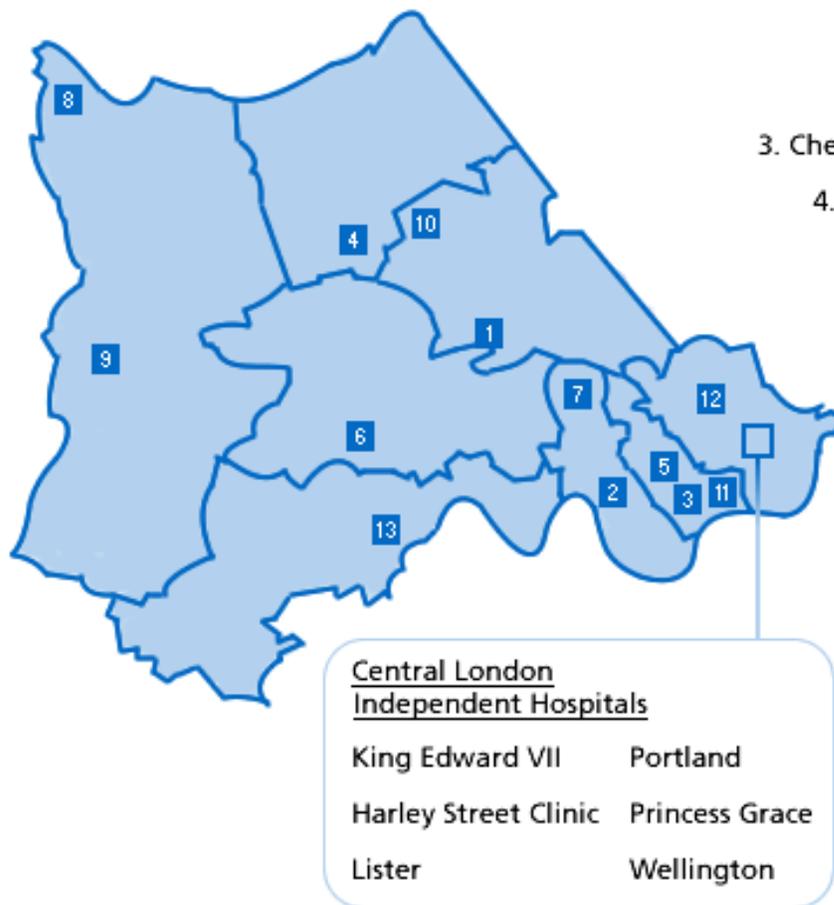


# Critical Care Transfer Training Handbook



1. Central Middlesex Hospital
2. Charing Cross Hospital
3. Chelsea and Westminster Hospital
4. Clementine Churchill Hospital
5. Cromwell Hospital
6. Ealing Hospital
7. Hammersmith Hospital
8. Harefield hospital
9. Hillingdon Hospital
10. Northwick Park Hospital
11. Royal Brompton Hospital
12. St Mary's Hospital
13. West Middlesex Hospital

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## Section 1

## Introduction

- 1 Training in the safe transfer of critically ill patients is a rarity. There are those who feel that it is not necessary, yet there is plenty of data to show that transfers are poorly performed. Many of you will have had experiences where transfers have not gone well. Of interest is that where transfer training is valued and addressed (such as in the military; retrieval teams; aeromedical teams) transfers take place with few incidents and in a far more efficient fashion than that often witnessed in the world of adult intensive care.
- 2 The North West London Critical Care Network (NWLCCN) transfer course evolved from a course run in East Anglia, which itself evolved from a course established in Newcastle by Dr Anna Bachelor. Our course has evolved quite significantly from the original course; not least because it incorporates important local issues and has evolved along with changes in our region and feedback from course delegates and faculty alike.
- 3 The [aim of this hand book](#) is not to reiterate current published guidelines regarding the transfer of critically ill patients [4], but to highlight the physiological, logistical and legal problems that can occur when undertaking various modes of transfer. Such aspects are seldom covered in the small number of publications pertinent to this topic, and yet a basic knowledge of these facts together with meticulous attention to patient preparation prior to transfer can significantly reduce the risks to patients from such an intervention.
- 4 **In order to get the most out of your day on the transfer course, you should read this handbook prior to your attendance.** This will give you the chance to highlight any questions, issues or comments prior to the course, with the opportunity to address these on the day.

