

## Cardiopulmonary resuscitation for sports medicine diploma

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### Potentially reversible causes of non-ventricular fibrillation/ventricular tachycardia (VF/VT)

A useful mnemonic derived from the conditions shown in fig 1 causing a non-VF/VT cardiac arrest is the four Hs and the four Ts.

#### Hypoxia

There are many cardiac and respiratory causes of severe hypoxia, which require emergency treatment of the underlying condition. Oxygen treatment in an appropriate dose should be administered where possible. However, it is important to exclude a mechanical cause such as upper airways obstruction or tension pneumothorax.

#### Hypovolaemia

The casualty should be inspected for evidence of haematemesis or melaena stool. Internal haemorrhage should always be suspected with evidence of penetrating wounds to the abdomen or chest.

#### Hyperkalaemia/Hypokalaemia

Elevated plasma potassium levels occur with renal failure, diabetic ketoacidosis, potassium sparing diuretics, or excessive ingestion of potassium salts. In the context of a cardiac arrest, the patient should be given intravenously 10 ml 10% calcium chloride, 50 mmol sodium bicarbonate, and 10 units soluble insulin with 25 g dextrose.

Hypokalaemia can result from excessive vomiting or diarrhoea, but most commonly it is a consequence of diuretic treatment. Intravenous KCl can be given in a dose not exceeding 20 mmol/h.

#### Hypothermia

Hypothermia only exists when the core temperature is below 35°C. The risk is increased by drug or alcohol consumption, illness, injury, hypoglycaemia, or neglect. Death should therefore not be confirmed in a hypothermic patient until the patient has been rewarmed to above 33°C, which may require prolonged resuscitation; children have been successfully resuscitated without any brain damage after



Figure 1 Climbers in snowhole.



Figure 2 Climber in spindrift.

submersion of up to one hour in very cold water. Wet clothing should be covered with further insulation including an outer layer, which is windproof and waterproof and only removed when the casualty has reached shelter. The casualty should then be dried and covered with blankets. A casualty who is conscious, shivering, and uninjured may be immersed up to the neck in a hot bath provided that he/she is able to climb into the bath, kept at 40°C, with minimal assistance. All hypothermic patients should be monitored in intensive care. If the patient is profoundly hypothermic or unconscious, a number of methods may be used in various combinations depending on the facilities available.

- (1) Ventilation with warm humidified oxygen
- (2) Warm (40°C) fluid through a central vein
- (3) Gastric or peritoneal lavage with warm fluid
- (4) Blood rewarming by haemodialysis or cardiopulmonary bypass.

Elderly patients with insidious onset hypothermia should not be actively rewarmed because of the risk of pulmonary and cerebral oedema.

### Tension pneumothorax

A tension pneumothorax occurs when air gathers rapidly between the lung and the chest wall causing collapse of the lung on the affected side and compression of the mediastinum. It results in hypoxia and hypotension and may cause cardiac arrest. Clinical signs include decreased movement, hyper-resonance on percussion, reduced air entry, reduced vocal resonance, and tracheal deviation away from the affected side. Treatment involves releasing the air trapped in the pleural space by insertion of an intravenous cannula or a chest drain in the second intercostal space in the mid clavicular line.

### Tamponade

Cardiac tamponade occurs when fluid accumulates in the pericardial space causing embarrassment of right ventricular diastolic function. Clinical signs include muffled heart sounds, hypotension, increased jugular venous pressure on inspiration (Kussmaul's sign), and pulsus paradoxus. Rupture of the myocardium after infarction causes rapid bleeding into the pericardial space and sudden non-VF/VT cardiac arrest as the result of tamponade. Emergency treatment involves aspirating blood by inserting an 18 gauge cannula into the pericardial space from just below and left of the xiphisternum. Prognosis is poor.

### Toxic and therapeutic disturbances

Drug overdose and drug side effects can cause non-VF/VT arrest. Occasionally specific treatment or antagonists can reverse the effects of the drug.

### Thromboembolic events

Massive pulmonary embolism is a recognised cause of non-VF/VT arrest and can often be fatal. Emergency surgery or thrombolysis can be life saving. The diagnosis must be suspected if risk factors are present: recent surgery, pregnancy, smoking, oral contraceptive pill, underlying malignancy, immobility, and obesity.

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### Further reading

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