medical emergencies

diagnostic and management procedures from Boston City Hospital

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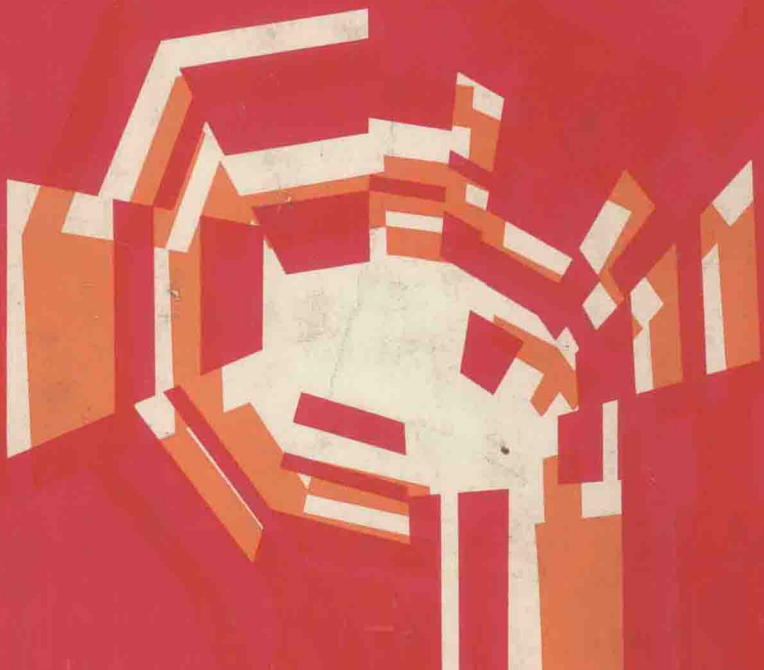

medical emergencies

DIAGNOSTIC AND MANAGEMENT PROCEDURES FROM BOSTON CITY HOSPITAL

edited by

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MEDICAL EMERGENCIES: DIAGNOSTIC AND MANAGEMENT PROCEDURES FROM BOSTON CITY HOSPITAL

PREFACE

THE DIAGNOSIS AND TREATMENT of medical emergencies is an important part of the experience of all house officers. At the Boston City Hospital, interns, assistant residents, and residents in medicine are all intimately involved with patients not only in the triage procedures but in the immediate problems of diagnosis and management. Increasing attention is being directed toward the broad aspects of emergency medicine.

We feel that ideas originally stimulated by a series of thought-provoking lectures by the attending faculty for the orientation of incoming house officers at Boston City Hospital will be of interest to a large number of physicians. This book is therefore intended to provide for the interested physician detailed discussion of the diagnosis and treatment of a broad spectrum of emergency problems especially relevant to internal medicine. It is hoped that these chapters will give the reader an understanding of the decision-making process involved in the handling of medical emergencies.

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1 DRUG OVERDOSES AND POISONINGS

RALPH B. FREIDIN

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  - Intubation
  - Stabilize Cardiovascular System
  - Position Patient
  - Diagnosis and Correction of Electrolyte Disturbances
  - Convulsions
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- Estimate Degree of Intoxication
  - Judge the Severity
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- Clinical Manifestations and Therapeutic Outline for Important Intoxications
  - Barbiturates
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  - Ethchlorvynol

Methyl Alcohol
Ethylene Glycol
Salicylates
Phenothiazines
Minor Tranquilizers
Tricyclic Antidepressants
Opioids

DRUG OVERDOSAGE and poison ingestion are medical emergencies frequently seen at the Boston City Hospital. Because it is not possible to maintain familiarity with all the potential toxins, and because in most clinical poisonings the responsible agent is either unknown or one for which there is no specific antidote, this chapter will describe a systematic management plan for these emergencies and then describe the clinical presentation and specific therapy for several major poisonings. The psychiatric problems surrounding these intoxications as well as dysfunction of specific organ systems complicating them are discussed in greater detail in separate chapters (7, Acute Respiratory Failure; 8, Management of Acute Fluid and Electrolyte Problems; and 16, Psychiatric Emergencies).

The manifestations of most overdoses and poisonings are very similar: lethargy, coma, seizures, hypoxia, blood volume depletion, respiratory depression, cardiac depression, renal failure, and electrolyte disturbances. Because these complications are common to many other medical emergencies, it is more important to establish that one is dealing with an intoxication than to identify the specific drug or toxin.

Diagnosis sometimes is easy because a patient may tell a friend or the physician that he has taken an overdose, and he may even say what drug or poison he has taken. Other patients may be reluctant to admit what they have done and instead offer only vague complaints of abdominal pain, behave strangely, or evidence metabolic disturbances. Other patients may be acutely confused, agitated, or stuporous, and may be having seizures or be in coma. In all of these patients showing such clinical states, drug toxicity and poisoning should be considered as part of the differential diagnosis.

