Airway

Intubation should be performed if there is any need for assistance in maintenance of the airway (positioning or adjuncts).[53] Other indications include failure of protection of the airway (low GCS, inability to swallow), expected clinical course (burns, deteriorating GCS) or if assistance with ventilation is needed to maintain oxygenation or for controlled ventilation in head injury.[53] If intubated, the tracheal tube must be firmly secured and its position confirmed clinically, by capnography[53, 54] and chest x-ray. Reassessment of the airway and position of the tracheal tube should occur after any significant movement of the patient such as moving from resuscitation room to ambulance.

Breathing

A transport ventilator must be used for all ventilated patients.[55] Patients should be stabilised on the ventilator before transfer to allow assessment of the adequacy of ventilatory settings. An arterial blood gas sample should be analysed just prior to transfer to assess adequacy of ventilation and to ensure appropriate blood gas targets are achieved prior to transportation e.g. pCO_2 4–4.5kpa in the head injured.[43, 53] Any change to ventilator settings or inspired oxygen concentration mandate re-assessment after sufficient time to allow stabilisation of the respiratory parameters. O_2 saturation monitoring should be used throughout the transfer process. All ventilated patients should have end tidal CO_2 monitoring during transfer. Airway pressures must be monitored.[26]

Any suspicion of pneumothorax necessitates intercostal drainage. Drain tubes should not be clamped and Heimlich flutter valves may be preferred to underwater seals unless the patient has a haemothorax. If these devices are changed for the transfer, this

should not occur immediately prior to transfer but with sufficient time before to allow assessment of any malfunction.

Orogastric or nasogastric tubes should be inserted, not spigoted, and allowed to drain freely. This is especially important during air transport.[26] NG tube position, if possible, should be confirmed by x-ray before transport.

Circulation

A minimum of 3 lead ECG monitoring is needed. The rhythm should be stable, or if not, appropriate management e.g. pacing instituted before transfer.

Hypovolaemic patients tolerate movement poorly.[56–58] Hypovolaemic patients should, therefore, not be transferred unless absolutely necessary e.g. ruptured aortic abdominal aneurysm. Adequate resuscitation to maintain a normal and stable pulse and blood pressure is mandatory. Whenever possible bleeding should be controlled. Laparotomy, fracture stabilisation and other interventions to control haemorrhage should be performed prior to transfer.[54] Inotrope requirements should also ideally be stable and not escalating.

At least two functioning secured intravenous lines should be present before transfer. If central access is required, this should be provided before transfer and the position of the lines should be checked on X-ray films. Invasive arterial monitoring is recommended for most critically ill and injured patients to allow accurate blood pressure assessment during transport.[57] This should be secure and functioning before transfer. CVP lines should be well secured and accessible. Pulmonary artery catheters should be withdrawn 5–10♣cm to prevent inadvertent “wedging” during transport (unless waveform is displayed).

Recent haematology and electrolytes results should be reviewed and when significant abnormalities are detected corrective therapy is instituted before transfer.

A urinary catheter must be placed and draining adequately.

Disability

A significant number of critically ill patients will not require to be intubated before transfer. However, all intubated patients must be adequately sedated and paralysed. If the patient is having seizures, these should be controlled prior to transfer. Regular pupil checks should be performed and specialist advice sought should evidence of raised intracranial pressure be detected before transfer.

Exposure

It is essential that the primary survey and log roll be completed to avoid non-detection of injuries in patients with major injury. A secondary survey should be undertaken preferably before transfer.

The patient must be well secured on the transfer trolley. In-line immobilisation of the entire spine is usually required for all unconscious trauma patients. The patient should not, however, be transferred on a spinal board unless there are no alternatives. Ideally, patients with spinal cord injury should be transferred using a full-length vacuum mattress[59] providing it can be adequately secured.

Critical illness or injury disrupts the patient's normal temperature control mechanisms. This is particularly important in children. The core temperature must be normal or rising to normal before transfer as active warming is difficult during transfer. Movement may also precipitate malignant arrhythmias in severe hypothermia.[60] Consideration needs to be given to continuous core temperature monitoring during transfer if there are specific concerns regarding temperature control. The StaR course[43] advocates "mummy wrapping" in blanket or sleeping bag to prevent heat loss and to secure the patient and tubes and lines.

Some patients may need specific positioning such as in raised intracranial pressure.

Specialist advice may be needed and the position attained well before transfer.

Patients should have their eyes covered to prevent corneal injuries.