

15 REMOTE MEDICAL EMERGENCIES

Stephen Hearn

Serious problems may arise during expeditions. Many will involve patients with pre-existing illnesses such as asthma, diabetes or epilepsy.

As with all aspects of expedition medicine the key is adequate pre-trip planning and preparation. Medical screening before the expedition will identify those with existing medical conditions and those with risk factors for the development of medical problems. This allows the medical officer to obtain specialist advice, equipment and medication. The chronic medical problems of expedition members should form an important part of the expedition risk assessment.

The management of all medical emergencies should focus on the assessment and management of the casualty's airway, breathing and circulation

Assessment and management of the casualty's airway, breathing and circulation is often required before treatment of the specific condition is initiated. In an emergency, the ABC approach focuses the attention and facilitates the rapid identification and management of immediately life-threatening conditions.

Since equipment, investigations and assistance are limited in the expedition environment, it is essential rapidly to evacuate all casualties with medical emergencies to the most appropriate hospital for definitive care as soon as is possible.

PREVENTION

It is important that the medical officer (MO) and leader of the expedition are aware of all expeditioners' pre-existing medical conditions, medications and allergies. This should be carried in a written format. The medical officer should brief members of the expedition about signs of illness and immediate treatment for known conditions, especially asthma, diabetes and epilepsy. In addition, the medical officer should add to the expedition first aid kit relevant emergency medications for known pre-existing

medical conditions of expedition participants. Expeditioners should take adequate supplies of their own medication with them.

Asthma

Asthma results from narrowing of the small airways in the lungs. It can be precipitated by cold, exercise, allergy or infection.

Signs and symptoms of asthma

- Shortness of breath with a feeling of chest tightness
- Expiratory wheeze
- Rapid respiratory (breathing) rate
- Rapid heart rate (pulse).

Signs of severe asthma

- Inability to complete sentences
- Heart rate > 110 beats per minute
- Respiratory rate > 25 breaths per minute
- Exhaustion from fighting for breath.

Management of asthma

The mainstays of pre-hospital care for asthma are bronchodilator drugs such as salbutamol, oxygen and steroids.

Most people with asthma will have their own salbutamol (Ventolin) inhaler. They should be encouraged to use this. In severe cases they will be too breathless to use it effectively. In such cases it is possible to improvise a “spacer” device using a plastic bottle, inserting the inhaler through a hole cut in one end and inhaling through the bottle opening. Four to eight puffs of the inhaler should be given each time the spacer device is used. In severe cases this should be repeated frequently.

Steroids in the form of prednisolone tablets (adult dose 50mg) should be given in severe cases. It should be noted that these take 6 hours to be effective and that intravenous steroids (hydrocortisone) do not take effect more rapidly than oral tablets.

If the expedition has oxygen available, this should be provided for the casualty. If an expedition is carrying oxygen and has known people with asthma it should carry a nebuliser mask and salbutamol nebulers.

In very severe asthma, salbutamol should be given parenterally. Ideally this should be in the form of a slow intravenous infusion. However, if this is not possible it can be given by subcutaneous or intramuscular injection.

It is important to be aware that in some severe cases movement of air in and out of the chest may be so reduced that a wheeze will not be produced. Therefore beware

of the absence of wheeze or “silent chest”. People with asthma often respond very well to initial treatment with salbutamol, but after a short period they may deteriorate again. Casualties with severe asthma should be evacuated to hospital urgently.

Summary of asthma management

- Oxygen (if available)
- Salbutamol inhaler via a spacer or nebulised
- Steroids – 50mg oral prednisolone or 200mg intravenous hydrocortisone
- Salbutamol by intravenous infusion in very severe attack.

Epilepsy

Seizures (fits) usually occur in patients with known epilepsy, but it is possible that first seizures may occur during an expedition in expeditioners with no previous history. Seizures can also occur in people who do not have epilepsy following head injury or alcohol withdrawal, as a result of hypoglycaemia (low blood sugar levels) or in severe brain infections (e.g. cerebral malaria).

It is important for people with epilepsy on expeditions to take their anticonvulsant medication as prescribed.

Signs of an epileptic seizure

- Collapse
- Unresponsiveness
- Jerking movements of arms and legs
- Tongue biting and jaw clenching
- Incontinence.