Patients who have taken an unknown quantity of medicine in the presence of a family member in order to attract attention frequently dramatize and tend to overestimate the amount they have ingested. On the other hand, patients who try to minimize what they have done may have taken much larger quantities than they are willing to admit.

To assist in the diagnosis, one should question family members or friends who accompanied the patient or the ambulance service which brought the patient to the accident floor. Were there any empty medicine bottles or containers of commercial products found with the patient? Is the patient currently under the care of a physician, and has he prescribed any medications? Has the patient ever taken an overdose or poisoned himself before? Does the patient have evidence of old scars from previous suicide attempts or signs of intravenous injections?

Once a diagnosis of drug overdose or poisoning has been established, the physician should immediately institute the following sequence:

(1) provide general supportive care, (2) estimate severity, (3) prevent further absorption of ingested material, and (4) initiate removal of absorbed toxin. To spend time searching for a specific drug and its antidote, and thus delay basic supportive measures, is an error. *There are very few specific antidotes.* One needs to recognize that most morbidity and mortality from drug overdosage are due to excitation or depression of the central nervous system with depression or loss of normal reflexes (e.g., gag reflex), depression of respiratory drive, cardiac arrhythmias, and loss of vascular tone. Individually, or in combination, these may result in aspiration of gastric contents, respiratory failure, and cardiovascular collapse. Thus, the essence of managing a patient with an overdose or ingestion is to anticipate and prevent these complications. By observing a few basic principles, modified by special maneuvers (e.g., alkalinizing the urine, peritoneal dialysis, or hemodialysis) for special overdoses, most morbidity and mortality from *all* overdosage or ingestion can be avoided.

GENERAL PRINCIPLES OF MANAGEMENT

Supportive Care

1. *Evaluate carefully but speedily the status of the cardiovascular, respiratory, and central nervous systems.* A large-bore (no. 18 or no. 19) intravenous catheter should be installed and firmly secured. Because acute thiamine deficiency and hypoglycemia can mimic many intoxications, all stuporous, comatose, or hypotensive patients should receive immediately (1) thiamine, 50 mg I.V., (2) glucose, 50 to 100 ml of 50% solution I.V. In addition, patients with pinpoint pupils, hypoventilation, and depressed mental status should be treated with naloxone, 0.4 to 1.2 mg I.V. because of a possible narcotic overdose. Naloxone will not cause respiratory depression or interfere with a toxicology screen.

2. *Establish the rate, depth, and pattern of the patient's respirations.* Is the patient able to maintain adequate ventilation on his own? If he is breathing slowly (less than 10 times/min), with shallow respirations, an endotracheal tube should be inserted and connected to humidified compressed air, or 24% oxygen (i.e., use T-tube adaptor). However, the rate of breathing per se is not a very reliable index of adequate ventilation, because slow rates may be associated with either hypo- or hyperventilation. Studies of arterial blood gases, particularly the $Paco_2$, drawn on room air will help define the situation. Hypercapnia indicates that the patient is unable to maintain adequate gas exchange with this means, and a mechanically assisted ventilator (preferably a patient-triggered volume respirator with a control to take over if the patient stops breathing) will be necessary. Patients with severe glutethimide overdose, characterized by fluctuating levels of consciousness and sudden apnea, should be managed only with a mechanical respirator which will automatically breathe for the patient if he becomes apneic.

The level of consciousness must be determined. If the patient is comatose, stuporous, drowsy, or has a depressed gag reflex, an endotracheal tube should be placed to keep his airway patent and prevent aspiration. The decision to intubate because of the patient's depressed mental status

should be made without reference to his respiratory status. However, the usual situation is that a drowsy or stuporous patient also has poor ventilation. If intubation is done for neurological reasons, a T-tube adaptor is all that is necessary.

3. *Stabilize the circulation.* Exposure to toxic substances can result in two types of circulatory disturbances: (1) faulty vasomotor tone or altered capillary permeability, and (2) depressed cardiac output. Both of these disorders are manifested as clinical hypotension.

Faulty vasomotor tone results from depression of vasomotor centers of the brain stem and usually occurs in association with generalized central nervous system depressants (e.g., barbiturates, glutethimide, ethanol). This category of hypotension is best treated by expanding the intravascular space with intravenous saline solution (1,000 ml normal saline solution with 20 mEq KCl). If the systolic blood pressure does not stabilize at 90 mHg after 500 to 1,000 ml of this fluid has been given in 30 minutes, one should add levarterenol (2 ml or 4 mg/liter of saline solution) and administer at a rate sufficient to stabilize the systolic pressure at 90 to 100 mHg. Epinephrine should not be used to restore the blood pressure in patients with overdoses, because it will worsen the hypotension associated with ingestion of phenothiazines and tricyclic antidepressants. In large doses, dopamine may produce the same paradoxical hypotension, and thus should be avoided.

