

Investigation and management of the poisoned patient

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Initial management

The diagnosis of acute poisoning may be clear, but it should also be considered in patients who present with altered consciousness, those unable to give a history and those who present with an episode of deliberate self-harm. Patients who have made serious attempts at suicide may go

to considerable lengths to conceal their actions.

An early diagnosis should be established and attention paid to anticipating and preventing complications. An early risk assessment of the potential harm the patient may do to themselves or others should be made.¹

The initial management of poisoned patients requires the urgent provision of an adequate airway, breathing and circulation.

Airway

A patent airway is vital. Decreased consciousness is associated with impaired gag and cough reflexes and an increased risk of aspiration, particularly in vomiting patients. The gag reflex must be tested and the result and time of assess-

ment recorded. The airway may also be compromised by thermal or caustic burns, and signs of this should be noted. Patients who have been exposed to hot gases may show signs of thermal burns in the mouth or loss of nasal hair.

Patients at risk of aspiration should be nursed in the left lateral position to minimise the consequences if aspiration occurs. Use of a cuffed endotracheal tube should be considered, as this helps prevent aspiration.

Breathing

Toxins may interfere with ventilation due to central effects on the nervous system or local effects that cause muscle weakness. If the gastric contents or toxins have been inhaled, gas exchange at the alveolar level may be impaired and the patient can become hypoxic even if ventilation is adequate.

Arterial blood gases are the best guide to the adequacy of respiration. Pulse oximetry is non-invasive and readily available. It may be misleading, however, as a patient with severe carbon monoxide poisoning may have severely impaired oxygen delivery but apparently normal oxygen saturation.

Circulation

Toxins affect the cardiovascular system in various ways (Table 1). Administration of fluids or elevation of the legs is often sufficient to treat hypotension. In resistant cases, insertion of a central venous catheter allows measurement of central venous pressure.

Hypertension is sometimes seen in patients with sympathomimetic poisoning (see 'Recreational drug toxicity' on pages 99–103). Rhythm disturbances often settle after oxygenation has been improved and electrolyte and acid–base balances corrected.

Diagnosis

This should be an ongoing process that is open to review. As a minimum, the nature, timing, precipitating factors and psychiatric diagnoses that underlie the admission should be determined.

Table 1. Cardiovascular effects of poisoning.

Cardiovascular effect	Example
Decreased cardiac output	Negative inotrope Negative chronotrope Arrhythmias
Decreased blood pressure	Vasodilatation Hypovolaemia
Increased blood pressure	Vasoconstriction

Key Points

Initial assessment and resuscitation of acutely poisoned patients should concentrate on airway, breathing, circulation and diagnosis

Analytical tests should be performed to establish or confirm the diagnosis and to monitor treatment. The timing of blood sampling should be recorded accurately to allow appropriate interpretation of results

Oral activated charcoal may prevent absorption if given within one hour of overdose and perhaps longer with sustained-release preparations. Gastric lavage is indicated only for recent ingestions that are life-threatening

Appropriate use of antidotes may be life-saving for patients poisoned with particular poisons

For some poisons, elimination may be enhanced by multiple doses of activated charcoal, haemodialysis or haemoperfusion

KEY WORDS: absorption, diagnosis, elimination, management, self poisoning

Investigations

Analytical tests should be directed towards establishing or confirming a diagnosis or for determining and monitoring treatment. If doubt exists about the need for an analysis, a sample of blood and urine may be taken and stored for subsequent analysis. Advice on the recommended availability and use of laboratory investigations has been agreed between the National Poisons Information Service and Association of Clinical Biochemists.²

Investigations may be readily available (glucose, electrolytes, creatinine, transaminases and clotting) or more specialised. Electrocardiography should be performed if the patient is hypotensive, has an arrhythmia or underlying heart disease or is suspected of taking a pro-arrhythmic agent. A chest X-ray may be needed if aspiration is suspected.

Specific assays of drug concentrations sometimes determine subsequent management. For example, where paracetamol poisoning is suspected, the concentration of paracetamol in the blood should be determined a minimum of four hours after acute poisoning. The timing of blood sampling must be recorded accurately to allow appropriate interpretation of results.

Prevention of absorption

Induced emesis is not recommended.³

Gastric lavage

Gastric lavage contributes little benefit to the course of most poisonings. It is used rarely and should be considered only up to one hour after ingestion of a potentially life-threatening amount of a poison.⁴

Activated charcoal

Many, but not all, poisons are adsorbed by activated charcoal (Box 1). Its use should not be considered a matter of routine. A single dose of charcoal can be given by mouth or via nasogastric tube up to one hour after ingestion of a potentially toxic amount of a poison well adsorbed by charcoal and perhaps beyond an hour in

Box 1. Poisons inadequately adsorbed clinically by activated charcoal.

