

Guidance On:

The Transfer Of The Critically Ill Adult



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Executive Summary

These guidelines have been produced as a collaboration between the Intensive Care Society (ICS) and the Faculty of Intensive Care Medicine (FICM). They follow three previous editions of similar guidelines produced by the ICS.

As with the previous guidelines, the intention is to provide colleagues with up to date evidence based advice and to promote high standards of care during the transfer of critically ill patients.

Prior to developing the guidelines, data relating to transfer activity was obtained from the Intensive Care National Audit and Research Centre, The Scottish Intensive Care Society Audit group and from Critical Care Operational Delivery Networks in England, Wales and Northern Ireland.

A systematic literature review was carried out to identify articles relating to transfers published since the previous edition of the ICS guidelines was prepared.

As previously, the quality of published evidence relating to transfers is poor comprising mostly case series from single centres. Recommendations are therefore based on a combination of available evidence, expert opinion and advice from patient representatives.

Summary of Recommendations

Organisation and planning

1. Each Critical Care Network (ODN) should have a nominated lead for transfer whose responsibilities include the development and oversight of referral pathways, transfer protocols and associated quality assurance programmes.
2. All acute hospitals should nominate a lead consultant for critical care transfers with responsibility for guidelines, staff training, competencies, and equipment provision. This individual should report to the trust critical care delivery group / governance meeting and Network Transfer Forums.
3. All acute hospitals must have systems and resources in place to resuscitate, stabilise and transport critically ill patients when required. Plans should encompass all critical care areas including intensive care and high dependency care areas, acute wards and emergency departments.
4. All acute provider trusts must have arrangements in place to ensure that transfers for capacity reasons alone (non-clinical transfers) occur only as a last resort. Where necessary transfer should be to the most appropriate hospital for the clinical needs of the patient, while taking account of bed availability, transfer distance, and designated transfer group.
5. Critical Care Networks and provider trusts should consider whether the development and use of dedicated transport teams would be appropriate to best meet the transfer needs of their patients.
6. All acute hospitals responsible for transferring critically ill patients must have access to a CEN¹ compliant transfer trolley.
7. Critical Care Networks should liaise with local NHS Ambulance Provider Trusts to ensure the availability of suitable ambulances for critical care transfer and compatibility of mounting systems with transfer trolleys.
8. Critical Care Networks and provider trusts should agree a framework for prioritisation of inter-facility transfers and appropriate response times in keeping with the nationally agreed protocol.
9. All staff potentially involved in the transport of critically ill patients should have access to appropriate educational resources, receive training in transfer medicine and have the opportunity to gain experience in a supernumerary capacity.
10. All staff involved in transfers must be able to demonstrate the range of competencies appropriate to their role. Staff without the appropriate training and competencies should not undertake unsupervised transfers.
11. Critical Care Networks and provider trusts should consider the use of simulation training in their transfer training packages with a particular focus on the practical and technical aspects of transfer.
12. All monitoring and equipment must be suitable for use in the transfer environment and mounted on the transfer trolley in such a way as to be CEN compliant.

¹ Comité Européen de Normalisation. (European Committee on standardization)

13. Equipment must be serviced, maintained and checked prior to use in such a way as to reduce the risks of failure during transfer.
14. Ideally all equipment within a Critical Care Network should be standardised to enable the seamless transfer of patients without, for example, interruption of drug therapy or monitoring due to incompatibility of leads and transducers.
15. Standardised equipment lists and standardised transfer bags offer practical and safety advantages and should be considered by all networks / trusts.
16. Critical Care Network lead clinicians must ensure that adequate governance arrangements are in place across the network and that all patient transfers are subject to audit, critical incident reporting and review including analysis of feedback from patients and relatives.
17. All acute provider trusts should ensure that the movement of critically ill patients within hospitals (intra-hospital transfers) are subject to similar governance arrangements.
18. A mechanism for capturing the numbers of critical care transfers occurring nationally, indications, incidents and outcomes should be developed.
19. All acute provider trusts should use the datix system (or equivalent) for reporting incidents occurring during critical care transfer. Reports should include 'critical care transfer' as an identifier to enable future data searching and analysis.

Clinical Guidelines

20. The decision to transfer and to accept a patient must be made by appropriate consultants in both the referring and receiving hospitals.
21. Transfer for immediate lifesaving interventions must not be delayed by lack of availability of a critical care bed.
22. Repatriation policies for patients who no longer require specialist care should be agreed across networks. Patients who require repatriation must be transferred within 48 hours of being identified as suitable for repatriation.
23. Patients and their relatives should be kept informed at all stages of the transfer process and should be provided with appropriate written information.
24. Where required, arrangements for air transport should be agreed with local NHS ambulance provider trusts, or air ambulance providers. Contact numbers should be available in all ICUs and emergency departments.
25. Prior to the transfer of a critically ill patient, a risk assessment must be undertaken and documented by a senior clinician to determine the level of anticipated risk during transfer. The outcome of the risk assessment should be used to determine the competencies of the staff required to accompany the patient during transfer.
26. Patients should be appropriately resuscitated and stabilised prior to transfer to reduce the physiological disturbance associated with movement and reduce the risk of deterioration during the transfer.
27. Check lists should be used to help to ensure that all necessary preparations have been completed, prior to each stage of the transfer.

28. Minimum standards of monitoring must be applied in every case. Monitoring should be continuous throughout the transfer. All monitors, including ventilator displays and syringe drivers should be visible to accompanying staff.
29. A documented record of observations and event must be maintained.
30. Patients should be securely strapped to the transfer trolley by means of a 5-point harness (or similar). Reassurance, sedation, analgesia and anti-emetics should be provided as required to reduce patient discomfort and distress.
31. All portable equipment must be securely stowed to reduce the risk of injury in the event of an accident.
32. Staff must remain seated at all times and wear the seat belts provided. If it is necessary to attend to the patient during transfer, the ambulance crew should be informed and the vehicle stopped in a safe place.
33. High speed journeys must be avoided except where clinically necessary. Blue lights and sirens may be used to aid passage through traffic to deliver a smooth journey.
34. Only staff with appropriate training and competencies should undertake aero-medical transfers. Minimum requirements include safety training, evacuation procedures for the aircraft, and basic on board communication skills (particularly for helicopters). More advanced training in aeromedical transfer is however desirable.
35. Critical Care Networks should develop standardised documentation for both inter-hospital and intra-hospital transport. This should include a core data set for audit purposes.

Research Recommendation

There should be future research into the impact of transfer on patients and their relatives with a particular focus on understanding patient and relative experiences, to enable future improvements in practice aimed at minimising the distress potentially caused by transfer.

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*We would like to extend our sympathies to the family of Jonathan Ball who sadly passed away before this guidance was published. Although a full time NHS consultant in Bradford, he had served with the Royal Air Force (RAF) and had a particular interest in air transport.

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- Critical Care Operational Delivery Networks in England, Wales and Northern Ireland
- Intensive Care National Audit and Research Centre
- The Scottish Intensive Care Society (Audit Group)