## Section 2

### Background – the national picture

- 5 The process of transferring critically ill patients within and between hospitals is increasingly common. Intra-hospital transfers are most commonly performed to enable diagnostic or therapeutic investigations and interventions, while inter-hospital (secondary) transfers may be performed for a number of clinical or non-clinical (bed capacity) reasons. The last published national data [1] estimated that in excess of 11 000 patients were transferred between intensive care units (ICUs) in Great Britain. This figure had increased by about 10% on the previously published data from eight years earlier [2].
  
- 6 It is likely that this national figure has increased significantly since this data was published. The number of intra-hospital transfers (e.g. to the theatres, CT scan etc...) will be an order of magnitude greater than that of inter-hospital transfers; however poor data collection for intra-hospitals makes it impossible to estimate the number that take place each year.

### Notes

## Section 3

### Background – the local picture

- 7 During the period 2016-2017, data from the North-West London Critical Care Network shows that 703 patients underwent secondary transfer including 342 Level 3 and 169 Level 2 patients. This data was compiled from transfer documentation completed with cross-reference to any Emergency Bed Bureau (EBS) data available, but may still be an underestimate of the true number. EBS data represents less than 5% of the data captured. The Network transfer data is consistent and has improved patient safety through increased training and education. There has been fluctuation in the number of capacity transfers as Services across the sector move.
- 8 The significance of these figures lay in the high number of critical incidents that have been reported during such transfers [3] and the frequency with which transfers were undertaken for non-clinical reasons (between 50-66% of all transfers). It is worth remembering that the patient being transferred is usually one of the sickest patients in the hospital; often has unknown pathology; and has a pattern and severity of illness that remains to be established. It is a wonder then that transfers are still undertaken by very junior staff with little insight into the potential complications that can and do occur.
- 9 In North West London initially for audited period (2007-8) 17% of all transfers resulted in a critical incident, with the majority of these being related to equipment or battery failure. This figure was relatively low compared with some published data [1,3] however it did increase slightly as auditing began in our sector; a situation which probably reflected improvement in reporting rather than better performance. It was anticipated that the number of *reported* incidents would increase as education, training and the issues surrounding transfers gained higher profile. However, the Network reduced the rate of incidences during secondary transfer and has maintained this consistently lower than 9% for 6 years. We are able to regularly refine the training to reflect any trends in incidences.

**“Whether it is a 100 yards or 100 miles, the same principles should be applied”**

- 10 There is a paucity of specific training in transferring critically ill patients despite this being a common occurrence in both the National Health Service (NHS) and Private Healthcare of the United Kingdom. Knowledge and skills are taken for granted on the assumption that these must be present for the clinician to perform their day-to-day duties. There is increasing data, however to show that this assumption is incorrect. While many clinicians performing transfers will possess the necessary skills that are required, they may never have been required to apply these skills outside of their familiar and controlled work environment and their knowledge of the physiological, equipment and logistical aspects of the transfer is frequently inadequate.
- 11 It is significant that when the transfer is the clinical focus (as with aeromedical, military and dedicated retrieval teams) ‘transport medicine’ is considered a sub-specialty in which clinicians must be educated. Such education includes a number of areas often neglected during non-specialist transfers:
- Understanding the physiological effects of transportation
  - Legal aspects of transfer
  - Timing - adequate stabilization and preparation
  - Anticipation of common problems and their solutions - particularly communication failure
  - Familiarity with equipment and environment (including the ambulance or aircraft)
  - Available modes of transport and their unique problems

- 12 While this handbook will cover the fundamentals of some of these topics, it is impossible to include the 'hands-on' aspects such as equipment and ambulance familiarization which are best achieved in the workplace or through attending a dedicated transfer training course.

