Management of Acute Poisoning: General approaches

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Introduction

- Basic knowledge and practices in managing acute poisoning.
- Understanding this basic and general approaches is vital for healthcare provider in facilitating decisions of diagnosis, risk assessment and treatment plan of specific type of poisoning.
- Pharmacist should identify their important roles in the management flow regardless their setting of practice.
- Other healthcare providers are part of the important team members in managing poisoned patient.
Scenarios: Pharmacist may encounter

- A doctor call the pharmacist National Poison Centre (NPC) to get information on how to manage a poisoning case recently admitted to the ED.
- A mother of a 2 yo boy called a community pharmacist asking whether 50 tablets of Vitamin C is toxic to her child or not.
- A public walk into your retail pharmacy asking whether the TCM product he took contains any poison.
- A doctor called a pharmacist in hospital DIS asking about dosing, dilution and preparation of ethanol to treat methanol poisoning.
- A doctor contacted a pharmacist in hospital TDM enquiring about procedure on measuring carbamazepine level in an overdosed patient.
- A doctor/pharmacist from NPC called a pharmacist in a community/hospital pharmacy to get assistance on identifying an unknown tablet that was taken overdose by a patient.
Competencies for Pharmacist

• Good history taking – consider various circumstances in poisoning
• Able to understand and correlate the signs and symptoms with suspected agent
• Understand lab findings
• Able to choose and search in relevant reference sources
• Able to evaluate risk of the patient
• Able to deliver relevant information which is individualized to the patient.
• Good in handling drug-related enquiries eg antidote, drug dosing, dilution etc.
- Drug overdose
- Chemical accident
- Envenomation
- Occupational exposure
- Environmental contaminant
- Adverse reaction
GENERAL APPROACH

1. Emergency stabilization
2. Clinical evaluation
3. Limiting absorption of poison
4. Enhanced elimination of poison
5. Administration of antidote
6. Supportive therapy
7. Appropriate disposition

first things first
Emergency Stabilization

- maintenance of adequate airway
- adequate oxygenation and ventilation
- adequate circulation
- treat convulsions
- correction of metabolic abnormalities
- manage coma
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CLINICAL EVALUATION

A. History taking
B. Physical examination
C. Toxicological screening
CLINICAL EVALUATION: A. History Taking

- agent and amount
- time & location of exposure
- route of exposure
- intake of other substances
- circumstances of exposure
- current medications
- past medical history
- prehospital treatment
CLINICAL EVALUATION: B. Physical Examination

- general status
- look at the skin
- smell the breath
- listen to the lungs
- evaluate the heart
- examine the abdomen
- perform neurological exam
• May need to remove clothing for thorough exam
• Check clothing for objects or substances
• Assess general appearance of patient - Agitation, confusion, or obtundation
• Exam skin for bruising, cyanosis, flushing
• Exam eyes for pupils size, nystagmus, reactivity, dysconjugate gaze, increased lacrimation
• Oropharynx for increase salivation or excessive dryness
• Heart: rhythm, rate, regularity
• Lungs: bronchorrhea or wheezing
• Abdomen: bowel sounds, tenderness or rigidity
• Extremities: fasiculations, tremor
• Neuro: CNS, reflexes, muscle tone coordination, cognition, ability to ambulate
Abdomen

- hypoactive: anticholinergics
- hyperactive: organophosphates

Neurologic Exam

- coma: opioid, isoniazid
- paralysis: snake bite
- anisocoria: ethylene glycol
- blindness: methanol

Glasgow Coma Scale (E, M, V)
Measure conscious state:
- Eye opening
- Best motor response
- Best verbal response

Scoring
- MILD = 13 - 15
- MODERATE = 9 - 12
- SEVERE = 3 - 8
A toxidrome is a combination of signs and symptoms which, when taken collectively, characterize a suspected toxicant.

**Organophosphates/carbamates**
- Diarrhea/diaphoresis
- Urination
- Miosis/muscle fasciculations
- Bradycardia/bronchorrhea
- Emesis
- Lacrimation
- Salivation

**Opioids**
- Coma
- Respiratory depression
- Miosis/mydriasis
CLINICAL EVALUATION: B. Physical Examination

Poisons with delayed signs and symptoms:
- ethylene glycol: 6 hours
- organophosphate: 6-12 hours
- paracetamol: 36 hours
- paraquat: 48 hours
- methanol: 48 hours
- thyroxine: 4 weeks

Asymptomatic or mild initial condition not necessarily warrant good prognosis
CLINICAL EVALUATION: C. Toxicological screening

- Specimen collection
  - Timing of sampling
  - Manner of sampling
  - Type of biologic fluid

Availability of specific lab investigation in Malaysia
- Urine paraquat
- Rapid urine test for substance of abuse
- Blood methanol, ethanol
- Pseudocholinesterase (not RBC cholinesterase)
- CarboxyHemoglobin (COHb)

