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Transfer of the critically ill adult patient

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Learning objectives

By reading this article you should be able to:

- Define the indications and contraindications to patient transfer.
- Recognise and anticipate the risks involved.
- Identify the key steps in organising and performing a safe patient transfer.

Key points

- Secondary transfer should only be performed when absolutely necessary and in the patient's best interests.
- Transfer decisions must be made by senior clinicians at the referring and receiving institutions.
- Competence for transfer can be gained from courses, observation of colleagues and aided by personal reflection.
- Competence should reflect the requisite technical and non-technical skills required for safe transfer.
- Safe transfer relies upon a robust framework of clinical governance. Governance standards provided by the Association of Anaesthetists Great Britain and Northern Ireland and Intensive Care Society should be used in conjunction with local policies.

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Critically ill patients are in a dynamic and often precarious physiological state; transfer potentially exposes them to additional harm and instability. The goal of critical care transfer should be the maintenance of high-quality care while moving the patient to an appropriate location, in an expedient and safe manner.[1] This review aims to provide an overview of safe transfer practice and is not intended as a 'how-to' guide.

Transfers

Types of transfer

Transfer of critically ill patients is performed by healthcare professionals using various platforms and for multiple indications (Table 1). Broadly, patient transfer can be categorized by:

(i) Position on care pathway: primary, secondary, tertiary
(ii) Transfer platform: bed, road, or air
(iii) Urgency of care: emergency, urgent, routine
(iv) Level of care provided in transit: 0,1, 2, or 3
(v) Indication for transfer: clinical or capacity
(vi) Distance/duration of transfer: intra-hospital, inter-hospital or international

With greater centralization of resources and the formalization of critical care networks, secondary and tertiary transfers are likely to increase in frequency. Rationalizing trauma management will lead to severely injured patients bypassing local hospitals, increasing primary transfer time in favour of early delivery to definitive care.

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Table 1 Commonly used transfer terms[2]

Adult	Patient more than 18 yr of age
Critically ill	Patient requiring a level of care greater than that normally available on a standard ward (ICS level of care 1–3)
Primary transfer	Movement of patients from scene of injury or illness, to the nearest receiving hospital
Extended primary transfer	Movement of a patient from the scene of injury or illness to a specialist centre or trauma centre, bypassing the nearest hospital to reach a centre more appropriate to the needs of the patient
Secondary transfer	Movement of a patient from any hospital facility (emergency department/ward/critical care facility/operating theatre) to another centre
'Clinical' transfer	Patient transfer for speciality treatment or investigation not provided at referring hospital
'Capacity' transfer	Patient transfer for specialist treatment or investigation normally provided at referring hospital, but which is not currently available. The use of the term 'non-clinical transfer' should be avoided. Transfers for capacity reasons may still be clinically necessary and are sometimes critical
Repatriation	Patient transferred back to referring hospital or a hospital nearer the patient's home address
Inter-hospital transfer	Transfer of a patient between hospitals
Intra-hospital transfer	Transfer of a patient between areas/ departments within the same hospital site

All acute hospitals must have systems and resources in place to resuscitate and stabilize critically ill patients and carry out time-critical transfers when required.[2,3] In the UK, the majority of primary transfers are conducted by the ambulance service. Secondary transfer duties usually fall to anaesthetic/critical care doctors, accompanied by a member of the nursing staff and a paramedic crew. This article will focus on the provision of the inter-hospital transfer of adult critical care patients with a 'transfer team' consisting of a doctor and assistant (as is the norm in the UK).

Transfer process

The process of transfer can be broken down to the following stages:

(i) Identify need to transfer a patient
(ii) Agreement between referring and accepting senior clinicians
(iii) Handover from critical care staff to transfer team
(iv) Transfer between care facilities
(v) Handover from transfer team to accepting team
(vi) Return transfer team and equipment to base

Transfer epidemiology

At present poor documentation and sporadic data collection makes meaningful data analysis of critical care transfers difficult.[4] In 2014–5, NHS Digital reported 258 956 critical care (High Dependency Units (HDUs) and Intensive Treatment Units (ITUs)) episodes, with approximately 11 000 admissions from external hospitals. Patients rarely enter a critical care environment without the requirement for additional support or monitoring, and most will therefore have been transferred to a critical care department when 'critically ill'.[2] Many of the same pitfalls of inter-hospital transfer are observed during intra-hospital transfer,[5] and both can be approached in a systematic similar manner to improve safety. It is worth noting that these statistics do not capture the numerous additional moves a patient may make within the hospital during a critical care admission for imaging, investigation, and treatment.