Introduction, standards of care, and scope of guidelines

1. Introduction

- 1.1. Following initial resuscitation and stabilisation in hospital, critically ill patients frequently require transfer to another hospital. Indications for such transfers include specialist investigation or treatment not available in the referring unit, lack of availability of a staffed critical care bed and repatriation.
- 1.2. In 1997 it was estimated that over 11,000 critically ill patients were transferred between hospitals in the UK each year.¹ Figures for the number of transfers carried out currently are difficult to obtain as there is no national reporting system.
- 1.3. Data from the Intensive Care National Audit and Research Centre (ICNARC) case mix programme,² indicates that there were 601,478 admissions to 266 participating critical care units in England Wales and Northern Ireland in the three year period 1st April 2014 - 31st March 2017. Of these, 28,418 (4.7%) were transferred from another hospital. This equates to an annual figure of around 9500 transfers per year, although the number appears to be increasing in real terms year on year. Whilst almost all General Intensive Care units now participate in the case mix programme, the coverage of specialist units is less complete, so it is likely that this figure remains an under estimate. [Appendix 1]
- 1.4. The ICNARC data suggests that 27.8% of transfers originate from an Emergency Department, 35.5% from a general critical care unit, 11% from a specialist critical care unit and 25% from other areas. During the three year period, 3687 transfers (13%) were the result of repatriation of which 513 (1.8% of total) were from abroad.
- 1.5. Transfers occurred fairly evenly through the week Monday to Friday with slightly fewer occurring at weekends. More transfers occurred between the hours of 18.00 hours and 07.59, (56%) than during the day (44%).
- 1.6. Data from the Scottish Intensive Care Society Audit Group³ indicates that in the same three year period April 2014 - March 2017 there were 105,457 admissions to critical care units in Scotland. Of these 3745 (3.6%) were admitted following transfer from another acute hospital. This equates to an annual figure of around 1250. The data does not identify the reason for transfer. [Appendix 2]
- 1.7. The highest level of care received by patients transferred during this period was level 2 in 1241 cases (32.4%) and level 3 in 67.6%. Again transfers were spread fairly evenly during the week with slightly fewer on Sundays and Mondays than other days. In contrast to the ICNARC data more transfers (60.6%) occurred during the day 08.00 - 19.59 hours, than at night (39.4%).
- 1.8. To gain a greater understanding of the standards of UK practice, we also conducted a survey in 2018 of Critical Care Operational Delivery Networks in England, Wales and Northern Ireland, requesting transfer data for the comparable three year period to the ICNARC / SICSAG data above. Thirteen of the 20 Networks responded. Although incomplete, the data suggests that approximately 65% of transfers occur for clinical reasons, 16 % for non-clinical reasons, 11.5% are repatriations, with the remainder of the data being missing or unknown. [Appendix 3]
- 1.9. Whilst it remains difficult to obtain a complete picture of critical care transfer activity in the UK, it is clear that there are still significant numbers of patients being transferred annually and this number is likely to increase further as a result of the increasing centralisation of specialised services.

- 1.10. Approximately 16% of transfers currently are non-clinical and therefore potentially avoidable. Whilst there is little published evidence on the impact of such transfers on patients, one propensity matched cohort study of 759 patients from the ICNARC case mix programme, transferred for non-clinical reasons within 48 hours of admission, demonstrated an increased length of ICU stay for the transferred patients of 3 days.⁴ Although there was no statistically significant difference in mortality at ultimate hospital discharge, this increased length of stay is likely to have significant ramifications for patients and their relatives in terms of distress, inconvenience and cost.

2. Standards of care

- 2.1. In preparing these guidelines, a systematic literature review was carried out in November 2017 to identify relevant articles published since 2009, relating to clinical practices and standards of care during the transport of critically ill patients. Fifty articles, including 2 sets of guidelines published by other groups and 48 articles relating to the process of patient transfer were selected for review. The search strategy and results are included in Appendix 4.
- 2.2. The number of articles published over the period suggests that there is still considerable interest globally in the process of patient transfer. Much of the data cited however, is from single centre audits and case series which provide the weakest level of evidence, such that their validity and wider applicability should be interpreted with caution.
- 2.3. Fanara *et al* for example, estimated that the overall incidence of adverse events during inter-hospital transfer reported in the global literature was as high as 68% with serious adverse events occurring in between 4.2% - 8.9%.⁵ The rates of cardiac arrest during transfer were reported as 0.38% to 1.6%. A large retrospective cohort study from Canada however, looked at adverse events occurring in over 5144 urgent transfers by road and found adverse events occurring in only 6.5%.⁶
- 2.4. To gain a greater understanding of the standards of UK practice, we conducted a survey in 2018 of Critical Care Networks in England, Wales and Northern Ireland. Of the 13 networks that responded, all reported having some training in place for staff in relation to conducting transfers. All had standardised transfer forms and checklists available but only 6/13 had a standardised risk assessment process. Only 50% reported having access to a CEN compliant transfer trolley and standardised equipment across the network, and only 10 of the 14 networks indicated that they had robust audit processes in place for inter-hospital transfer. Transfers were carried out by appropriately trained staff in between 75 - 90% of cases. Critical incidents were recorded in 4.2% of transfers. This is likely to be an underestimate of the true incident rate. An prospective audit from the South West Critical Care Network of 1124 transfers over a 5 year period recorded critical incidents in 6.9% of transfers.⁷
- 2.5. Thus whilst the literature should be interpreted with caution, the available evidence continues to suggest that compliance with existing guidelines remains poor and concerns persist over the standard of many transfers.

3. Definitions and Scope of guidelines

- 3.1. These guidelines are intended to provide colleagues with up to date, evidence based guidance in order to improve the standards of care during transport of critically ill adults in the UK.

- 3.2. For the purpose of these guidelines “critically ill” is defined as requiring a level of care greater than that normally provided on a standard hospital ward, i.e. ICS Levels of Care 1-3.⁸
- 3.3. The guidelines apply to the secondary transfer of all critically ill adult patients in the UK, including those transferred from areas such as the Emergency Department, and Post Anaesthesia Care unit. They apply both to transfers between hospitals (inter-hospital transport) and to those transferred between departments within a hospital (intra-hospital transport) since similar levels of preparation, supervision and care are required for each.

4. Grading of evidence and recommendations

- 4.1. The majority of the published articles identified in the systematic literature review relate to small observational studies, single centre case series, audits and reviews. There are no published randomised controlled trials and meta-analysis is precluded by the heterogeneity of the various studies. Whilst this may reflect the difficulty of performing high quality research in this area, the quality of the evidence available to inform the guidelines is rated as low or very low.⁹
- 4.2. As a consequence, all recommendations are made, based on a combination of the available published evidence, expert clinical opinion and advice from patient representatives.

Organisation and planning

5. Organisation within networks

- 5.1. The Department of Health’s publication Comprehensive Critical Care,¹⁰ made planning for inter-hospital transfer of the critically ill patient mandatory at local, regional and national level, with transport services organised and coordinated to deliver safe, efficient, and timely inter-hospital transfer, of all critically ill or injured patients.
- 5.2. To facilitate this, managed clinical networks were established with responsibility for the coordination and development of transfer services, within defined geographical areas. Changes to commissioning arrangements following the Health and Social Care Act 2012, led to a review of these clinical networks. The NHS Commissioning Board (NHS CB) concluded that clinical networks had been responsible for significant and sustained improvements in quality of patient care and outcomes.¹¹
- 5.3. A framework for the continued provision of clinical networks as Operational Delivery Networks (ODNs) was published, with a focus on the co-ordination of patient pathways between providers over a wide area to ensure access to specialist resources and expertise.¹² Twenty critical care ODNs were established in England, Wales and Northern Ireland, with responsibility for the oversight of effective referral pathways and safe and effective transfer processes.
- 5.4. **Recommendations**

1. Each Critical Care Network (ODN) should have a nominated lead for transfer whose responsibilities include the development and oversight of referral pathways, transfer protocols and associated quality assurance programmes.

6. Organisation within trusts

- 6.1. Within each ODN, individual Acute NHS Trusts are required to define those geographically related hospitals to which they transfer patients for capacity reasons alone.¹⁰
- 6.2. These “Transfer Groups” are specific to each trust and arrangements are not necessarily reciprocal. Acute Trusts at the boundaries of network areas may include trusts from neighbouring networks in their transfer group, and if appropriate, use a different tertiary referral centre from their parent critical care network.¹⁰ Close co-operation between adjacent critical care networks is therefore a necessity.
- 6.3. All trusts should have systems in place to ensure that their critical care bed state is regularly updated on the Directory of Beds Services Management Pathways System (DOS) or equivalent bed management system, to facilitate identification of available beds for transfers.
- 6.4. The transfer of any patient outside of a predefined transfer group for capacity reasons alone, is considered a critical incident and should be escalated to the chief Executive / Chief Operating officer (or nominated deputy) of the referring NHS Trust, to ensure that all appropriate alternatives have been considered.

6.5. Recommendations

2. All acute hospitals should nominate a lead consultant for critical care transfers with responsibility for guidelines, staff training, competencies, and equipment provision. This individual should report to the trust critical care delivery group / governance meeting and Network Transfer Forums.
3. All acute hospitals must have systems and resources in place to resuscitate, stabilise and transport critically ill patients when required. Plans should encompass all critical care areas including intensive care and high dependency care areas, acute wards and emergency departments.
4. All acute provider trusts must have arrangements in place to ensure that transfers for capacity reasons alone (non-clinical transfers) occur only as a last resort. Where necessary transfer should be to the most appropriate hospital for the clinical needs of the patient, while taking account of bed availability, transfer distance, and designated transfer group.