**Notes**

## Section 5

### Physiological effects of transfer

- 13 The process of moving patients exposes them to certain physical forces. If these forces are mild and under conditions of normal health, they will usually result in minimal physiological sequelae. However, if the forces are of high magnitude and if the patient's ability to compensate is attenuated by critical illness then significant physiological alterations can occur. These have been discussed in detail elsewhere [5] but are summarized below.
- 14 The hazards to which we are exposed during transportation can be considered dynamic or static:

#### Dynamic Hazards:

- 15 **This section comes with a minor health warning. It is rather heavy going in places and may be a little hard for those who are not fluent in normal physiology. The main message is easy however:**

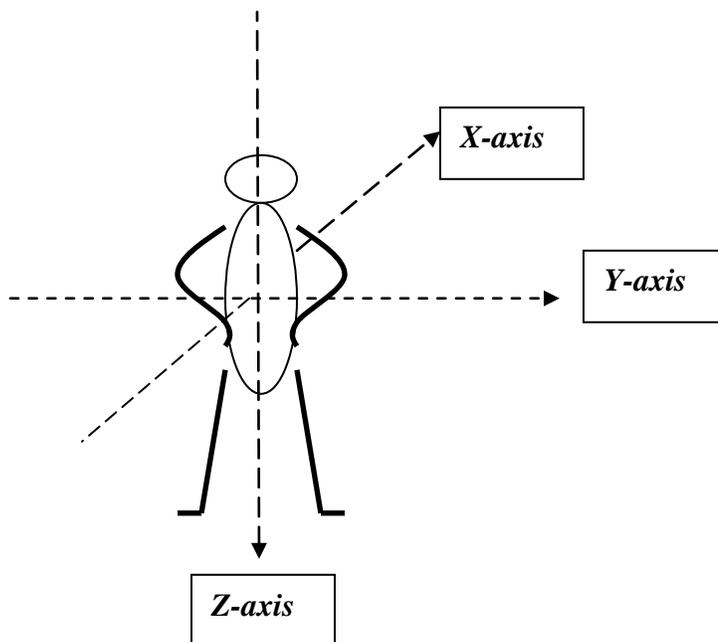
- **If you accelerate towards your head – your blood will move towards your feet (like an elevator rapidly rising)**
- **If you accelerate towards your feet – your blood (and stomach contents) will move towards your head (like an elevator falling)**
- **If you get bogged down by the different forces discussed below, simply return to this principle for some respite**

- 16 The main dynamic hazard is that of acceleration which may be positive or negative, linear or angular. Newton's third law states that 'for every action there is an equal and opposite reaction'. Thus when a body is accelerated due to the action of an external force, it will experience an equal and opposite force termed 'inertia'. This inertial force may be experienced in the x-axis (antero-posterior), y-axis (lateral), z-axis (cephalo-caudal) or in

any combination of the above [figures 1 and 2]. The physiological effects of this inertia result from the displacement of solid organs and (more importantly) the blood, and depend upon the rate, magnitude (measured in numbers of gravities or G's) and direction of acceleration (axis).

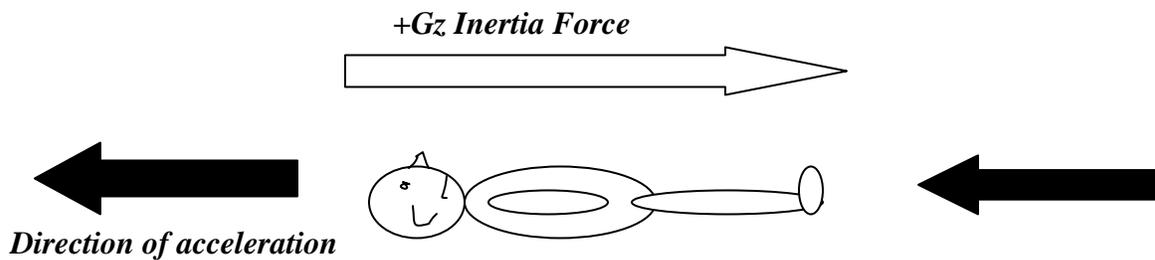
**Figure 1.**

Illustration of the axes through which acceleratory forces act relative to the human body



