Electrocution is death caused by an electric shock. It results in 0.54 deaths per 100,000 people per year, of which:

- More than 90% are by generated electricity
- Of the low voltage deaths, most are in the home or workplace
- Of the high voltage deaths most are in the workplace

Electrocution can occur from domestic or industrial electricity. A Low voltage is one below 1000 volts. A High voltage is above this level.

The UK domestic supply is 240 V alternating current 50 Hz

The domestic electricity supply in the UK is about the most lethal combination that could have been devised. The voltage of around 240V is sufficient to cause muscle spasm and thus a 'hold-on' effect, so that a live conductor may not be able to be released. At the same time it is too low to cause a 'throw-off', which accounts for many of the survivors of shocks due to high-tension conductors. The frequency of the cycle of alternating current is in the middle of the most lethal range for causing ventricular fibrillation.

## Factors influencing the severity of electrical injury include

- Whether the current is alternating (AC) or direct (DC)
  - Contact with alternating current may cause titanic contraction of skeletal muscle. This may prevent release from the source of electricity and may also cause respiratory arrest. It may also cause VF (analogous to R-on-T phenomenon). Asystole is more common after DC shock.
- Voltage
- Magnitude of energy delivered
  - Current is expressed in amperes. High current (15-20mA) initiates muscle spasm
- Resistance to current flow
  - Skin resistance is decreased by moisture, increasing the likelihood of injury. Nerves and blood vessels are good conductors. Increased resistance is offered by muscle, skin, tendon, fat and bone in that order. Axons become distorted, blood vessels sustain endothelial damage, while muscle swelling and necrosis may occur.
- Pathway of current through patient
  - Transthoracic (hand to hand or opposite leg) is more likely to be fatal than a vertical (hand to foot) or straddle (foot to foot)
- Area and duration of contact

Management overleaf.

# Management

- If necessary, resuscitate along ABC lines.
- Take accurate history asking about source of electricity, contact made, loss of consciousness, entry/exit wounds, any associated symptoms.
- Obtain an ECG
- Examine patient looking for entry/exit wounds. These are often full thickness burns and can help to assess the flow of the current through the body

## Admission or discharge?

- Asymptomatic patients with a normal ECG who have sustained an electric shock from a domestic supply may go home.
- Arrange review of burns if necessary
- If abnormal ECG, history of loss of consciousness, soft tissue damage/large burns or symptomatic refer physicians for overnight ECG monitoring.

Electrical injuries caused by the action of an electric current on the human body can range from benign small skin burns to life-threatening internal organ damage. Most injuries are sustained through contact with low voltage domestic circuits, and will not need extensive treatment. However, cardiac monitoring is important in selected patients due to risk of cardiac arrhythmias.

May be needed to prevent renal failure

Resuscitation

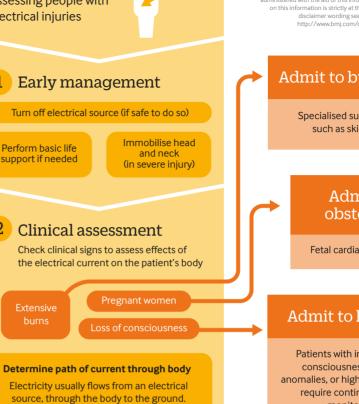
A prolonged resuscitation

attempt is warranted

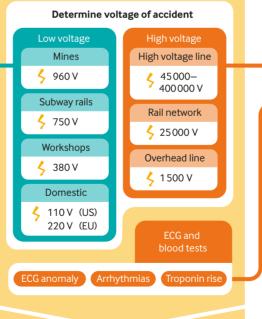
# A shock to the system

Assessing people with electrical injuries

2



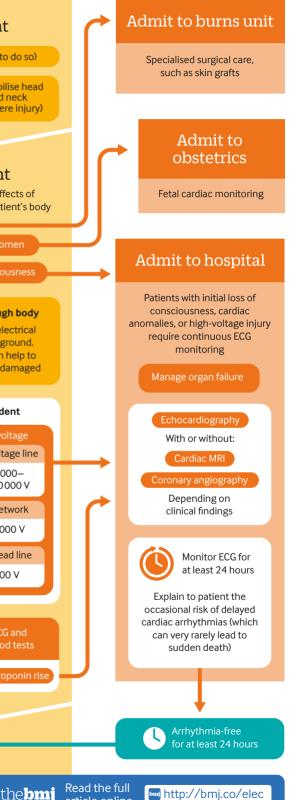
source, through the body to the ground. Locating entry and exit points can help to determine which organs could be damaged



#### 3 Discharge

If there is no cause for concern, consider prompt discharge

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## **Potential injuries**

#### Cardiovascular

- Arrhythmias (most common)
- Heart muscle injury
- Bradycardia ٠
- Clotting in blood vessels

#### **Respiratory arrest**

- Diaphragm paralysis
- Tetanic contraction •
- Inhibition of control in brain

#### Skin burns

- Infection
- Dehydration

#### Neurological

- Loss of consciousness
- Impaired recall
- Spinal cord injury
- Paralysis
- Loss of sensations in limbs

#### **Kidney failure**

- Myoglobin tubular precipitation
- Generalized hypotension

## Musculoskeletal

- Fractures/luxations
- Muscle damage
- Rhabdomyolysis
- Compartment syndrome