Seizures usually resolve spontaneously without treatment. Following a seizure a patient may be confused and sleepy and even weak or paralysed for a period of up to a few hours. This is known as the post-ictal phase.

Management of epileptic seizure

The main dangers during seizures are airway obstruction, injury caused by the fall or during uncontrolled movements, and aspiration pneumonia. As the casualty’s teeth are normally clenched during seizures it is difficult to maintain the airway using an oropharyngeal airway. If the patient’s airway becomes compromised a nasopharyngeal airway, inserted via the nose, is ideal and should be supplemented by a chin lift or jaw thrust.

Casualties should be placed in the recovery position (see Figure 13.1 on page 131) on their left side to help maintain their airway and reduce the risk of aspiration.

Other expedition members who are present during the seizure should attempt to reduce trauma to the head and body during seizures.

High-flow oxygen should be provided if available as the casualty's rate and depth of respiration are likely to be compromised. If the seizure continues for more than 5 minutes, diazepam should be administered. This can be done most simply using rectal preparations or it can be given by slow intravenous injection (dose 10mg by either route). If the seizure continues, a second dose of diazepam should be considered after a further 5 minutes. Be aware that intravenous diazepam may depress the breathing.

If hypoglycaemia is suspected this should be treated.

Seizures in people who are not epileptic and prolonged seizures in known people with epilepsy require that the patient be evacuated.

Summary of seizure management

- Maintain the airway
- Insert a nasopharyngeal airway (if trained to do so)
- Give oxygen
- Use intravenous or rectal diazepam (adult dose 10mg) if seizure continues for over 5 minutes
- Give a further dose of diazepam if seizure continues for another 5 minutes after the first dose.

Diabetic emergencies

With careful blood glucose control, there is usually no problem in taking people with diabetes on most expeditions. Diabetic expeditioners must have been trained to maintain their own diabetic control and fully understand how to adjust their insulin dosage according to exertion, food intake and blood glucose measurements.

Two types of emergency may befall people with diabetes:

- 1 Low blood sugar – hypoglycaemia (blood glucose less than 3.5mmol/l)
- 2 High blood sugar – ketoacidosis.

Hypoglycaemia

Hypoglycaemia, a blood glucose less than 3.5mmol/l, develops when food intake has been less than normal or physical exertion has been greater than normal. As these factors are regularly present in the expedition setting, people with diabetes must be able to adjust their insulin dose according to anticipated physical activities and environmental conditions.

Signs and symptoms of hypoglycaemia (low blood sugar)

- Confusion, anxiety or light-headedness
- Inappropriate behaviour
- Slurred speech
- Sweating
- Loss of consciousness (or failure to wake up in the morning!)
- Seizures.

Investigation

- Blood glucose measurement using a stick test (commonly known as a “BM”).

Management of hypoglycaemia

- If casualty is conscious give sugary drink and something to eat
- If casualty is unconscious:
 - place in recovery position and maintain the airway
 - Hypostop to mucosa of mouth
 - give glucagon by intramuscular injection
 - administer intravenous 50% dextrose (50ml) if glucagon not effective
 - give casualty something to eat once they have regained consciousness.

Hypoglycaemic episodes in known people with diabetes who make a full recovery rarely require evacuation if a cause can be found.

Diabetic ketoacidosis

Diabetic ketoacidosis results from a blood sugar that is too high. A high level of glucose in the urine leads to water loss through passing excessive volumes of urine and dehydration. Excess glucose in the bloodstream leads to the formation of acidic ketones. Ketoacidosis is often precipitated by another illness such as a chest or urinary tract infection. It may, however, simply be due to a lack of insulin.

If people with diabetes develop an infection they should monitor their blood glucose more frequently than normal and usually need to increase their insulin dosage in order to prevent the development of ketoacidosis.

Symptoms and signs of diabetic ketoacidosis

- Thirst
- Passing excessive volumes of urine
- Vomiting

- Rapid breathing rate and unusually deep breathing
- Abdominal pain
- Reduced conscious level.