The risks of critical care transfer

The risks of critical care transfer have been widely reported and can be split into three categories:

(i) Technical: patient/equipment
(ii) Non-technical: crew resource management
(iii) Organizational: governance

Medical staff report a difficulty or complication during two-thirds of intra-hospital transfers.[6] Incident reporting has shown that one-third of inter-hospital complications result in adverse outcomes including major physiological derangement (15%), patient/relative dissatisfaction (7%), prolonged hospital stay (4%), physical/psychological injury (3%), and death (2%). The authors believed these events are under-reported and the true incidence of complications to be higher.[5] Clinicians do not routinely undertake any other work with such a high rates of potential patient harm. Reassuringly, outcomes can be improved and adverse incidents reduced with careful patient selection, transfer planning, and equipment preparation, and reassuringly, most (52–91%) of these incidents are preventable.[6]

During transfer, monitoring and maintenance of physiological targets should be maintained, with care provided by a competent team in an expedient manner.[7] It is incumbent on all those organizing transfer services and providing in-transit care to ensure the safety of staff and patients.[3] Transfer should not be undertaken unless the risks of continuing care in the patient's current location are greater than the potential benefits of transfer.

Risks: technical

Patients in critical care environments require high levels of care; those being transferred are often being moved for specialist management. Patients should be appropriately selected by senior clinicians with resuscitation and stabilization before transfer.[1,2] Removing a patient from a static critical care environment requires physical movement while restricting positioning, monitoring, examination, and intervention.

Problems with ventilation of the lungs, blood pressure control, and arrhythmias are common.[6] Capacity transfers should be minimized as they expose the patient to all the risks of transfer, with no treatment benefit. Capacity transfers, if essential, should only be performed during normal working hours.[3,8] Usually, patients who are unstable should be managed optimally in their current location; however, on occasion, transfer may be required for stabilization but these are high risk transfers and ought to be performed by experienced personnel.

Inadequate or unreliable power and oxygen supply are two major causes of equipment failure during transfer. Transfer equipment often differs from that routinely used in hospital and may be unfamiliar to medical and nursing staff. When audited, transfer equipment is frequently missing, damaged, incompatible or out of date.[6] Dedicated equipment must be designed for transfer and appropriate for use aboard the selected transfer platform.[5] The transfer platform must be appropriate inside, for both the patient and transfer team, and outside, for the environment it is likely to encounter. Before transfer, routes should be agreed and emergency strategies discussed.

Risks: non-technical

A hospital critical care department has a large team with experts and equipment on hand to provide assistance and interventions, but clearly these are not available in-transit. Transfers involve small teams working in isolation, and these teams are often unfamiliar with each other and the patient.[9] Common management issues with communication and liaison between the ICU and sites of destination or origin have been identified as risks to patient safety.[5]

Risks: organizational

A clear structure of governance is essential for safe practice and stressed by the Association of Anaesthetists Great Britain and Northern Ireland (AAGBI), Royal College of Anaesthetists (RCoA), and Intensive Care Society (ICS). The RCoA outlines that each Trust and Critical Care Network should have a designated consultant who is responsible for transfers, guideline production, training, documentation, data-capture and audit, encouraging best practice and standardization of protocols, equipment, and documentation.

Transfer places burdens on both the preparing and remaining staff.[10] Transfer must not jeopardize other patients[11] or work within the hospital.[3] Admission[12] and transfer[13] delays are independently associated with ICU morbidity and mortality and must be kept to a minimum.

Accompanying staff must be safely and promptly returned to their base after transfer, although it should be noted that the transferring platform may not always be able to fulfil this task.[3] Late finishes need to be acknowledged with rest times observed. A dedicated transfer service has many advantages and is the preferred method of transferring patients requiring specialist treatment or who require prolonged transport.[3]

Setting the standards for transfer

The AAGBI and the ICS both produce transfer guidelines outlining how safe transfer of sick patients can be achieved,[2,3,14] as do the National Institute for Health and Care Excellence and the Scottish Intercollegiate Guidelines Network. These documents should be used in conjunction with local policy to ensure safe practice within an appropriate structure of governance.

Training and competence

The AAGBI states that *'education and preparation are central to any safe transfer'* and recommends *'personnel undertaking transfers should have the appropriate competencies, qualifications and experience … it is highly desirable that this should include attendance at a suitable transfer course'*.[3]

Before independent transfer, all staff should be suitably competent, and have performed transfers under direct supervision.[3] Transfer competencies are now essential components of the Royal College of Anaesthetists, Faculty of Intensive Care Medline and Royal College of Emergency Medicine curricula. There are several generic training courses available, but consideration should be given to the development of local training, focussing on local practice.