**Figure 2:**

Diagram illustrating linear acceleration [solid arrows] of patient with inertial force acting in the opposite direction [white arrow]:



- 17 The most significant effects are seen during acceleration in the z-axis, during which forces acting towards the feet (resulting from accelerating the body in the foot-to-head direction) are designated *positive* and those acting towards the head, *negative*. Thus a +Gz force is experienced when an inertial force of one gravity acts in the z axis towards the patient's feet [figure 2].
- 18 When the body is exposed to +Gz forces (like a rising elevator) any movable organ will be accelerated in the direction of the inertial force. The most important of these is the blood. During exposure to such forces, blood will 'pool' in the feet resulting in decreased cardiac preload, decreased cardiac output and blood pressure. In health, the baroreceptor and vasoconstrictor reflexes will limit these effects, but such reflexes are often obtunded or absent in the critically ill due to illness or drug therapy. Consequently, hypotension may be profound, particularly if preload is already reduced due to hypovolaemia or positive pressure ventilation. This can be prevented by optimizing preload prior to transfer; the use of pneumatic anti-shock suits; or by raising the patient's legs during the acceleration (thus limiting the vector acting in the z-axis). Generally speaking, 'well-filled' patients tolerate transfer better than those who are hypovolaemic.

**Remember: 'Full patients travel better'**

- 19 The cardiovascular consequences of exposure to -Gz forces can be predicted in the same way as above (think of someone in a falling elevator). The most profound influencing factor during such forces is the movement of blood from the lower body towards the thorax and head. This results in increase in blood returning to the right heart (pre-load) and right atrial distension. Normal compensatory mechanisms would adjust for this

by increasing the strength with which the heart pumps (cardiac contractility) and heart rate, however in patients who have cardiac dysfunction or in whom compensatory mechanisms are absent, this process may result in cardiac dysrhythmias, pulmonary oedema and even cardiac arrest. Such forces are most commonly experienced during negative acceleration (deceleration) which can be of far greater magnitude than those experienced during acceleration. This is due to most vehicles having far greater braking than accelerating power.

- 20 Prevention is best achieved by limiting hard braking and having head-up tilt during transfer. On the whole the potential physiological derangements from deceleration are greater than those from acceleration due to the greater forces experienced and so head-up positioning is optimum. This has the effect of limiting the Gz forces exerted on the thorax and head during linear acceleration and deceleration.
- 21 The neurological effects of +Gz exposure have been well documented through military aviation studies [6,7], and although these effects are unlikely during patient transfers it may be impossible to assess their effects accurately in an unconscious patient. The pooling of blood in the lower body and feet results in reduced blood supply to the brain. In health, progressive +Gz exposure will lead to loss of peripheral vision (grey-out), loss of vision with consciousness maintained (black-out) and complete loss of consciousness (G-LOC). Significantly, seizures have been reported on return of blood supply to the brain after cessation of these forces. Although the symptoms of reduced supply may not be recognized in an unconscious patient, it is important to have an appreciation of the risks this may pose and also of the possibility of convulsions once this situation reverses.