7. Role of dedicated transport teams

- 7.1. There is some evidence in the literature that the use of dedicated transfer teams improves the outcome of critically ill patients transferred between hospitals.
- 7.2. A prospective observational study in the Netherlands by Wieggersma et al. evaluated adverse events and patient stability during Mobile Intensive Care Unit (MICU) transfers, using a specialised retrieval team, compared to standard ambulance transfer.¹³ There was a decline in adverse events in the MICU group from 34% to 12.5%, with all MICU incidents being related to technical / equipment failure. Patients transferred by MICU demonstrated significantly better arterial blood gas values (pH, PaO₂ and PaCO₂), despite significantly higher APACHE II scores than in the standard transfer group. More patients in the standard care group required emergency airway intervention on arrival in the receiving unit.

- 7.3 A large cohort study from Victoria, Australia, assessed the impact of the introduction of an adult retrieval service on major trauma outcomes.¹⁴ Data relating to 3009 major trauma cases extracted from the Victoria State Trauma Registry, showed that the transfers by the Victoria Retrieval Service had a lower adjusted odds ratio for in hospital mortality compared to those that were not.
- 7.4 It seems likely, that the value of specialised transfer teams lies in the familiarity of the staff with the transport equipment, procedures and logistics of transfer. The make-up of the retrieval teams varies markedly in different studies and it is unclear what combination of personnel might constitute the ideal transfer team. A randomised non-inferiority study by Lieshout et al, compared nurse led versus physician led transfer in 298 patients. Adverse events did not differ markedly between the two groups, (16.3% in nurse led group compared to 15.2% in the physician led group) however, the sample size was too small for non-inferiority to be unequivocally established.¹⁵
- 7.5 There is little published evidence relating to the potential disadvantages of specialised transfer teams, although these may include delays in mobilisation and deskilling of hospital staff with subsequent difficulty in carrying out time sensitive transfers. Plans also need to be maintained for the transfer of patients in the event that the transport service is overwhelmed or unavailable.
- 7.6. Despite these concerns, there may be logistical and practical advantages in the use of dedicated transport teams which could be centrally located at a tertiary referral centre (retrieval team), affiliated to an individual critical care network or networks (regional transport team) or based in individual hospitals (hospital transport team). Arrangements would depend on geographical area, funding and demand.
- 7.7. **Recommendations**

5. Critical care networks and provider trusts should consider whether the development and use of dedicated transport teams would be appropriate to best meet the transfer needs of their patients.

8. Standards for ambulances

- 8.1. Standards for road ambulances are stipulated in British and European Standards document 1789-2007 (Commonly referred to as CEN regulations). Section 4.5.9. of these standards, requires that without exception, "*all persons and items e.g. medical devices, equipment and objects normally carried on the road ambulance shall be restrained, installed or stowed to prevent them becoming a projectile when subjected to acceleration / deceleration forces of 10g in the forward, rearward left, right and vertical directions*".¹⁶
- 8.2. Transfer trollies should be CEN compliant and configured to carry monitors, syringe pumps, ventilators, and reserve oxygen cylinders, and have secure anchorage for patient harnesses / restraints etc.
- 8.3. Standards also require that emergency ambulances carry a minimum of 2000 litres of oxygen. Most vehicles are now equipped with 2 F size cylinders (total 2720 litres) and DC / AC power inverters.
- 8.4. All aspects of the provision and safe operation of air ambulances are governed by the Civil Aviation Authority.

8.5 Recommendations

6. All acute hospitals responsible for transferring critically ill patients must have access to a CEN compliant transfer trolley.
7. Critical Care Networks should liaise with local NHS Ambulance Provider Trusts to ensure the availability of suitable ambulances for critical care transfer and compatibility of mounting systems with transfer trolleys.

9. Prioritisation of transfers

- 9.1. A new National Framework for prioritisation of Inter-Facility Transfer (IFT) has recently been published by the Association of Ambulance Chief Executives.¹⁷ This describes four levels of priority for inter-facility transfer based on clinical need and urgency, partially mapped to the Ambulance Response Programme (ARP) target response times for England.
- 9.2. IFT level 1 (ARP category 1: mean target response time 7 minutes; 90% in 14 minutes) is reserved for those situations where a facility is unable to provide immediate life-saving interventions such as resuscitation and requires the clinical assistance of the ambulance service in addition to a transport resource.
- 9.3. IFT level 2 (ARP category 2: mean target response time 18 minutes; 90% in 40 minutes) is reserved for situations where transfer is required for immediate (time critical) life, limb or sight saving intervention in another facility. The next available emergency ambulance will be allocated, and it is vital therefore that patients and accompanying staff are ready to travel as soon as the ambulance arrives to avoid unnecessary delay in returning the ambulance to emergency service.
- 9.4. IFT level 3 and level 4 are for less urgent transfers and the response time are not defined. IFT level 3 is for patients who do not need immediate time critical intervention but require transfer to provide a level of care not available in the current facility. IFT level 4 is for patients who do not fit any of the above descriptions. Networks and acute providers will need to agree response times with ambulance providers through their normal commissioning processes.

9.5 Recommendations

8. Critical Care Networks and providers trusts should agree a framework for prioritisation of inter-facility transfers and appropriate response times in keeping with the nationally agreed protocol.

10. Training and competencies

- 10.1. The role of the ambulance staff during transfer is to ensure the safety of the vehicle and its occupants. The role of the accompanying clinical team is to provide any required on-going medical / nursing care and to ensure the safety of the patient. Evidence suggests that significant numbers of transfers are still being undertaken by inexperienced and inadequately trained staff and this is likely to be responsible for the continuing high rate of avoidable critical incidents.

- 10.2. In a 2008 survey of speciality trainees from the Wessex Region in years one and two of training (n=31), 88% had undertaken an inter-hospital transfer alone, whilst 94% had transferred a patient on their own within the hospital. 65% had received some transfer training, but only 33% had been on a specific transfer course, 39% (n=12) had been asked to undertake a transfer when they did not feel they had adequate experience to do so.¹⁸
- 10.3. A similar survey in 2014 of Anaesthetic and Emergency Medicine trainees in Scotland found 20% of respondents had received no training prior to their first solo inter-hospital transfer. Few had previously conducted a transfer with a senior colleague (9%) or attended a transfer course (4%), 61% rated their transfer training as deficient or absent and 94% felt there was a place for more formal tuition in transfer medicine.¹⁹
- 10.4. A number of studies have highlighted that technical and equipment problems are common during transfer and that the ability to resolve these is an important patient safety factor. One study highlighted the value of simulation training in this respect.²⁰ A study by Becker et al, highlighted the limited training of physicians regarding the medical and legal aspects of transport medicine. They found that a one hour, educational intervention objectively increased emergency medicine and critical care trainees' understanding of the medico-legal aspects of inter-facility patient transfers.²¹
- 10.5. All the Operational Delivery Networks that responded to the survey carried out in 2018 indicated that transfer training was provided within the Network. There is no national standard for this training however, with Networks reporting a range of approaches including use of eLearning, didactic teaching and simulation training. Whatever approach to training is adopted, it must deliver the core knowledge and competencies required by staff.
- 10.6. Transfer competencies for medical staff are included in the Intensive Care Medicine CCT produced by the Faculty of Intensive Care Medicine²² and in the Anaesthesia CCT produced by The Royal College of Anaesthetists.²³ Competencies for Advanced Critical Care Practitioners undertaking transfers are not defined in the ACCP Curriculum and will need to be agreed locally to reflect role and scope of practice. Competencies for nursing staff are included in the National Competency Framework for Adult Critical Care (Step 2 Competencies) produced by the Critical Care Networks - National Nurse Leads.²⁴
- 10.7. **Recommendations**

9. All staff potentially involved in the transport of critically ill patients should have access to appropriate educational resources, receive training in transfer medicine and have the opportunity to gain experience in a supernumerary capacity.
10. All staff involved in transfers must be able to demonstrate the range of competencies appropriate to their role. Staff without the appropriate training and competencies should not undertake unsupervised transfers.
11. Critical Care Networks and provider trusts should consider the use of simulation training in their transfer training packages with a particular focus on the practical and technical aspects of transfer.