Patients who are hypotensive because of loss of intra- or extravascular fluid (i.e., blood loss, diarrhea, vomiting, and leakage of plasma into lungs, serous cavities, or gastrointestinal tract) should be treated by volume expansion. They may not be hypotensive when lying flat, but will become so when caused to sit up or stand. To avoid the risk of hepatitis, one should not give whole blood or fresh frozen plasma unless the patient is actively hemorrhaging. Instead, mannitol or dextran should be given in conjunction with normal saline solution. Vasopressor drugs usually are not necessary except in the very late stages of this type of shock.

Some patients are hypotensive because of suppression of cardiac contractility (e.g., from diphenylhydantoin) rather than altered vascular tone or loss of intravascular volume. Before administering fluids to hypotensive patients, one must determine if the hypotension is due to low cardiac output. These patients may be in congestive heart failure as well as hypotensive and require treatment for heart failure by removal of intravascular volume to restore blood pressure.

Elderly patients and those whose cardiovascular status is unknown should have their central venous pressure monitored while large volumes of saline are infused rapidly.

4. *Position the patient.* If the patient is alert with intact gag reflex, and properly oriented, he should be positioned in a semierect posture. On the other hand, if he has any of the following: (1) stupor, (2) coma, (3) disorientation, or (4) depressed gag reflex, and it is decided not to use endotracheal intubation, he should be placed in the Sims' (semiprone) position with his left side down, right knee and thigh drawn up under him, and left arm along his back. A "reversed" Trendelenburg's position with the patient prone and his head lowered 30 to 40 degrees

below his hips is also acceptable. Both of these positions minimize the chance of aspirating oral secretions.

5. *Diagnose and correct any electrolyte disturbance.* Respiratory acidosis (elevated P_{CO_2}, low P_{O_2}, low pH, and normal serum HCO_3^-) and metabolic acidosis (low P_{CO_2}, normal or elevated P_{O_2}, low pH, and low serum HCO_3^-) are the most frequently encountered acid-base disturbances requiring specific treatment. Primary respiratory alkalosis (low P_{CO_2}, elevated pH, normal or elevated P_{O_2}, and normal serum HCO_3^-) is occasionally seen, particularly with ingestion of salicylates, but it almost never requires treatment. Serum electrolytes should be monitored carefully when osmotic or alkaline diuresis is used, because large quantities of Na^+, K^+, and Ca^{++} can be removed by these therapies. Refer to Chapter 8, Management of Acute Fluid and Electrolyte Problems, for detailed discussion of these problems.

6. *Treat generalized convulsions.* These should be treated by giving 1,000 to 1,200 mg of diphenylhydantoin intravenously slowly over 20 to 30 minutes. This should be administered by a 250 mg bolus injected intravenously over 5 minutes and repeated four times. It should not be given with 5% dextrose in water (D/W) infusing, because this will cause the diphenylhydantoin to precipitate. Drugs which suppress the central nervous system—barbiturates and diazepam—should *never* be used initially in cases of overdose, because they are likely to sedate further a patient who already has an altered mental status. If use of Dilantin does not control the seizures, and they are judged to be a risk for the patient (compromised respiration, aspiration, metabolic acidosis, hyperthermia), the patient should be paralyzed with pancuronium (Pavulon), 0.04 to 0.1 mg/kg, or diazepam, 5 to 10 mg I.V. Simultaneously, he should undergo endotracheal intubation, and his respiration should be controlled on a volume respirator.

7. *Obtain laboratory tests.* The initial laboratory tests will be determined by the severity of the clinical situation. However, in all patients suspected of having an overdose or poisoning one or two large tubes of clotted blood and a urine specimen (preferably before diuresis has been started) should be obtained and sent for qualitative and quantitative toxicological examination. In patients with metabolic acidosis the urine sediment should be examined for oxalate crystals (ethylene glycol is metabolized to oxalic acid) and a ferric chloride test performed (several drops of 10% solution of $FeCl_3$ to urine turn violet or purple in presence of salicylic acid). If the patient is alert or only minimally sedated or agitated (and appears to be improving), further blood tests may not be needed. On the other hand, if the patient is considered to have a serious overdose, emergency determination of electrolytes, blood sugar, urea, and arterial blood gases (on room air) should be obtained.