- 22 These effects can be prevented through the same actions used to prevent the cardiovascular effects of +Gz forces. The exception to this is the use of a Valsalva manoeuvre (taught to military pilots to counteract grey-out, black-out or G-LOC) which reduces the loss of blood volume from the brain due to the increase in intra-thoracic pressure. This does, however, exacerbate the subsequent cardiovascular effects.
- 23 Contrary to the above situation, the neurological effects of –Gz forces have been less well studied due to the extreme discomfort experienced when healthy individuals are exposed to forces greater than -1Gz for any prolonged period of time. The effects of -1Gz are those experienced when hanging upside-down. Prolonged exposure to this or higher forces has resulted in a condition of ‘red-out’ whereby vision becomes red due to blood engorgement or the lower eyelid being forced over the pupil. Haemorrhages have been reported in both retina and brain following such forces, but the most important effect is to increase intra-cranial pressure (ICP). This can have potentially devastating effects in patients with critical brain injury and existing compromised cerebral blood flow. In such situations, an increase in ICP can result in critical reduction in blood flow resulting in cerebral ischaemia.
- 24 The main mode of prevention in this situation is again to keep the patient in the head-up position and to limit positive and negative acceleratory forces as much as possible.
- 25 The most significant effect of acceleration on the gastrointestinal system is that of gastro-oesophageal reflux during exposure to –Gz forces. This is best prevented by intubating the stomach and aspirating the contents at appropriate moments, or simply maintaining free drainage into a collection bag.

- 26 In addition to the effects described above, consideration must be given to the potential axial loading effect that Gz forces have on the vertebrae. This can be significant when transferring patients with unstable vertebral fractures and again emphasizes the point that, where possible, a smooth transfer is the safest transfer.
- 27 Finally, it is important to emphasize that the forces described above will act on any equipment or objects that are inadequately immobilized, turning them into ballistics. An extreme example of this was seen by the London Ambulance Service (personal communication) when a 90kg incubator became mobile while the ambulance carrying it was traveling at high speed. Such occurrences can prove extremely dangerous to patient and escorts alike.
- 28 **Remember – in summary:**

- **If you accelerate towards your head – your blood will move towards your feet (like an elevator rapidly rising)**
- **If you accelerate towards your feet – your blood (and stomach contents) will move towards your head (like an elevator falling)**

### **Static Hazards:**

- 29 The main static hazards to which we are exposed during transportation are:
- Noise
  - Vibration
  - Temperature
  - Atmospheric pressure

- 30 While noise can cause significant difficulties with communication during transfers, and vibration and temperature alterations can be significant and potentially damaging, it is the latter of these that will be considered in most detail here. The damaging effects of vibration can be reduced by paying meticulous attention to padding and protecting any areas of the patient in contact with hard objects. The most common temperature consideration is that of hypothermia, particularly when traveling in vehicles or aircraft that are open to the environment or lack heating facilities. In such situations, arrangements must be made to provide adequate warming for the patient and to prevent heat loss.
- 31 Atmospheric considerations are only really of relevance during air transfers, where the reduction in ambient pressure (even in pressurized aircraft) results in relative hypoxia and expansion of gas-filled cavities. The hypoxia at altitude needs to be accounted for in calculating oxygen requirements for the transfer: higher inspired oxygen fraction may be required than that used on the ground and thus oxygen consumption during the flight may be greater than would otherwise be predicted.
- 32 The important gas-filled cavities to consider are listed below:
- Ears
  - Sinuses
  - Teeth
  - Bowels
  - Pleura
  - Blood
  - Equipment
- 33 In any of the above cavities, loss of communication with the environment results in inability to equalize with the ambient pressure thus creating a pressure gradient. This can result in problems ranging from discomfort

(ears, sinuses, teeth) to life-threatening (perforated bowel, pneumothorax, gas embolism). The effect on the cavity will depend on its rigidity, contents and whether the pressure gradient develops at altitude or at ground level. For example the Eustachian tube connecting the middle ear to the pharynx is a non-rigid structure which is expanded during aircraft ascent due to the gas in the middle ear expanding. Thus communication is maintained with the external environment and gas equilibration occurs. However on descent, the pressure gradient reverses and the tube can collapse preventing communication. This causes the gas within the middle ear to contract and the tympanic membrane to be pulled inwards. It is for this reason that tympanic membrane ruptures occur most frequently during descent rather than ascent.

- 34 Any gas containing equipment or drugs will exhibit the same phenomena described above, with gas expansion during ascent and contraction during descent. This is most frequently seen with pressure bags used to assist infusion of intravenous fluids or flush lines. During ascent, care should be given to prevent rupture by reducing the pressure appropriately. Conversely during descent, the bag may require re-inflation.
- 35 Less obvious than the above, but more important is to remember that the cuff on the tracheal tube will expand during ascent and this may result in tracheal mucosal damage, or cuff rupture. The best way to prevent this is to fill the cuff with sterile water or saline. This prevents the need to decrease the cuff volume during take-off and re-inflate during landing.