11. Equipment

- 11.1. The literature consistently identifies equipment failure as the most common adverse event during transfer. Parmentier-Decruq et al examined 262 mechanically ventilated patients undergoing inter-hospital transfer. Equipment related incidents accounted for the largest subgroup of adverse events with incidents involving airway equipment accounting for 17.2%.²⁵ Similarly Venkategowda et al reported on 254 patients undergoing transfer and found that 64% of adverse incidents related to equipment failure.²⁶
- 11.2. In the Survey of Critical Care Operational Delivery Networks undertaken in 2018, although there was no consistency in how networks recorded or reported adverse events, equipment related issues were again the predominant problem with battery failure a particular issue.
- 11.3. All equipment used during transfer should be specified by the manufacturer as suitable for use in the transport environment. Equipment which maybe suitable for use in road vehicles may not have Airworthy Medical Equipment (AME) certification and may not be appropriate to utilise in flight. AME certificates are specific to each individual piece of equipment, matched to a specific aircraft type and must be obtained from an approved provider prior to flight.
- 11.4. Portable monitors should have a clear illuminated display and be capable of displaying ECG, oxygen saturation (SaO₂), non-invasive blood pressure, two invasive pressures, capnography (EtCO₂) and temperature. Alarms should be visible as well as audible in view of extraneous noise levels.
- 11.5. Portable mechanical ventilators should have, as a minimum, disconnection and high pressure alarms, the ability to supply positive end expiratory pressure (PEEP) and variable inspired oxygen concentration (FiO₂), inspiratory / expiratory (I / E) ratio, respiratory rate and tidal volume. In addition, the ability to provide pressure controlled ventilation, pressure support and continuous positive airway pressure (CPAP) is desirable.
- 11.6. All equipment should be mounted in the transfer trolley in such a way as to be CEN compliant, and should be below the level of the patient. This lowers the centre of gravity, improving stability of the trolley, and allows unhindered access to the patient.
- 11.7. Additional equipment for securing and maintaining the airway, intravenous access, and emergency interventions should also be available. A list of suggested equipment has been published²⁷ and is included in Appendix 5. The provision of standardised equipment and transport bags across trusts / networks provides familiarity for staff, quicker access in an emergency and ease of checking / restocking.²⁷
- 11.8. Accompanying staff should wear suitable warm and protective clothing including appropriate footwear. High visibility jackets should be worn and these should be provided by the employer. A mobile telephone, and contact telephone numbers should be available for liaison with the base and / or receiving unit.
- 11.9. **Recommendations**

12. All monitoring and equipment must be suitable for use in the transfer environment and mounted on the transfer trolley in such a way as to be CEN compliant.
13. Equipment must be serviced, maintained and checked prior to use in such a way as to reduce the risks of failure during transfer.

14. Ideally all equipment within a critical care network should be standardised to enable the seamless transfer of patients without, for example, interruption of drug therapy or monitoring due to incompatibility of leads and transducers.
15. Standardised equipment lists and standardised transfer bags offer practical and safety advantages and should be considered by all Networks / Trusts.

12. Governance arrangements

- 12.1. The principles of good clinical governance are well established. Critical care networks and individual trusts should have governance arrangements in place to ensure standards for the transfer of critically ill patients are maintained. This should include the use of audit, critical incident reporting and feedback from patients / relatives regarding their experiences. A suggested minimum data set for audit purposes is included in Appendix 6.
- 12.2. Procedures should be in place to enable the immediate notification of major critical incidents to other members of the critical care network and to national organisations where appropriate.
- 12.3. The NHSI National Reporting and Learning System (NRLS) is a central database of patient safety incident reports. All information submitted by trusts is analysed to identify hazards risks and opportunities to improve healthcare safety. To try and gain a greater understanding of equipment related issues during transfer, we requested data relating to critical incidents occurring during critical care transfer in England Wales and Northern Ireland. The lack of consistency in the way incidents were recorded however meant that we were unable to easily identify the appropriate data set for analysis.
- 12.4. **Recommendations**

16. Critical Care Network lead clinicians must ensure that adequate governance arrangements are in place across the network and that all patient transfers are subject to audit, critical incident reporting and review including analysis of feedback from patients and relatives.
17. All acute provider trusts should ensure that the movement of critically ill patients within hospitals (intra-hospital transfers) are subject to similar governance arrangements.
18. A mechanism for capturing the numbers of critical care transfers occurring nationally, indications, incidents and outcomes should be developed.
19. All acute provider trusts should use the datix system (or equivalent) for reporting incidents occurring during critical care transfer. Reports should include 'critical care transfer' as an identifier to enable future data searching and analysis.

Clinical guidelines

13. Transfer decisions and ethics

- 13.1. The decision to transfer a patient is always the joint responsibility of the referring and receiving clinicians. The medical staff at the receiving unit may offer specialist advice on patient management, however primary responsibility for the patient always lies with the clinician in attendance who may, if circumstances change, decide not to transfer the patient.
- 13.2. A contentious issue which sometimes arises when a transfer is necessary because of lack of availability of critical care beds, is whether to transfer the new and potentially unstable patient, or an existing more stable patient who is less likely to deteriorate. In general, no patient should be subjected to an intervention that is not in their best interest and it could be considered unethical, to transfer one patient out of a critical care unit for the sole purpose of making room for another. This may on occasion however, be the most pragmatic approach, particularly where the transfer is required to generate capacity in a tertiary centre for a patient requiring specialist care.
- 13.3. When transfer to a specialist centre for immediate life-saving intervention is required (e.g. acute neurosurgery), this must not be delayed by lack of availability of an intensive care bed in the specialist centre. Transfer must occur to enable the required intervention, whilst arrangements are made, to provide the subsequent on-going care.
- 13.4. This requirement clearly creates challenges for tertiary centres in ensuring capacity and equity of access to specialist services. Repatriation of patients from specialist centres back to their referring centres once they no longer require specialist care is entirely appropriate and should normally occur within 48 hours of the patient being identified as suitable for repatriation.
- 13.5. Once a patient has been accepted by a receiving unit, the bed must be kept available to receive the patient until the patient arrives or until the transfer is stood down. This is particularly true of repatriations (including those from overseas) when the patient may be travelling long distances and there may be logistical delays in the transfer process.
- 13.6. **Recommendations**

20. The decision to transfer and to accept a patient must be made by appropriate consultants in both the referring and receiving hospitals.
21. Transfer for immediate lifesaving interventions must not be delayed by lack of availability of a critical care bed.
22. Repatriation policies for patients who no longer require specialist care should be agreed across networks. Patients who require repatriation must be transferred within 48 hours of being identified as suitable for repatriation.

14. Communication with patients and relatives

14.1. Whilst many critically ill patients will be unconscious or lack capacity, every effort should be made to communicate with patients about transfer arrangements. Patients and their relatives should be kept informed at all stages of the transfer process and provided with appropriate written information. In most cases relatives will be unable to travel with the patient and arrangements for their onward travel and accommodation should be clarified. Contact details for the receiving unit and visiting times should be provided.

14.2. Patients who lacked capacity at the time of transfer and who subsequently regain consciousness / capacity may be disorientated and confused and need help and support to understand where they are and what has happened.

14.3 Recommendations

23. Patients and their relatives should be kept informed at all stages of the transfer process and should be provided with appropriate written information.

15. Selection of transport mode

15.1. The choice of transport mode will depend on the nature of the illness, urgency of transfer, distance, availability of transport, mobilisation times, geography, traffic, weather conditions and cost.

15.2. Road transport has the advantage of low overall cost, rapid mobilisation time, less limitation by adverse weather conditions, less potential for physiological disturbance and easier patient monitoring. Staff are also more familiar with this environment.

15.3. Air transport may be considered for longer journeys, when road access is difficult, or when for other reasons, it may be quicker. Perceived speed of air transport must however be balanced against organisational delays and the need for road transfer at either end of the journey.

15.4. Helicopters vary in size, accommodation and range. They generally provide a less comfortable environment than a road ambulance or pressurised fixed wing aircraft. Vibration and acceleration / deceleration forces significantly adversely affect patient haemodynamics and monitoring. In addition, they are expensive and have a poorer safety record than fixed wing aircraft. Due to expense, they are not usually available to return staff and equipment to the base hospital and alternative arrangements will have to be made.

15.5 Recommendations

24. Where required, arrangements for air transport should be agreed with local NHS ambulance provider trusts, or air ambulance providers. Contact numbers should be available in all ICUs and emergency departments.

16. Accompanying personnel and risk assessment

16.1. Critically ill patients should normally be accompanied by one or two suitably trained and experienced clinical staff during transfer. The background of the staff, (Medical / ACCP /

Nursing / Other Practitioner practitioner) and the competencies required will depend on the nature of the underlying illness, co-morbidities, level of dependency and risk of deterioration during transfer.