Estimating the Degree of Intoxication

1. *Attempt to judge the severity of an overdose or poisoning.* This is one of the most difficult aspects of managing an overdosed patient, but it is crucial. This estimate, based on clinical assessment of the patient, will have to be made and acted upon before the results of any toxicologic

tests are available. Obviously, if the patient's neurological status or vital signs are severely altered, the estimate is easy. However, if the patient is only moderately somnolent or agitated and his vital signs are "acceptable," the physician must decide if he will improve or may possibly develop more serious manifestations of his overdose. One should try to determine how long ago the ingestion occurred, how many pills were taken, and whether the patient vomited after the overdose. A rapid physical examination should be done to establish baseline values of vital signs: skin color and temperature; mental status, muscle tone, deep tendon reflexes, and abnormal movements; pupils, fundi, extraocular movements; cardiovascular status; lungs; and abdomen. In performing this examination one should be alert for physical signs which may suggest specific toxins. Some of the more important signs are listed in Table 1-1.

Table 1-2 shows a classification scheme developed for patients with barbiturate poisoning [1], but it is applicable for any overdose from a

TABLE 1-1 Physical Signs Suggesting Various Toxins

Physical Signs or Symptoms	Toxins To Be Considered
Vomiting, nausea, diarrhea	Heavy metals (lead, arsenic); alcohols (ethanol, methanol, ethylene glycol); salicylates; digitalis; morphine and its analogs
Coma	Barbiturates; chloral hydrate; paraldehyde; bromide; ethchlorvynol; carbon monoxide; salicylates; atropine; scopolamine; ethanol
Delirium, agitation	Atropine; scopolamine; alcohol; amphetamine; barbiturates; physostigmine
Convulsions	Phenothiazines; strychnine; propoxyphene; amphetamines; alcohols (ethanol, methanol, ethylene glycol); salicylates; carbon monoxide; cholinesterase inhibitors; hydrocarbons
Dilated pupils	Amphetamines; glutethimide; alcohols; belladonna group; meperidine; cocaine; ephedrine; sympathomimetics; parasympatholytics; cyanide; botulin toxin
Constricted pupils	Morphine; propoxyphene; barbiturates; chloral hydrate
Partial or total blindness	Methanol
Pink skin	Carbon monoxide; cyanide; atropine (skin flushed and dry); phenothiazine
Kussmaul respiration	Salicylates; methanol; ethanol; ethylene glycol
Dry mouth	Belladonna group; botulin toxin; antihistamines; morphine; phenothiazines; tricyclic antidepressants
Hematemesis	Mercuric chloride; salicylates; phosphorus; fluoride
Diaphoresis	Alcohol; insulin; fluoride; salicylates; physostigmine
Extrapyramidal tremor	Phenothiazines

TABLE 1-2 Classification of Effects of Central Nervous System Depressants

Class	Characteristics
0	Asleep, but can be aroused and can answer questions
I	Comatose, but will withdraw from painful stimuli; reflexes intact
II	Comatose; does not withdraw from painful stimuli; no respiratory or circulatory depression. Most reflexes intact
III	Comatose; most or all reflexes absent, but without depression of respiration or circulation
IV	Comatose, reflexes absent. Respiratory depression with cyanosis or circulatory failure and shock, or both

Modified from Reed, Driggs, and Foote [1].

central nervous system depressant. As one might expect, patients in classes III and IV have the highest mortality rates.

Interpretation of toxicologic reports is difficult. Because of the large variation in individual susceptibility, such reports are more important in establishing the presence of a toxin than in predicting the severity of the intoxication. The latter is more accurately determined by repeated clinical assessment of the patient. Furthermore, many patients ingest more than one toxin, and they may be synergistic. Patients who abuse drugs may develop tolerance to them so that their response to the drug is altered. This is particularly true of narcotics and amphetamines. Long-term use of alcohol, barbiturates, and glutethimide also produces tolerance and lessens the correlation of the blood level with the extent of toxicity. Table 1-3 lists toxic and lethal levels for major toxins.

2. *Observe all clinical signs carefully.* Careful clinical observation is the most crucial aspect of supportive care and the best means of evaluating the severity of the overdose. The patient should be under constant observation. Serial measurements of blood pressure, pulse, and respiration, and observation of lungs, pupils, mental status, and neurological reflexes should be made and recorded on a flow chart by the same observer at 15- to 30-minute intervals. This type of clinical monitoring is essential to evaluate the progress of the intoxication, response to therapy, and the necessity for additional therapy.

Once support of the patient's vital systems has been established (or if the patient is asymptomatic with stable vital signs initially), attention can be directed to reducing the quantity of drug which the patient has in his body. The methods of accomplishing this are: (1) gastric emptying to prevent further absorption, and (2) increasing the rate of excretion to reduce the toxic level. One must recognize that these measures are adjuncts to basic support and at no time should they receive more attention than conscientious supportive care.

PREVENTION OF FURTHER ABSORPTION OF INGESTED MATERIAL

REMOVAL OF GASTRIC CONTENTS Further absorption of the ingested drug may be terminated by inducing vomiting or by gastric lavage. This