Management of diabetic ketoacidosis

- If unconscious, place in recovery position and maintain airway.
- Give oxygen if available.
- Measure blood sugar.
- Encourage oral fluids if casualty is conscious.
- Administer intravenous fluids if casualty is conscious. If diabetic ketoacidosis is confirmed commence an intravenous infusion of 0.9% saline giving 1000ml over ½–1 hour, followed by 500ml per hour for the next 2–3 hours. Persistent hypotension may require an increase in infusion rate and/or colloid administration. Avoid over-rapid infusion with the risks of pulmonary oedema and adult respiratory distress syndrome, especially in elderly people and patients with ischaemic heart disease. Once the blood glucose level is less than 15mmol/l, change the intravenous infusion fluid to 5% dextrose. This should be given at a rate of 500ml every 4 hours. If signs of hypovolaemia persist, a 0.9% saline infusion should be given concurrently with the dextrose.
- Give insulin according to a recognised protocol (e.g. “sliding scale”) if high blood sugar is confirmed by stick testing. One such insulin “sliding scale” protocol is that recommended by the *Oxford Handbook of Accident and Emergency Medicine*, Wyatt et al. Oxford Medical Publications 1999. “Give 20 units of insulin (actrapid) IM immediately, than 6 units per hour IM. Check plasma glucose levels every hour initially and when the plasma glucose level is less than 14mmol/litre, reduce the amount of insulin to 4 units per hour IM.”
- Treat any underlying infection with appropriate antibiotics.

Patients with diabetic ketoacidosis require intensive medical care and should be evacuated as quickly as possible.

Anaphylaxis

Anaphylaxis is a severe form of allergic reaction. This may result from ingestion of certain foods or drugs, or follow insect stings and bites.

Signs and symptoms of anaphylaxis

- Rash – red, itchy, raised, rapidly evolving
- Shortness of breath, chest tightness or feeling of obstruction in the throat
- Wheeze (like an asthma attack)

- Nausea, vomiting
- Colicky abdominal pain, diarrhoea
- Swelling of the lips, tongue, gums, throat and face
- Rapid heart rate
- Low blood pressure and shock (loss of consciousness, collapse).

Casualties with anaphylactic reactions deteriorate rapidly; this requires prompt assessment and treatment.

Many people with a history of anaphylaxis will carry their own adrenaline in the form of an EpiPen. The medical officer and fellow expeditioners accompanying such people should receive training in the appropriate use of this device.

Management of anaphylaxis

- If the casualty is unconscious, place him or her in the recovery position and maintain the airway.
- Give oxygen if available.
- Give adrenaline (1:1,000 or 0.1% solution) by intramuscular injection (adult dose 0.5mg of 0.1% solution). This may need to be repeated if ineffective or if the patient deteriorates following transient recovery. Adult EpiPen delivers only 0.3mg.
- Administer chlorpheniramine intravenously (adult dose 10mg). Give orally if intravenous administration not possible.
- Give salbutamol, either nebulised (adult dose 5mg) or 10 doses from a metered dose inhaler via a spacer if asthma, wheeze or respiratory distress is a feature of the reaction.
- Administer hydrocortisone intravenously (adult dose 200mg) or prednisolone orally (adult dose 50mg).
- Give intravenous fluids if shocked.

Steroids do not have an immediate effect but help to prevent the recurrence of anaphylaxis, which may occur a number of hours after the initial episode. This is known as the “rebound” phenomenon.

All casualties with anaphylaxis require evacuation to definitive care.

Chest pain

The possibility of angina or myocardial infarction (heart attack) should be considered in casualties with chest pain. In these cases chest pain results from a lack of blood flow to the heart muscle.

Signs and symptoms of angina and myocardial infarction

- Chest pain – heavy, tight
- Pain spreading to arms, neck or through to the back
- Sweating
- Shortness of breath
- Nausea, vomiting
- Collapse, shock.

Heart attacks, however, frequently occur with atypical symptoms or even with no chest pain.

Management of angina or suspected myocardial infarction

- Give oxygen if available.
- Give aspirin 300mg to chew.
- Spray glyceryl trinitrate under the tongue if blood pressure normal. Give one spray, then repeat after a few minutes if the blood pressure does not fall.
- Administer opiate analgesia intravenously if pain persists.
- Give prochlorperazine (Buccastem) or metoclopramide for nausea.