16.2. Whilst the ICS Levels of Care provide an indication of dependency, they do not correspond directly to the level of risk during transfer for any individual patient. Determining the level of risk requires a risk assessment to be undertaken by an experienced clinician prior to the transfer. The risk assessment should take in to account the following:

- The patient's current clinical condition (assessed using a physiological track and trigger score and other physiological parameters relevant to the patient's condition)
- Specific risks related to the patient's condition
- Risks related to movement / transfer
- Likelihood of deterioration during transfer
- Potential for requiring additional monitoring / intervention
- Mode of transport and likely duration of transfer

16.3. Based on the risk assessment, the competencies of staff required to accompany the patient can be determined. Low risk patients may only need to be accompanied by a nurse (or other registered practitioner). Higher risk patients will usually require an additional clinician with resuscitation, and critical care competencies including advanced airway skills. An example of a pre-transfer risk assessment / stratification system is included in Appendix 7.

16.4. **Recommendations**

25. Prior to the transfer of a critically ill patient, a risk assessment should be undertaken and documented by a senior clinician to determine the level of anticipated risk during transfer. The outcome of the risk assessment should be used to determine the competencies of the staff required to accompany the patient during transfer.

17. Preparation for transport

17.1. Meticulous resuscitation and stabilisation of the patient before transport is the key to avoiding complications during the journey, although the time taken to achieve this has to be balanced against the need for immediate transfer for specialist life saving intervention.

17.2. Prior to departure transport attendants who have not been involved in the initial care of the patient should take time to introduce themselves to the patient / relatives and to familiarise themselves with the patient's history and the treatment and investigations already undertaken. A full clinical assessment including a physical examination should be performed.

17.3. The airway should be assessed and, if necessary, secured and protected. Intubated patients should normally be sedated, have muscle relaxants administered and be mechanically ventilated. Inspired oxygen should be guided by oxygen saturation (SaO₂) and ventilation by end tidal carbon dioxide (EtCO₂). Following stabilisation on the transport ventilator an arterial blood gas analysis should be performed prior to departure, to ensure adequate gas exchange. Inspired gases should be humidified using a disposable heat and moisture exchanging (HME) filter.

- 17.4. If a pneumothorax is present or likely, a chest drain should be inserted prior to departure. Underwater seal drains may be used provided they are kept upright and below the level of the patient. Chest drains should not be clamped during transfer.
- 17.5. Secure venous access is mandatory and a minimum of two intravenous cannula (central or peripheral) are recommended. A suitably secured indwelling arterial cannula is ideal for blood pressure monitoring.
- 17.6. Hypovolaemic patients tolerate moving poorly. Continuing sources of blood loss should be identified and controlled. In the absence of contraindications (e.g. penetrating trauma, ruptured aortic aneurysm or active bleeding), efforts should be made to restore the circulating volume to near normal prior to transport. This may be guided by central venous pressure and / or cardiac output measurement. If vasopressors or other vasoactive agents are required to optimise haemodynamic status, patients should be stabilised on these before leaving the referring unit.
- 17.7. A nasogastric / orogastric tube and urinary catheter should be passed and free drainage allowed into collection bags.
- 17.8. Before departure named medical and nursing personnel at the receiving unit should be contacted to update them on the patient's condition and to provide an estimated time of arrival. The means of return to the base hospital for the medical and nursing staff (and equipment) accompanying the patient should be established.
- 17.9. **Recommendations**

26. Patients should be appropriately resuscitated and stabilised prior to transfer to reduce the physiological disturbance associated with movement and reduce the risk of deterioration during the transfer.

18. Use of check lists

- 18.1. Brunsveld-Reinders et al. identified five transfer checklists that had been published to aid transfer.²⁸ The majority of check list items were focused on the pre-transfer phase, whilst documented incidents were mostly related to patient physiology and equipment malfunction during the transfer. Only one published checklist specifically covered all three phases of the transfer process (pre- during- and post- transfer).
- 18.2. Ash et al, carried out a prospective single-centre study looking at outcomes pre and post introduction of a checklist. Physiological derangement during transfer was significantly reduced (73.2% vs 39.6%, $p < 0.001$) as were equipment related adverse events (47.1% vs 15.7%, $p < 0.05$) following checklist introduction.²⁹ Choi et al. similarly demonstrated a reduction in adverse events (36% vs 22.1%) and reduction in serious adverse events (9.1% vs 5.2%) following introduction of a check list.³⁰
- 18.3. Berube et al. evaluated 180 patients before and 187 patients after the introduction of a checklist, and found a 20% absolute reduction in transport incidents, with statistical significance in three areas: requirement for emergency medication, failure of monitor batteries, and difficulties with mobilisation of the patient from bed to transfer platform.³¹

18.4. Recommendations

27. Check lists should be used to help to ensure that all necessary preparations have been completed, prior to each stage of the transfer. [Appendix 8]

19. Monitoring during transport

- 19.1. The standard of monitoring during transport should be at least as good as that at the referring hospital or base unit. The minimum standards of monitoring required are:-
- Continuous observation
 - Cardiac rhythm (ECG) monitoring
 - Non-invasive blood pressure
 - Oxygen saturation (SaO₂)
 - End tidal carbon dioxide (ETCO₂) in intubated / ventilated patients
 - Temperature
- 19.2. Intermittent non-invasive blood pressure measurement is sensitive to motion artefact and is unreliable in a moving vehicle. It is also a significant drain on the battery supply of monitors. Continuous, invasive blood pressure measurement, through an indwelling arterial cannula should normally be used.
- 19.3. Central venous catheterisation is not essential but may be of value in optimising filling status prior to transfer or may be required for the administration of inotropes and vasopressors.
- 19.4. Although the use of pulmonary artery catheters has declined in recent years, if in use the pulmonary artery pressure trace should be continuously displayed on the transport monitor. If this is not possible, the catheter should not be left in the pulmonary artery during transport but should be withdrawn to the right atrium or superior vena cava for central venous pressure (CVP) monitoring.
- 19.5. Inspired oxygen concentration, flow rate and oxygen supply should be monitored in all patients receiving supplemental oxygen. In those receiving additional ventilatory support (CPAP, non-invasive ventilation, invasive ventilation) ventilator settings and airway pressures should also be monitored.
- 19.6. Capnography / end tidal CO₂ monitoring is mandatory in all intubated ventilated patients. Systems for monitoring end tidal CO₂ during non-invasive ventilation are becoming available and may be of value in monitoring airway patency and adequacy of ventilation.

19.7. Recommendations

28. Minimum standards of monitoring must be applied in every case. Monitoring should be continuous throughout the transfer. All monitors, including ventilator displays and syringe drivers should be visible to accompanying staff.

29. A documented record of observations and events must be maintained.

20. Safety during transport

- 20.1. Department of Transport statistics reveal that between 2008 and 2016, 2979 people were injured in road traffic collisions involving ambulances.³² The prime concern during transport must be to ensure the safety of all those involved in the transfer, together with that of other road users and pedestrians.
- 20.2. Patients should be secured to the transport trolley by means of an appropriate restraint (e.g. 5-point harness / straps). This may be distressing for conscious patients and reassurance, sedation, analgesia and anti-emetics should be provided as required to reduce anxiety and distress. Pressure areas (including neurovascular bundles) should be appropriately protected. Warming / insulating blankets should be used to keep the patient warm unless otherwise contraindicated. Indwelling lines and tubes should be secure, visible and accessible.
- 20.3. All equipment (including transfer bags) must be securely stowed, and either fastened to the transport trolley or securely stored in appropriate lockers in the ambulance. When this is not possible, equipment should be placed on the floor against the bulkhead wall. Under no circumstances should equipment (e.g. syringe pump) be left on top of the patient trolley. This may become a dangerous projectile in the event of a sudden deceleration. Gas cylinders must be held in secure housings at all times.
- 20.4. Legislation requires that staff should remain seated at all times and wear the seat belts provided. The only exception being if medical attention or treatment is required that cannot be delayed. Adequately resuscitated and stabilised patients should not normally require any significant changes to their treatment during transport. If, however, unforeseen clinical emergencies arise and the patient requires urgent intervention, this should not be attempted in a moving ambulance. The crew should be advised and the vehicle stopped appropriately in a safe place before administering treatment.
- 20.5. A major issue in respect of safety is speed of travel. Legislation permits a vehicle used for ambulance purposes to exceed the speed limits, provided that the observance of speed limits would '*hinder the use to which the vehicle is being put on that occasion*'. Similarly ambulances may vary the requirements of certain traffic signals including traffic lights and pelican crossings provided that '*the vehicle does not proceed at any time in a manner likely to cause danger to pedestrians or other vehicles*'.
- 20.6. These are not blanket exemptions and each case must be judged on its merit. For the majority of cases, high speed travel is not necessary. Blue lights and sirens can be used to aid the progress of the ambulance through areas of high traffic density, e.g. junctions, without requiring the ambulance to be driven at high speed. This approach delivers a smooth journey with the minimum of delay. Where a high speed journey is undertaken, staff could be required to justify the decision in the event of an accident or adverse event.

