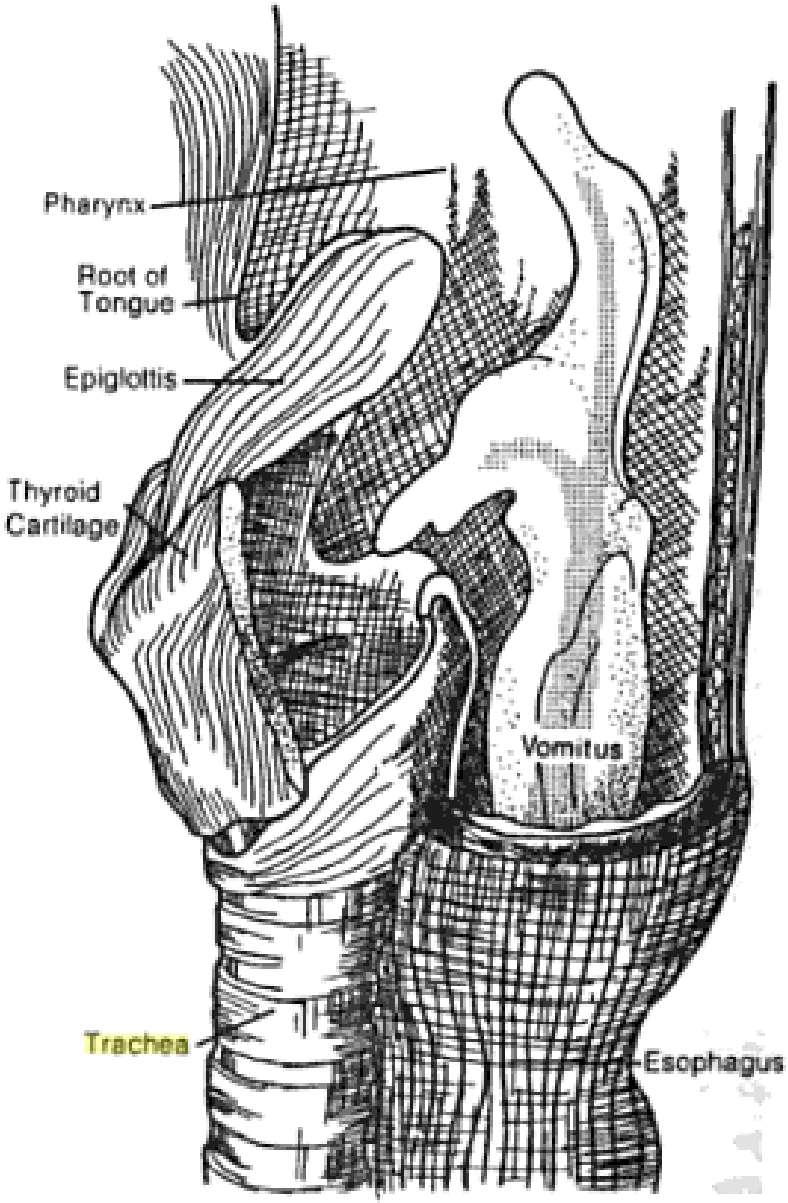
- After the patient is stabilized.
- Removing any unabsorbed poison from the GI tract and other sites such as the skin.
- Severity of intoxication is usually proportional to the length of time that an unabsorbed toxic agent remains in the body.

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

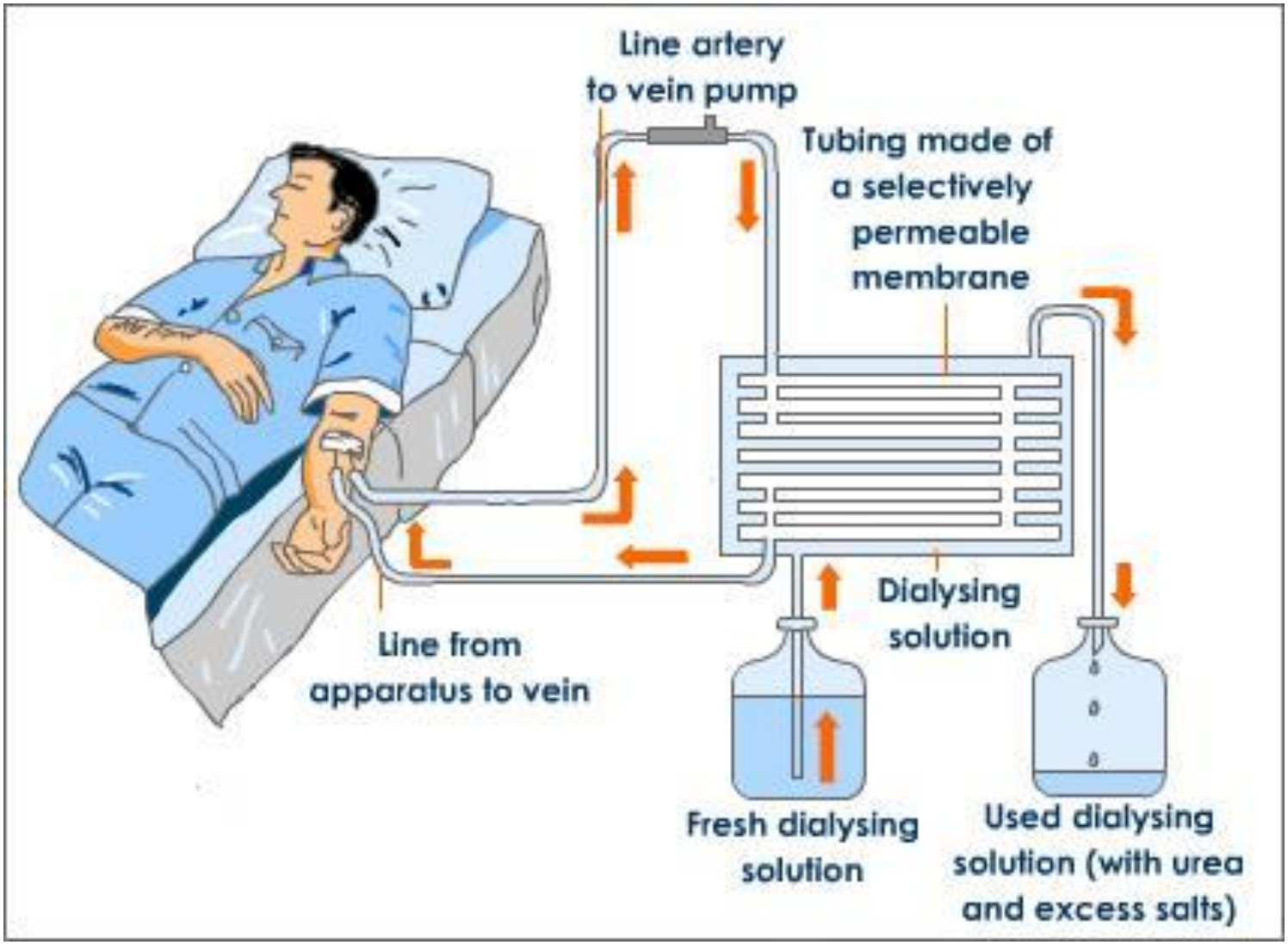
- pH manipulation is to enhance renal excretion of a compound by increasing the amount of the ionized form in the kidney.
- Increased elimination of weak acids occurs when urinary pH is more alkaline, and increased elimination of weak bases occurs when urinary pH is acidic.
- Alkaline diuresis is by 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.