Transfer staff should undertake regular training, including instruction and reflection on their technical and non-technical skills.[15] Where possible, healthcare providers should train together in the teams in which they are likely to be deployed. Lack of protocols, formal guidance, and procedural training is associated with inconsistencies in coordination and handover of patient care.[16]

Checklists and apps

Most transfer incidents can be limited by simple rechecking of equipment and the patient before transfer, or by the appropriate use of protocols during transfer.[5] Pre-departure checklists should be routinely used, ensuring that all necessary preparations have been completed;[2] a generic example is contained in the ICS guidelines.[3] Checklists and aide-memoirs on handheld devices are likely to be more widely adopted in years to come. If recording patient information, the normal Caldicott and confidentiality rules apply.

The transfer process: Who? With whom? When? How? With what?

Who?

It is imperative patients are transferred for the appropriate clinical reasons. With high demand for finite services, it may be necessary to transfer patients who no longer need such specialist care to enable a more appropriate admission. In this situation, the most stable patient should usually be moved to minimize the potential for deterioration during transfer. The decision to transfer a patient to another hospital must be agreed by the responsible consultants in both the referring and receiving hospitals. During transfer, the responsibility for support and supervision to the transfer team is provided by referring senior clinician.[2,3]

With whom?

The choice of transfer team will determine the scope of the transfer. An intra-hospital transfer is often the first time that trainees work under distant supervision. Trust should foster an environment where transfer teams, or individuals can voice concerns or ask for help when they are asked to practice outside the scope of their competence or comfort. Full guidance on the appropriate qualifications of accompanying staff have been published by the ICS.[2]

When?

The process of transferring a patient, from referral to handover, can often take longer than anticipated. With urgent patients, it is essential to strike a balance between speed and safety as hasty preparation may well result in a delay during the transfer. The risks posed to patient, crew and other road

users are infrequently mitigated by the minutes gained driving with 'blues and twos' during secondary transfer.[2,3]

Non-urgent ambulances, depending on tasking can take several hours to arrive, disrupting both the referring and receiving hospitals. Transfer of patients during the daytime working hours is safer as there are more staff available for preparation and to cover the duties of those absent while transferring and receiving a new patient. Transfer at night or in bad weather carries additional risks such as fatigue and dangerous driving conditions.

How?

The appropriate and careful preparation of the patient before transfer is crucial, preventing problems and delay. An 'Airway, Breathing, Circulation (ABC)' or similar systematic approach to the patient helps to avoid oversight and pre-empt potential pitfalls. The following is a guide and should be used in conjunction with AAGBI, ICS, and local guidance, and specific targets for certain patient cohorts should be observed (e.g. head injury).

Airway

In transit, intubation/reintubation is suboptimal in the extreme and should be avoided by anticipating potential decline and securing tracheal tubes (TTs). Before transfer, TT placement should be checked, radiologically confirmed and recorded.

Breathing

Care should be taken to ensure that ventilation is adequate, whether spontaneous or mechanical, and verified with arterial blood gases. 'Peg' saturation probes can be temperamental so consider either ear or single-use adhesive probes. End-tidal CO_2 monitoring is mandatory for care of the intubated patient. Pneumothorax should be identified, decompressed and drained before transfer. Oxygen requirements should be calculated before transfer (the authors suggest: 2 $\times$ (patient consumption + ventilator consumption). As with normal anaesthetic practice, bag valve masks are essential in case of gas/ventilator failure.

Circulation

Appropriate resuscitation should take place before transfer. At least two i.v. access sites should be available and accessible, and they must be adequately secured and of an appropriate size. Arterial lines should be well secured with non-invasive blood pressure monitoring in place for use in the event of art-line failure. Femoral central lines can kink or be difficult to access during transfer; jugular or subclavian access is preferable. Vasopressors and inotropes should be established and easy to titrate, if required. Appropriate blood products should be transferred with the patient, and unused products should be returned to the referring hospital's laboratory; a pre-transfusion sample maybe useful for the receiving lab. Specialist equipment including balloon pump, intracerebral pressure monitoring, pacing equipment, etc. should be discussed on a patient by patient basis.

Disability

Ongoing sedation and adequate analgesia are essential as paralysis is often advantageous. Propofol and an opioid (e.g. morphine, fentanyl, alfentanil or remifentanil depending on local practice and personal experience) are typically used and should be titrated to response. Periods of increased stimuli during transfer should be pre-empted. Blood glucose should be checked before departure and during transfer if administering insulin. Seizures should be controlled and a strategy for treatment of intracranial pressure agreed on, after discussion with the receiving specialist centre. It may be simpler to administer routine medications/feed, either before or after transfer, if appropriate, to limit the number of lines and infusions.

Exposure

The trauma patient should have their cervical spine, pelvic and long bone fractures immobilized as appropriate. All drains and lines should be securely fixed in place. There is an increased risk of hypothermia during transfer so ensure that uncovering of the patient is limited and heat loss considered (e.g. vacuum mattresses, blankets, bubble wrap, active warming have all been used), and continuous temperature monitoring is recommended.