20.6. Recommendations

30. Patients should be securely strapped to the transfer trolley by means of a 5-point harness (or similar). Reassurance, sedation, analgesia and anti-emetics should be provided as required to reduce patient discomfort and distress.
31. All portable equipment must be securely stowed to reduce the risk of injury in the event of an accident.

32. Staff should remain seated at all times and wear the seat belts provided. If it is necessary to attend to the patient during transfer, the ambulance crew should be informed and the vehicle stopped in a safe place.
33. High speed journeys must be avoided except where clinically necessary. Blue lights and sirens may be used to aid passage through traffic to deliver a smooth journey.

21. Aeromedical considerations

- 21.1. Whether using helicopters or fixed wing aircraft, the transport of patients by air presents clinicians with many problems unique to this mode of travel. Staff involved in aeromedical transport must have both a high level of expertise, specialist knowledge and practical training. The information below is therefore intended only to highlight issues which may be relevant for those preparing a patient for air transfer.
- 21.2. A fall in barometric pressure results in a reduction in alveolar partial pressure of oxygen and may lead to hypoxaemia. Increased inspired oxygen concentration is mandatory for all aeromedical transfers.
- 21.3. A fall in barometric pressure also leads to an increase in the volume of gas filled cavities within the patient. Endotracheal tube cuff pressure should be monitored. Pneumothoraces must be drained. Nasogastric tubes should be inserted and placed on free drainage. Pneumo-peritoneum and intracranial air are relative contraindications to air transport. Tissues may also swell, and plaster casts should be “split”.
- 21.4. Increased altitude is also associated with a fall in temperature and additional measures may be required to keep the patient warm. Noise and vibration may cause nausea, pain and motor dysfunction. Anti-emetic pre-medication should be available for patients and ear protection provided.
- 21.5. **Recommendations**

34. Only staff with appropriate training and competencies should undertake aeromedical transfers. Minimum requirements include safety training, evacuation procedures for the aircraft, and basic on board communication skills (particularly for helicopters). More advanced training in aeromedical transfer is however desirable.

22. Documentation and handover

- 22.1. The poor quality of documentation and handover between providers is consistently identified as a factor in adverse events with multiple studies suggesting that improved communication is a key to reducing errors.^{33,34} Ong et al. reviewed 24 studies relating to handover practices during inter-hospital transfer.³⁵ Although there was a lack of evidence on best handover practices, the review found consistent evidence of the need for improved communication and information transfer.
- 22.2. Clear records should be kept at all stages. These should include details of the patient's condition, reason for transfer, names of referring and accepting consultants, clinical status prior to transfer and details of vital signs, clinical events and therapy given before, during and after transport.

- 22.3. On arrival at the receiving hospital there should be a formal handover between the transport team and the receiving medical and nursing staff who will then assume responsibility for the care of the patient and their relatives.
- 22.4. Handover should include a verbal and written account of the patient's history, vital signs, therapy, significant clinical events, X-rays, scans and other investigations. Details of advanced directives, treatment limitation decisions resuscitation status, and information given to the patient and relatives should also be handed over.
- 22.5. **Recommendations**

35. Critical Care Networks should develop standardised documentation for both inter-hospital and intra-hospital transport. This should include a core data set for audit purposes. [Appendix 6]

23. Insurance and indemnity

- 23.1. For NHS staff, carrying out patient transfers on behalf of their employing organisation and working within their scope of practice, normal NHS indemnity arrangements will apply. Staff carrying out transfers under any other circumstances, should ensure that they have appropriate employer and / or personal indemnity cover in place.
- 23.2. Whilst safety is of paramount importance during transfer, there is always the possibility of an ambulance being involved in an accident. The Intensive Care Society and the Association of Anaesthetists of Great Britain and Northern Ireland have negotiated insurance for all their members involved in the transport of critically ill patients. Details are available from the Societies' offices.

24. Research recommendations

- 24.1. In addition to the establishment of a national audit data base for critical care transfers (above) there should be future research into the impact of transfer on patients and their relatives. There should be a particular focus on understanding patient and relative experiences, to enable future improvements in practice aimed at minimising distress potentially caused by transfers.

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Appendix 1. ICNARC transfer data to / from critical care units in England, Wales and Northern Ireland 2015-17

Of 601,478 admissions to 266 critical care units in England, Wales and Northern Ireland participating in the Case Mix Programme between 1 April 2014 and 31 March 2017, 28,418 (4.7%) admissions were transferred from another hospital.

Table 1
Number and percentage of admissions and transfers per financial year

Year (Apr-Mar)	2014/15	2015/16	2016/17
Total ICU Admission	187,251	202,085	212,178
Total transfers from another acute hospital,(%)	9,058 (4.8)	9,585 (4.7)	9,775 (4.6)

Table 2
Number of transfers by year and destination for source and reasons for transfer

Year (Apr-Mar):	2014/15			2015/16			2016/17		
Destination ^a :	General critical care unit	Specialist critical care unit	HDU	General critical care unit	Specialist critical care unit	HDU	General critical care unit	Specialist critical care unit	HDU
Source									
ED ^b	1,483	1,039	20	1,446	1,244	29	1,372	1,253	22
General critical care unit	2,609	467	37	2,827	558	42	2,896	611	56
Specialist critical care unit	970	62	8	966	61	4	1,006	71	9
Other	1,827	474	62	1,811	514	83	1,846	551	82
Reason									
Planned transfer	2,663	1,201	61	2,883	1,427	80	2,980	1,415	77
Unplanned transfer	3,068	829	54	2,973	930	66	2,919	1,046	59
Repatriation	1,158	12	12	1,194	20	12	1,221	25	33
Repatriation from abroad	175	13	2	198	21	2	178	22	2

a Note that while CMP coverage for general critical care units is close to 100%, coverage for specialist units and HDUs is lower and therefore the numbers for these unit type should not be considered complete

b Transfers from an ED in another acute hospital cannot be identified if admitted via another location in the receiving hospital, e.g. theatre or imaging

Table 3
Number of transfers by destination for day / time of week

Year (Apr-Mar):	2014/15			2015/16			2016/17		
Destination ^a :	General critical care unit	Specialist critical care unit	HDU	General critical care unit	Specialist critical care unit	HDU	General critical care unit	Specialist critical care unit	HDU
Day/time of admission									
Mon 08:00-17:59	390	120	9	427	127	8	417	142	5
Mon 18:00-Tue 07:59	556	210	9	543	193	8	507	236	19
Tue 08:00-17:59	475	126	7	471	150	17	478	149	10
Tue 18:00-Wed 07:59	565	170	8	575	217	14	547	212	9
Wed 08:00-17:59	465	103	10	512	120	12	485	137	14
Wed 18:00-Thu 07:59	557	185	14	573	233	6	582	224	10
Thu 08:00-17:59	493	92	5	523	129	10	520	130	17
Thu 18:00-Fri 07:59	611	181	12	567	188	20	580	239	9
Fri 08:00-17:59	517	115	4	490	125	9	541	160	9
Fri 18:00-Sat 07:59	567	169	10	626	212	15	651	236	20
Sat 08:00-17:59	386	100	10	379	130	9	400	111	13
Sat 18:00-Sun 07:59	473	158	8	471	199	14	499	193	12
Sun 08:00-17:59	382	139	12	399	150	7	432	111	13
Sun 18:00-Mon 07:59	452	174	9	494	204	9	481	206	9

These data derive from the Case Mix Programme Database. The Case Mix Programme is the national clinical audit of patient outcomes from adult critical care co-ordinated by the Intensive Care National Audit & Research Centre (ICNARC). For more information on the representativeness and quality of these data, please contact ICNARC. Data provided 11 May 2018

Appendix 2. SCISAG transfer data to / from critical care units in Scotland 2014-17

Of 105,457 admissions to critical care units in Scotland between 1 April 2014 and 31 March 2017, 3,745 (3.6%) admissions were transferred from another hospital. Of the patient transferred, the highest level of care provided was level 2 in 1214 (32.4%) of patients, and level 3 in 2531 (67.6%).