## **Notes**

## Section 6

## Legal, insurance and safety considerations

- 36 It is worth stating clearly that all our actions in clinical medicine should be based on the ethical assumptions of:
- Beneficence (doing good)
  - Non-maleficence (doing no harm)
  - Justice (fair treatment for all)
  - Autonomy (respect for patient's wishes)
- 37 Critical care transfers challenge these assumptions at all of these levels. It is no surprise therefore that there are numerous legal conundrums when transferring and retrieving patients; yet there is a lack of case-law to provide appropriate solutions. The legal ramifications have been rendered even more complicated since the introduction of the Mental Capacity Act in 2007.
- 38 Generally speaking the most important aspect of the transfer process is to maintain the same professional and personal conduct that would be considered 'good clinical practice' in the normal working environment. The Consultant in charge of the ICU transfer must take ultimate responsibility for the appropriateness of the transfer with adequately trained and experienced staff. The patient remains the responsibility of these staff until formal handover has been completed at the receiving hospital, with the legal record of the transfer process being an essential piece of documentation. In the event of advice being offered by telephone, little legal guidance is available. Certainly the individual administering drugs and providing the bedside care has an obligation to question and defer advice if they feel that to act on it would be of detriment to the patient.
- 39 Telephone advice is simply *guidance* and is only as valid as the information that was received and utilized in formulating that advice; thus

there is inevitable potential for communication errors and subsequent 'finger-pointing' should harm come to the patient. This stresses the importance of stating and ensuring clear and precise instructions when giving and receiving telephone advice, with appropriate documentation and records. Several retrieval centers in the United Kingdom utilize hard-drive recordings of all telephone conversations where medical information is exchanged in order to keep adequate legal records.

- 40 In the event of an individual being required to escort a patient outside of their place of employment, personal and professional indemnity will be provided by the employing Trust provided the individual is a member of the Trust's 'Liabilities to Third Parties Scheme' (LTPS) . In essence, the transfer vehicle and route becomes an extension of that individuals work environment for the duration of the transfer and return, *provided* this is spent performing Trust duties. Individuals performing high volume retrievals and transfers may feel better 'protected' through the insurance provided to members of institutions such as the Intensive Care Society of the United Kingdom.
- 41 The safety of performing transfers has been brought into question. Accidents have occurred during the transfer process itself and during all modes of transfer. One report from the United States highlighted the deaths of sixty air ambulance team members as a result of 84 crashes over a five year period [8]. Such data emphasizes the importance of justifying such transfers; if transfers are deemed essential, they should be performed in a sedate and careful manner in order to avoid risks to those involved. High speed transfers should be the exception, not the norm. The few minutes gained rarely benefit the patient but expose the transferring team to significant potential risks; individuals requesting such transfers must be able to justify these risks.

- 42 One aspect that is essential from both a safety and insurance perspective is that all staff must wear safety belts at all times when in a moving ambulance. If at any point the patient requires attention that cannot be provided by the seated (and belted) clinician, it is imperative that they communicate with the driver prior to undoing their belt in order that the latter can adjust their driving style or stop the ambulance accordingly.

### **Patient / relative information leaflet**

- 43 Wherever possible give the relatives as much information about the transfer including times, destination, contact details and any directions that will be helpful. There is a NWLCCN patient information leaflet available [http://www.londonccn.nhs.uk/news\\_item.asp?fdID=298](http://www.londonccn.nhs.uk/news_item.asp?fdID=298) and copies of the leaflet should be available in the Critical Care areas of the hospitals in North West London.