Packaging

Careful packaging should minimize movement, heat loss, snagging, and injury during the transfer. Creases and other clinical debris in sheets should be avoided to reduce pressure areas. Trauma patients may require a vacuum mattress or splints that may be difficult to remove while maintaining full spinal precautions. Patients need to be secured to the transfer trolley before transfer (if using a vacuum mattress, patients need to be first secured within the mattress and then secured to the trolley). Transfer trolleys must fit securely into the vehicle to protect the patient and transfer team in case of an accident. Inter-hospital transfer on spinal board or scoop stretcher is inappropriate.

Documentation

Good medical records are essential for ensuring continuity of patient care. Recording vital signs can be challenging, but should be done every 5 min, as per AAGBI standards.[2] Significant events, interventions and drug administration should be recorded, as they would be in hospital. Additional details include patient identifiers, referring and accepting consultant and hospital, transfer team details and timings. Duplicates should be available for audit and incident reporting.[2] Standardized documentation should be developed across networks and should be used for both inter-hospital and intra-hospital transport.

Communication and handover

Poor communication can result in patient harm;[9] good communication smooths the transfer process and the handover process should be formalized.[3] Handover of care is usually a three or four stage process. Firstly, the referring and receiving senior clinicians should discuss transfer of care. Secondly, the referring unit should document a care summary and handover letter. Thirdly, if the transfer team is not familiar with the patient they should receive a handover from the base referring team. Finally, the transfer team should conduct a structured verbal handover to both medical and nursing personnel simultaneously, concentrating on any changes during transfer. A mobile phone is essential and it is wise to take a note of all potentially useful numbers at the referring and receiving institutions before transfer.

With what?

Emergency drugs

Drugs likely to be required (i.e. vasopressors, sedatives, and a neuromuscular blocker) should be drawn up and available in appropriate doses. Any stock medication (including fluids and blood products) that may be necessary should be taken on the transfer with the required diluting solution, labels, lines, and pumps. These can be kept in an easily transportable bag and should be regularly checked. It is helpful to have specific drug doses calculated before transfer, particularly with specific high-risk (e.g. neurosurgical and paediatric) patients.

Equipment

Transfer equipment should be durable, compact, intuitive, and well maintained. Additional equipment for ABC management is necessary; in most centres this is kept in a dedicated transfer bag. It is essential that the transferring clinicians are well accustomed to the transfer kit. This includes the ventilator, infusion pumps, monitoring, suction, defibrillator, transfer bags and trolley, and should form part of any departmental induction. A specific trolley for transfer of the critically ill patient is required, rather than a standard ambulance trolley. This should have docks for monitoring, infusion pumps, the ventilator and oxygen cylinders, and this equipment should be securely attached to avoid injury to both staff and patient during transfer.[2] The transfer trolley must be locked into place in the ambulance and plugged into the vehicle's power source via an inverter, before moving the patient into the vehicle. Additional batteries are also advisable.

By road or by air?

UK inter-hospital transfers are typically via land ambulance. Factors influencing the decision to transfer by air include urgency of care, geography, platform availability, weather, and access to airports/helipads. Fixed and rotary wing transfer follow the same basic principles, but have additional considerations which are beyond the scope of this article. The equipment and constraints of air-transfer vary depending on platform and provider; only clinicians confident and competent in aeromedical transfer should undertake such missions. Regardless of the platform, the clinical team should position themselves safely to enable observation and access to the patient and any ancillary equipment (e.g. monitoring, ventilator, syringe drivers, etc.). If clinical actions are required, a decision must be taken between the transfer team and ambulance crew weather to stop the vehicle to allow safe intervention.

Care of the transfer team

Personal protective equipment

Several factors can impair performance of the team and its individuals, so it is important to try and correct these when possible. Warm clothing, ideally high-visibility jackets, should be worn as theatre shrubs are not appropriate. A mobile phone and money for food and drink on the return journey is useful, particularly if there is a delay. Many clinicians suffer from motion sickness and this should be addressed.[2]

Insurance

The AAGBI and ICS offer membership with personal accident insurance cover in the event of an accident during a patient transfer. Membership of a defence organization is recommended.

Dedicated transfer teams

Transport of critically ill patients is increasing and is likely to continue doing so for several reasons.[17] The Department of Health in Quality Critical Care has recommended critical care networks consider the use of dedicated retrieval teams, for adult and paediatric transfers, in addition to the current super-specialist services (e.g. infectious diseases, extracorporeal membrane oxygenation, etc.). Dedicated transfer teams are expensive to introduce and maintain. Despite failing to demonstrate an improvement in adult patient outcome,[18] dedicated transfer teams may reduce complications during transfer and lessen the staff pressures at referring hospitals.[1,19]

Declaration of interest

None declared.

MCQs

The associated MCQs (to support CME/CPD activity) can be accessed at www.bjaed.org/cme/home by subscribers to *BJA Education*.

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