Table 1
Number of admissions to critical care and transfers per financial year

Year (Apr- Mar)	2014/15	2015/6	2016/7
Total ICU admission	33,641	35,137	36,679
Transfers from another acute hospital (%)	1,217 (3.6)	1,282 (3.7)	1,246 (3.8)

Table 2
Number of transfers by level of care and day / time of week Apr 2014 - March 2017

Day / Time of Admission		Level 2 care	Level 3 care	Total level 2 & level 3	Total transfers per day of the week	% of total transfer per day of week
Monday	08.00 - 19.59	98	187	285		
Monday	22.00 - 07.59	50	124	174	459	12.7
Tuesday	08.00 - 19.59	97	201	298		
Tuesday	22.00 - 07.59	59	140	199	497	13.8
Wednesday	08.00 - 19.59	99	238	337		
Wednesday	22.00 - 07.59	78	143	221	558	15.5
Thursday	08.00 - 19.59	103	239	342		
Thursday	22.00 - 07.59	80	136	216	558	15.5
Friday	08.00 - 19.59	123	212	335		
Friday	22.00 - 07.59	70	138	208	543	15.0
Saturday	08.00 - 19.59	108	229	337		
Saturday	22.00 - 07.59	62	152	214	551	15.3
Sunday	08.00 - 19.59	80	172	252		
Sunday	22.00 - 07.59	54	138	192	444	12.3

Data kindly provided by the Scottish Intensive Care Society Audit Group (SICSAG) The SICSAG data base includes data on all admission to adult critical care units in Scotland. Data provided on 4th September 2018.

Appendix 3. Transfer audit data from 13/20 Operational Delivery Networks (E,W &NI) April 2014 - March 2017

Network	1	2	3	4	5	6	7	8	9	10	11	12	13
Total number of critical care transfers	1744	1293	1377	1171	1630	373	599	423	1459	1736	177	1424	1075
Clinical	1192	920	1225	436	1141	265	404	NK	967	1274	158	747	801
Non Clinical	324	197	152	613	227	25	29	36	307	139	16	202	111
Repatriations	228	116	222	115	204	16	71	38	121	275	3	103	127
unknown	0	60	NK	7	58	67	95	NK	64	48	0	372	36
% of transfers undertaken by transfer trained staff?	75%	71%	90%	100%	NK	NK	90%	NK	NK	NK	NK	NK	NK
Number of incidents occurring during transfers?	121	159	8	17	NK	NK	30	NK	NK	19	NK	40	NK

National Summary 2014-17	
Total number transfers	14481
Total number clinical	9530 (65.81%)
Total number Non clinical	2387 (16.48%)
Total repatriations	1659 (11.46%)
Unknown	807 (5.57%)
Total transfers in ODNs providing transfer incident data	9350
Total number of transfer incidents recorded	394 (4.2%)*

Note:

7/13 Networks provided audit data covering the entire 3 year period.

NK= data unknown / not provided / incomplete / error

The variation in number of incidents recorded by ODNs is likely to reflect differences in data capture rather than a true clinical difference.

*The overall reported incident rate of 4.2% is likely to be an underestimate of the true incident rate.

Appendix 4. Systematic review search strategy and results

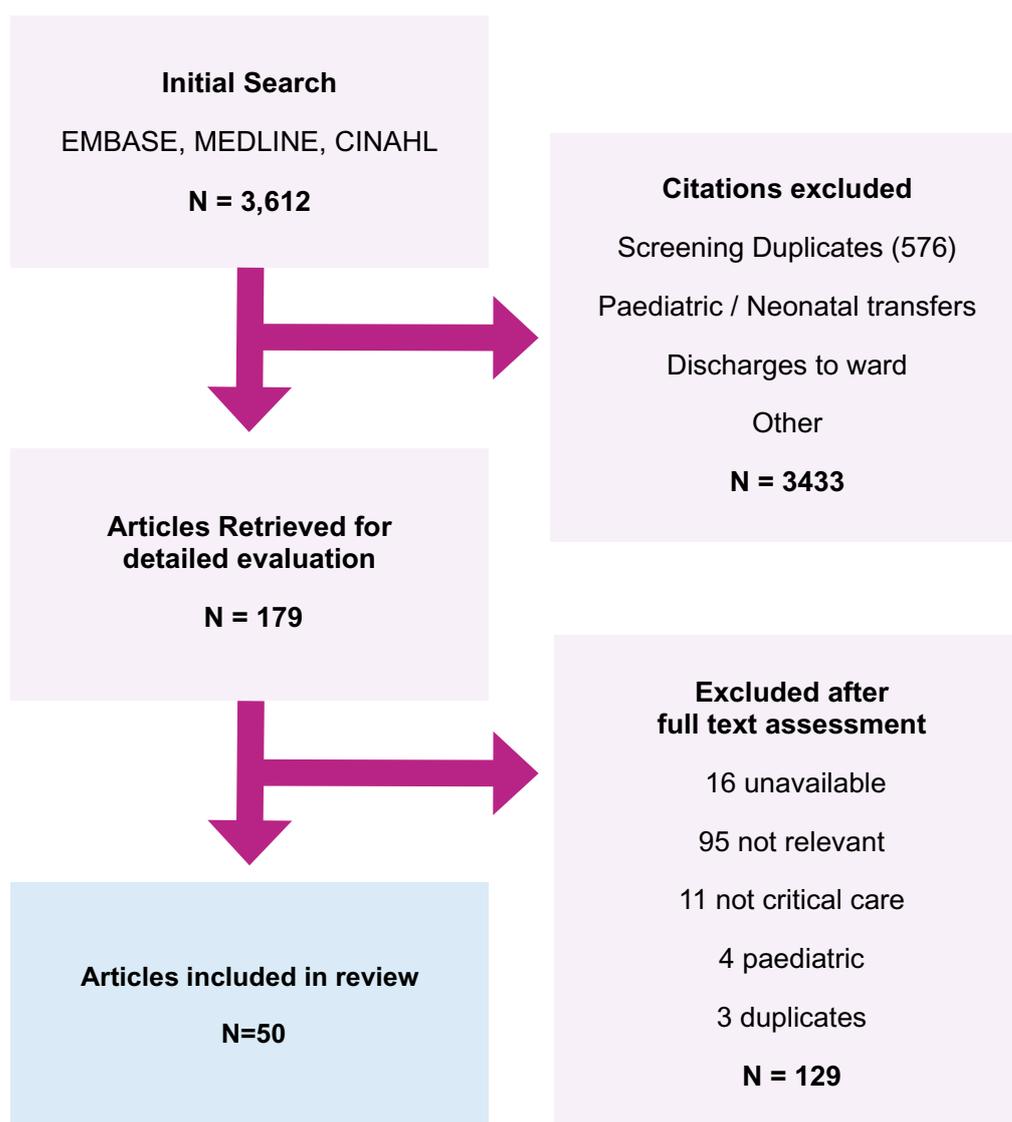
Three electronic databases (MEDLINE, EMBASE CINHAL) were systematically searched using the MESH terms 'Patient transfer', Patient transport, 'Transportation of Patients', in combination with 'Intensive care', 'Critical care', 'Critical illness', and 'Critically ill patient'. The same terms were also used as free text search items.

Eligibility criteria were defined prior to the search. Only English language articles published since 2009 were included. Research articles, local and national published audits and policy documents were included. Papers relating to neonatal and paediatric transfer were excluded.

Articles were initially identified and screened on the basis of the title and abstract and then full text articles obtained for review.

Results

179 full text articles were identified for further review. 16 were excluded because the full text article could not be obtained, 3 papers were found to be duplicates. A further 110 did not meet the inclusion criteria (did not relate specially to the transfer process). 50 articles were reviewed including 2 guidelines documents published by other groups and 48 articles relating to the process of transfer of critically ill adults.