Cyanide
Lead
Alkalis
Dichloro-diphenyl-trichloroethane (DDT)
Acids
Ethylene glycol
Methanol
Lithium
Organic solvents
Ethanol
Mercury
Ferrous salts

cases that involve sustained-release or modified-release drug preparations.⁵

The most important contraindication to activated charcoal is an unprotected airway, because its use may increase the risk of aspiration – in general and, more specifically, after ingestion of hydrocarbons. The use of a cathartic is not recommended with single-dose charcoal.⁶

Whole bowel irrigation

Whole bowel irrigation uses polyethylene glycol electrolyte solution given orally or via nasogastric tube. It occasionally is useful after potentially dangerous ingestions of modified-release or enteric-coated drugs and in 'body packers' – people who smuggle drugs by ingesting multiple packages.^{7,8}

Antidotes

Antidotes are available for a limited number of agents. Naloxone is effective in reversing opioid-induced respiratory failure. Flumazenil may improve the level of consciousness in those poisoned with benzodiazepines but may provoke seizures in mixed overdoses. Further detail on the use of these antidotes is given in 'Recreational drug toxicity' on pages 99–103.

Atropine and oximes are effective in the treatment of cholinesterase inhibition by organophosphorus compounds. Acetylcysteine is used to treat poisoning

with paracetamol (see 'Analgesics' on pages 96–9). Sodium bicarbonate is used to correct metabolic acidosis and to induce a sodium load and alkalaemia in patients with tricyclic antidepressant poisoning.

Enhancement of elimination

Multiple-dose activated charcoal

Multiple-dose activated charcoal adsorbs drugs present in the gut after ingestion, secretion into bile or transfer from the circulation into the gut (passively or by active secretion). This 'gastrointestinal dialysis' may be of value in treating patients who have ingested life-threatening amounts of the drugs shown in Box 2.⁹

Urine alkalinisation

Alkalinisation of urine pH may result in ion trapping. This may hasten the elimination of some polar drugs – for example, salicylates.¹⁰

Dialysis, haemoperfusion, plasmapheresis and plasma exchange

Haemodialysis, peritoneal dialysis, haemoperfusion, plasmapheresis and plasma exchange may be of some value in the treatment of patients with high plasma concentrations of a few drugs. Specialist advice should be taken.

Continued care

It is important to monitor and record heart rate, blood pressure, respiratory rate, temperature and level of consciousness at appropriate intervals to assess the

Box 2. Drugs for which multiple dose activated charcoal should be considered.

Phenobarbitone
Carbamazepine
Dapsone
Theophylline
Digoxin
Quinine

patient's progress. The nature of the underlying cause for the admission should be sought. Facilities for prompt psychiatric assessment and follow up should be available. Although in-hospital mortality in the UK is low, a small but important proportion of patients go on to complete suicide once discharged. Admission to hospital is a good time to introduce prevention strategies.

Patients may be reluctant to cooperate. They may feel frustrated that a suicide attempt has failed or may become agitated as a direct result of the poison they have ingested. Frustration may spread to involve staff, and a lack of empathy with 'difficult' or ungrateful patients must not be allowed to interfere with attempts to obtain a thorough history and perform a thorough examination.

Good nursing care is essential in ensuring the physical and psychological wellbeing of the poisoned patient, and management may be best undertaken in a specialist unit.¹¹ Prevention of complications depends to a large extent on regular observation and early intervention. Frequent turning of the unconscious patient helps protect skin and muscle. Correct management of blisters avoids secondary infection. A calm empathetic approach often provides welcome emotional support.

Violence

A number of patients may be alcohol or drug abusers, and admission to hospital may precipitate a withdrawal crisis. These events should be anticipated so that they may be avoided or ameliorated. Violence towards staff and other patients is a potentially serious problem, and procedures for dealing with it should be in place beforehand.

Anticipation and treatment of complications of poisoning

Hypothermia

Hypothermia precipitates arrhythmias and may occur as a direct result of poisoning or exposure of unconscious patient to a cold environment. Elderly people are at particular risk.

Hyperthermia

Cooling techniques include tepid sponging, cold baths and cooled peritoneal dialysis fluid. In some severe cases, the patient may need to be paralysed and ventilated.

Convulsions

Correction of hypoxia and the acid-base balance may prevent seizures. Benzodiazepines (for example, diazepam or lorazepam) are the pharmacological treatment of initial choice.

Rhabdomyolysis

Rhabdomyolysis can result from pressure necrosis, violent muscular activity, prolonged convulsions or ingestion of a wide variety of poisons. Myoglobin deposited in the renal tubules can lead to renal failure. Ensuring adequate hydration, administering sodium bicarbonate and obtaining adequate diuresis may help preserve renal function.

Urinary retention

Urinary retention may complicate poisoning from agents with anticholinergic effects. Firm suprapubic pressure may be all that is needed to empty the bladder, but temporary urinary catheterisation may be necessary.

Advice on poisoning

Within the UK, the National Poisons Information Service is available to provide specialist advice on the management of poisoning to healthcare professionals. Information may be accessed directly by the internet-based database Toxbase or by telephone. Telephone calls are answered by Specialists in Poisons Information, and consultant physicians are always available to provide additional clinical advice.

Discharge

Most patients in the UK will make a prompt recovery. Some may require further biochemical assessment before dis-

charge – for example, after severe paracetamol poisoning. Suitable facilities should be available to ensure adequate psychiatric assessment and follow up to address underlying conditions.

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