In the acute care setting, toxicology screening is very limited and does not contribute significantly.
CLINICAL EVALUATION: C. Toxicological screening

Radio-opaque Drugs (CHIPS)

- Chloral hydrate
- Heavy metals
- Iron and Iodides
- Psychotropics (TCA)
- Enteric-coated salicylates

There are varying radio-opacity among different medications and even for the same medication from different manufacturers.
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first things first
LIMITING ABSORPTION OF POISON

A. Decontamination (external and internal)
   A1. Skin decontamination
   A2. Eye decontamination
   A3. Induce emesis
   A4. Gastric lavage / Gastric aspiration

B. Adsorbent (Activated charcoal, Fuller’s Earth)

C. Cathartics

D. Whole bowel irrigation
Principles of Decontamination

• **External**
  – Protect yourself and others
  – Remove exposure
  – Irrigate copiously with water or normal saline

• **Internal**
  – Patient must be fully awake or intubated
  – Most common complication is aspiration
  – Gastric lavage/aspiration
LIMITING ABSORPTION:

A. Decontamination (external)

A1. Skin

- Protect yourself and other HC workers
- Remove clothing
- Flush with water or normal saline
- Use soap and water if oily substance
- Chemical neutralization can potentiate injury
- Corrosive agents injure skin and can have systemic effects

A2. Eyes

- Remove contact lens
- Flush copiously with water or normal saline
- Use local anesthetic drops
- Continue irrigation until pH is normal
- Slit lamp and fluorescein exam
LIMITING ABSORPTION:

A. Decontamination (internal)

A3. Induction of emesis

Use of syrup of ipecac is NO LONGER recommended in the management of poisoned patients because:

• it can cause prolonged vomiting
• can delay administration of activated charcoal
• its potential complications including pulmonary aspiration
LIMITING ABSORPTION: A. Decontamination

A4. Gastric lavage is a method of evacuating stomach contents by inserting a nasogastric or orogastric tube and subsequent administration then aspiration of small volumes of liquid, bringing with it the ingested poison.

It should not be considered UNLESS:

• patient has ingested a potentially life-threatening amount of poison
• procedure can be performed within 1 hour of ingestion.
• patient is fully awake or intubated

It can be of benefit up to 4 hours in patients who ingested substances that form concretions in the stomach or those that markedly decrease gastric motility.
LIMITING ABSORPTION:

A. Decontamination (Internal)

• Contraindications of Gastric Lavage:
  – Unprotected airway
  – Hydrocarbon or Caustic ingestion
  – Esophageal pathology

• Complications of Gastric lavage:
  – Aspiration ➔ Hypoxia, Pneumonia
  – Kinked Orogastric Tube
  – Perforation (Throat, Esophagus, Stomach)
  – Laryngospasm, Epistaxis, Great Discomfort
LIMITING ABSORPTION:

A. Decontamination (Internal)

Gastric lavage
LIMITING ABSORPTION: B. Adsorbent

Activated charcoal
- very fine particles with increased surface area that able to accumulates poison on its surface (adsorption not absorption)
- prepare slurry from AC powder
- charcoal tablet not useful for adsorbing poison

Fuller’s Earth
- Commonly used in paraquat poisoning since paraquat become deactivated after contact with soil/clay

Bentonite clay
- another alternative to Fuller’s Earth
LIMITING ABSORPTION:

B. Absorbent: Activated Charcoal

DOSAGE:

Children

0.5-1 g/kg

Adolescents and adults

25-100 g

Minimum dilution for slurry:
30 gram in 240mls

Normally given as single dose orally or via NG/OG tube
Contraindications to activated charcoal

- Gastrointestinal tract not anatomically intact
- Unprotected airway
- Presence of intestinal obstruction
- Ingestion of corrosive substances

It is not effective in the following substances:

- Alcohol
- Cyanide
- Iron
- Lithium
- Hydrocarbons
- Metals
Cathartics are intended to decrease the absorption of poison by accelerating the expulsion of the poison from the GI tract.

The two general types of osmotic cathartics used in poisoned patients are:
- saccharide cathartics (sorbitol)
- saline cathartics (magnesium citrate, magnesium sulfate, sodium sulfate).

* Cathartics have NO ROLE in the management of a poisoned patient when used ALONE.