Appendix 5. Supplementary equipment for use during transfer

Advanced Airway Equipment

1. 1x ET Tube 6
2. 1 x ET Tube 7
3. 1 x ET Tube 8
- 4.1 x ET Tube 9
5. 2 x laryngoscope Handles , Bulbs Batteries
6. 1 x Laryngoscope Blades 3
7. 1 x Laryngoscope Blades 4
8. 2 x Endotracheal ties
9. 1 x Magill Forceps
10. 1 x Tape for securing ET
11. 3 x Lubricant gels
12. 1 x Stylet
13. 1 x Gum Elastic Bougie
14. 1 x Tracheal dilator
15. 1 x Scalpel size 22
16. 1 x 10ml syringe
17. 1 x Torch
18. 2 x face masks
19. 1 x ETCO2 indicator

Self-ventilating Equipment

1. 1 x Gudel airways size 2
2. 1 x Gudel airways size 3
3. 1 x Gudel airways size 4
4. 1 x Nasopharyngeal airways 6
5. 1 x Nasopharyngeal airways 7
6. 1 x Oxygen Mask-non rebreathe size 4
7. 1 x Oxygen Mask-non rebreathe size 5
8. 2 x Oxygen tubing

Breathing Equipment

1. 1 x I-gel size 3
2. 1 x I-gel size 4
3. 1 x I-gel size 5
4. 1 x Airway HME Filter
5. 1 x Catheter Mount
6. 1 x Waters circuit
7. 1 x Sterile scissors
8. 1 x Anaesthetic mask size 4 Green
9. 1 x Anaesthetic mask size 5 Orange
10. 1x Stethoscope
11. 1 x Wave form capnograph

Suction Equipment

1. 2 x Yankauer suckes
2. 2 x Suction catheters (10F)
3. 2 x Suction catheters (12F)
4. 2 x Suction catheters (14F)
5. 2 x Suction tubing

External Equipment

1. 1 x self-inflating bag and mask with oxygen reservoir and tubing (BVM)

Inside pouch on side of bag

1. 2 x Clinical waste bags
2. 1 x Sharps box (to be sourced locally)
3. 1 x Hand-held portable suction
4. 3 x IV Fluids (crystalloid) 500ml
5. 1 x Pressure bag

Circulation Equipment

1. 2 x IV cannula size 14G
2. 2 x IV cannula size 16G
3. 2 x IV cannula size 18G
4. 2 x IV cannula size 20G
5. 2 x IV cannula size 22G
6. 10 x Pairs of non sterile gloves
7. 5 x Luer lock syringes 20ml
8. 4 x Luer lock syringes 50ml
9. 3 x Chloraprep skin wipes
10. 10 x Alcohol wipes
11. 2 x Blood./Colloid fluid giving sets (Gravity)
12. 5 x Infusion device giving sets
13. 5 x infusion device extension sets
14. 4 x 3-way taps (or equivalent)
15. 10 x Obturators (Red and/or white bungs)
16. 1 x Micropore tape
17. 4 x Gauze
18. 5 x Cannula dressings
19. 12 x ECG Electrodes
20. 1 x Trauma shear scissors
21. 10 x Labels
22. 10 x Sodium Chloride ampoules (flush)

Interventional circulation Equipment

1. 1 x EZ-IO Intraosseous Device
2. 3 x EZ-IO Needles
3. 5 x Needles Green
4. 5 x Needles Blue
5. 5 x Needles White
6. 5 x Drawing up needles
7. 2 x Tourniquets

Van Zwanenberg G.; Dransfield M.; Juneja R. A consensus to determine the ideal critical care transfer bag. Journal of the Intensive Care Society; Nov 2016; vol. 17 (no. 4); p. 332-340

Appendix 6. Proposed minimum data set for critical care transfer audit

Case Identifier(s)

Transfer details

From: Hospital
 From: Unit / Department / Area
 To: Hospital
 To: Unit / Department / Area

Reason for transfer

Specialist care
 Capacity (non-clinical transfer)
 Repatriation

Primary Diagnosis

< Text >

IFT Level / ARP category response requested

1 / 2 / 3 / 4

Transfer timings (Date / Time)

Referral accepted
 Ambulance Requested
 Ambulance Arrived
 Departure from Base
 Arrival at destination
 Team departure

Risk Assessment Completed Y/N

Level of risk

Low / Medium / High

Transferring personnel (Role / Grade)

- 1.
- 2.
- 3.

Level of care during transfer

Level 1 Level 2 Level 3

Level of respiratory support during transfer

None / CPAP / Non-invasive ventilation / Invasive ventilation

Critical Incident during transfer

Yes / No

Datix Number / identifier

Specify <text>

Appendix 7. Pre transfer risk assessment form

Example from West Yorkshire Critical Care Operational Delivery Network.

Transfer Risk Assessment	
<p>NB Risk assessment is to some extent subjective and other factors not listed may influence the perceived level of risk. The risk tool is provided for guidance only. It is the referring consultant / senior clinician's responsibility to ensure that the transfer is appropriate and that the transferring team have the appropriate competencies and skills required.</p>	
Low Risk	
<p>NEWS2 1-4</p> <p>Maintaining Airway</p> <p>FiO2 < 0.4 / Base deficit 0 to -4 mmol/l</p> <p>Not Requiring inotrope or vasopressor support</p> <p>GCS 14</p> <p>Normothermic</p>	<p>Nurse or clinical practitioner with appropriate competencies</p>
Medium Risk	
<p>NEWS2 5-6</p> <p>Maintaining Airway</p> <p>FiO2 < 0.6 / Base deficit -4 to -8 mmol/l</p> <p>Requiring low dose inotrope or vasopressor support < 0.2mg/kg/ min</p> <p>GCS 9-13 (consider elective intubation)</p> <p>Mild hypo/ hyperthermia</p>	<p>Nurse or clinical practitioner with appropriate competencies plus</p> <p>Doctor or Advanced practitioner with appropriate competencies.</p> <p>If potential to deteriorate then Doctor / Advanced Practitioner should have critical care and advanced airway competencies.</p>
High Risk	
<p>NEWS2 7 or more</p> <p>Intubated / ventilated</p> <p>FiO2 > 0.6 / Base deficit worse than -8 mmol/l</p> <p>CVS unstable and / or requiring inotrope or vasopressor support > 0.2mg/kg/ min</p> <p>Moderate hypo/ hypothermia</p> <p>Major Trauma e.g. head injury / chest, abdominal or pelvic injury</p>	<p>Nurse or clinic practitioner with appropriate competencies plus</p> <p>Doctor / Advanced Practitioner with critical care and advanced airway competencies.</p>

NEWS-2 Score

Level of Risk: Low Medium High

Name

Designation

Signature

Date

Time

Appendix 8. Pre transfer check list examples

1: Is patient stable for transport?

Airway

- Airway safe or secured by intubation
- Tracheal tube position confirmed on chest X-ray

Ventilation

- Adequate spontaneous respiration or ventilation established on transport ventilator
- Adequate gas exchange confirmed by arterial blood gas
- Sedated and paralysed as appropriate

Circulation

- Heart rate, BP optimised
- Tissue & organ perfusion adequate
- Any obvious blood loss controlled
- Circulating blood volume restored.
- Haemoglobin adequate
- Minimum of two routes of venous access
- Arterial line and central venous access if appropriate

Neurology

- Seizures controlled, metabolic causes excluded
- Raised intracranial pressure appropriately managed

Trauma

- Cervical spine protected
- Pneumothoraces drained
- Intra-thoracic & intra-abdominal bleeding controlled
- Intra-abdominal injuries adequately investigated and appropriately managed
- Long bone / pelvic fractures stabilised

Metabolic

- Blood glucose > 4 mmol/l
- Potassium < 6 mmol/l
- Ionised Calcium > 1 mmol/l
- Acid – base balance acceptable
- Temperature maintained

Monitoring

- ECG
- Blood pressure
- Oxygen saturation
- End tidal carbon dioxide
- Temperature

Appendix 8. Pre transfer check list examples

2. Are you ready for departure?

Patient

- Stable on transport trolley
- Appropriately monitored
- All infusions running and lines adequately secured and labelled
- Adequately sedated and paralysed
- Adequately secured to trolley
- Adequately wrapped to prevent heat loss

Staff

- Transfer Risk assessment completed
- Staff adequately trained and experienced
- Received appropriate handover
- Adequately clothed and insured

Equipment

- Appropriately equipped ambulance
- Appropriate equipment and drugs
- Pre-drawn up medication syringes appropriately labelled and capped
- Batteries checked (spare batteries available)
- Sufficient oxygen supplies for anticipated journey
- Portable phone charged and available
- Money for emergencies

Organisation

- Case notes, X-rays, results, blood collected
- Transfer documentation prepared
- Location of bed and receiving doctor known
- Receiving unit advised of departure time and estimated time of arrival
- Telephone numbers of referring and receiving units available
- Relatives informed and information provided
- Return travel arrangements in place
- Ambulance crew briefed

Departure

- Patient trolley secured
- Electrical equipment plugged into ambulance power supply where available
- Ventilator transferred to ambulance oxygen supply
- All equipment safely mounted or stowed
- Staff seated and wearing seat belts

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