Aspirin helps to reduce clot formation in the blood vessels supplying the heart muscle. Glyceryl trinitrate makes the vessels supplying the heart muscle wider, improving blood flow, though it may lower the patient's blood pressure sharply or cause a headache.

Patients with suspected angina or myocardial infarction should be evacuated to hospital for further assessment.

Other causes of chest pain include indigestion, muscular strain, pulmonary embolism (special risk at high altitude and following long-haul flights), broken ribs, and infections causing pleurisy and pericarditis.

Septicaemia

Severe bacterial infections of any origin may rapidly spread throughout the body, causing damage to many organs. Toxins produced by the bacteria mean blood vessel walls become “leaky”, causing the contents of blood vessels to leak out. This results in a depletion of fluid within the blood vessels, leading to shock (see page 179).

Patients will look unwell, have a rapid heart rate and rapid breathing rate. Unlike victims of shock from blood loss or dehydration, patients will be warm peripherally and may appear flushed.

Treatment is based on the administration of oxygen and intravenous fluids. If broad-spectrum antibiotics are available they should be given.

Alcohol intoxication

Excessive alcohol consumption can lead to a number of problems including trauma, aspiration, dehydration, hypothermia and hypoglycaemia.

The main form of treatment for alcohol intoxication is fluid replacement, given orally if conscious and intravenously if unconscious. Casualties should be nursed in the recovery position and their airway maintained to prevent aspiration of vomit. They should be kept warm to prevent hypothermia. If completely unconscious, they should be turned regularly to prevent the development of pressure sores.

Recreational drug ingestion

Recreational drugs can cause similar problems to alcohol intoxication. General supportive care, along similar lines to that described above, is required.

Substances such as *LSD* (acid) can result in psychosis which may require the administration of antipsychotic medication.

Stimulants such as *amphetamines* (speed) and *LSD* (acid) may cause agitation. Severely agitated patients may require sedation with a benzodiazepine.

MDMA (ecstasy) is a particularly harmful substance that may result in hyperthermia and is frequently fatal.

Opiate overdose causes reduced consciousness and breathing rate. The pupils will be very small. Opiate overdose can be reversed very effectively by the use of intramuscular or intravenous naloxone.

Shock

Shock is defined as a lack of tissue perfusion – basically, not enough blood is reaching the body's tissues. If shock is untreated, these tissues will rapidly die, causing irreversible organ failure.

Causes of shock

- Blood loss – trauma or bleeding into gut
- Dehydration
- Infection – septic shock
- Anaphylaxis
- Heart failure
- Spinal injury – neurogenic shock (see Chapter 14).

Signs of shock

- Rapid heart rate
- Rapid respiratory rate
- Weak pulse and low blood pressure

- Pallor
- Reduced conscious level if severe
- Reduced urine output.

In young people, almost 50% of the circulating blood volume must be lost before the blood pressure falls. This, therefore, is a late sign of shock.

Management of shock

- Maintain airway and provide oxygen
- Ensure casualty is lying down with legs raised
- Treat external bleeding with pressure and elevation
- Straighten and splint fractures
- Consider intravenous fluids.

The treatment for shock due to continuing blood loss is a surgical operation to stop the bleeding. Administration of intravenous fluids is a temporary measure only. Rapid evacuation is essential for shocked patients.

Dehydration

Severe dehydration results from lack of fluid intake and excessive loss from sweating, diarrhoea or vomiting. It has the same symptoms as shock, described above. Casualties will have dry mouths and will produce small amounts of dark, concentrated urine. Their core temperature (rectal) may be raised if they have heat stress or infection.

The cause of fluid loss should be addressed and fluid administered orally. If this is not possible intravenous fluids should be given. Oral fluids should have added salt and sugar to replace the large amount of salt loss in sweat, diarrhoea and vomiting. This can be in the form of commercially prepared oral rehydration salts (ORS) or by adding eight level teaspoonfuls of sugar and two teaspoonfuls of salt to a litre of clean/boiled water.

SUMMARY

Many potential medical problems can be anticipated and prepared for with adequate pre-trip planning. Casualties with medical emergencies should be assessed and treated using the ABC principle before specific treatment of the particular problem is initiated.