* Based on available data, the routine use of a cathartic in combination with activated charcoal is not endorsed. If a cathartic is used, it should be limited to a single dose in order to minimize adverse effects.
LIMITING ABSORPTION:

D. Whole Bowel Irrigation

WBI utilizes polyethylene glycol-electrolyte solution and is used to expel:

* poisons that are poorly absorbed by activated charcoal
* sustained-release drugs
* packed drugs in the body (body packers)

WBI induce liquid stool – poorly tolerated, cause discomfort, complications

There are no established indications to the use of WBI, nor are there conclusive evidences showing that this procedure improves patient outcome in poisoning cases.
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ENHANCED ELIMINATION OF POISON

• Does the patient need it?
  – Severe intoxication with a deteriorating condition despite maximal supportive care
  – Usual route of elimination is impaired
  – A known lethal dose or lethal blood level
  – Underlying medical conditions that can increase complications

• Methods:
  A. Multiple Dose Activated Charcoal
  B. Ion trapping technique – Urine alkalinization/acidification
  C. Extracorporeal elimination
  D. Forced diuresis (mannitol) - no longer recommended, no clinical evidence to support its effectiveness
ENHANCED ELIMINATION OF POISON:

A. Multiple Dose Activated Charcoal

• Optimum dose is unknown. After initial dose (25-100g in adult), give at a rate less than 12.5g/hour

• Based on experimental and clinical studies, MDAC should be considered only in patient who ingested life-threatening amount of - carbamazepine, dapsone, phenobarbitol, theophylline, quinine, phenytoin

Complications of MDAC

• Thickening of charcoal in the gut
• Gut obstruction/perforation
• Bowel infarction
• Pulmonary aspiration
ENHANCED ELIMINATION OF POISON

B. Ion trapping technique

1. Urine alkalization

- Salicylates, phenobarbital, chlorpropamide, phenoxyacetate herbicides.
- IV Sodium bicarbonate 1-2 ampules or 1 mEq/kg/dose to titrate urine pH within 7.5-8.5
- Contraindication – established or incipient renal failure

2. Urine acidification

- No longer recommended because it can produce metabolic acidosis, rhabdomyolysis and renal failure.
- Vitamin C titrated to acidic urine pH
### ENHANCED ELIMINATION OF POISON:

#### C. Extracorporeal Elimination

- Severe poisoning
- Reserve for specific agent (life threatening) that amenable to removal by this method:
  - Hemodialysis (HD), Hemoperfusion (HP), Hemofiltration (HF), Plasmapheresis, Exchange transfusion
- Clinical efficacy – difficult to differentiate from concomitant effect of other mechanism of metabolism and excretion (renal, liver)

#### Drug | Preferred method
--- | ---
Carbamazepine | HP
Ethylene glycol | HD
Lithium | HD
Methanol | HD
Methotrexate | HF
Phenobarbital | HP
Procainamide | HF
Salicylate | HD or HP
Theophylline | HP or HD
Valproic acid | HD or HP

**Remember:**
- *Consider pharmacokinetics and known behavior of the drug (Vd, protein binding, T1/2, MW)*
- *What clinical evidence is there for benefit with enhanced removal?
Hemoperfusion

Uses hemodialysis machine - but runs blood directly through a charcoal- or sorbent-containing filter
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MECHANISMS:

1. Inert complex formation
2. Accelerated detoxification
3. Reduction in conversion to more toxic compounds
4. Competitive inhibition at receptor site
5. Bypassing effects of poison
6. Antibodies Interacting with Poison
## Common antidotes

<table>
<thead>
<tr>
<th>Antidotes</th>
<th>Poison</th>
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<tbody>
<tr>
<td>N-acetylcysteine</td>
<td>Paracetamol</td>
</tr>
<tr>
<td>Atropine &amp; Pralidoxime</td>
<td>Organophosphate/carbamate</td>
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<tr>
<td>Vitamin K1</td>
<td>Anticoagulants</td>
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<tr>
<td>Pyridoxine</td>
<td>Isoniazid</td>
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<tr>
<td>Thiamine</td>
<td>Alcohol</td>
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## Antidotes

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<tr>
<td>Deferoxamine</td>
<td>Iron</td>
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<tr>
<td>Naloxone</td>
<td>Opioids</td>
</tr>
<tr>
<td>Flumazenil</td>
<td>Benzodiazepines</td>
</tr>
<tr>
<td>Ethanol or Fomepizole</td>
<td>Methanol, Ethylene glycol</td>
</tr>
<tr>
<td>Calcium chloride/gluconate</td>
<td>Calcium channel blocker, Hydrofluoric acid</td>
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SUPPORTIVE THERAPY

- IVF for replacement and maintenance of adequate circulating blood volume
- Frequent monitoring of urine pH during alkanization therapy
- Intensive nursing care (ET tubes, ulcers)
- Address metabolic disturbances
- Monitor vital signs
- Manage underlying illnesses
- Monitor fluid input and output
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APPROPRIATE DISPOSITION

- Short period observation versus admission
- Psychiatric evaluation
- Rule out child abuse / neglect
- Family counseling and education
Consult the National Poison Centre

Office Hours:  
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After Office Hours:  
+6012-430 9499  
(including weekends and public holidays)
Thank You