### **Notes**

## Section 7                      **Preparation and stabilisation**

- 44      Preparation and stabilisation are everything when it comes to facilitating a safe transfer. The commonly used '4-Ps' phrase (poor preparation leads to poor performance) is never more true than in this field of medicine (you can add more Ps if you so wish)! The approach used in this training course is an 'ABC' (actually A-R) approach which will be described repetitively during the course and is reinforced in both the 'aide memoirs' and on the Network transfer form (see Appendices A and B). You may come across other mnemonics however it doesn't matter which you use as long as you are methodical and consistent.

**Common problems during transfer - "If it can go wrong it will go wrong"**

- 45      There are several phases of the transfer which can be examined. Appendix 4 of the ICS guidelines [4] suggests breaking your preparation into patient, staff, equipment, organization and departure. As a pre-departure check list this is a useful tool utilized in many regional transfer forms in the United Kingdom. Sadly these are often poorly completed and unfamiliar to the transferring team.

### **The transfer checklist**

- 46      The transfer check-list and preparation requires a team approach in advance of the transfer taking place. Poor haemodynamic preparation for predictable physiological changes will result in the deterioration of the patient in transit. Without robust equipment servicing schedules and equipment maintenance, discovery that an infusion device, running on

battery, is not at optimal capability occurs when it is disconnected from the mains supply. Prevention of anticipated problems is optimized if preparation for transfers takes place every day. Emphasis must be placed on the importance and rationale for equipment checks especially on items usually in storage. Transfer bags need to be checked and signed for daily, user checks must be carried out on all equipment daily, battery charge status and that of spares needs to be recorded.

- 47 Intra-hospital transfer needs to be given the same importance as that of inter-hospital transfer. Therefore whether going to CT scan or to another hospital, the preparation and equipment should be the same. This provides the cultural and organizational change to ensure that it becomes routine. Few secondary transfers require urgent departure and the transfer itself should only require a few observations, vigilance and monitoring of the patient. This is usually the sign of a well prepared transfer. The following provides additional information and preparation that may prevent problems:

### **Patient**

- 48 It is common to wait for the transportation vehicle to arrive before connecting the patient to the transfer equipment. However this often delays both departure and identification of any problems with the equipment. It is useful to monitor and ventilate patients on the appropriate transfer equipment (using piped oxygen and mains-electricity) for a prolonged period of time so that when the transportation crew arrives time is saved and problems have been rectified. The 'packaging' of the patient can also be done prior to the crew arriving.
- 49 Attention should be paid to which direction to slide the patient and which side the lines are orientated; the patient will be head first with their left side up against the side of the ambulance. Critical care trolleys with space for

equipment will speed up the total time of a transfer [figure 3]. Temperature loss can be reduced by insulating the patient's head and torso with gamgee or blankets. Eye protection should be considered if the lids do not close completely and ear defenders should be used for rotary air transfer. Analgesia should be considered as ambulance trolleys have no suspension and the journey may cause significant discomfort to the patient.

### Staff

- 50 Transfer training and experience is desirable. Handover should be done at the earliest opportunity and most importantly, preparation for the transfer should be done well in advance of the transfer occurring. The individual performing the transfer is responsible for appropriate preparations and failure to perform relevant checks will render them liable. An appropriate transfer motto is; *'assume nothing and trust no-one!'*

### Equipment

- 51 *Drugs:* The duration of the transfer should be estimated and used to calculate drug, oxygen and battery requirements. Where possible, the changing of infusions mid-journey should be avoided.
- 52 It is worth establishing a plan for all eventualities. For example, what should be done if the inotrope infusion pump becomes faulty? In all circumstances, drug infusions should be rationalised. If an infusion is continued, such as Insulin, it should be considered essential and monitored during the transfer. In the event of infusion pump failure, sedative and neuromuscular blocking drugs can often be given as boluses thus freeing a pump for other infusions requiring accurate administration.
- 53 *Ambulance equipment:* Oxygen and defibrillators are carried on the ambulance and the ambulance crew should be contacted if these are

desired for the transfer to and from the vehicle. Knowledge of the ambulance equipment is essential but in reality the clinicians performing the transfer should be self-sufficient.

- 54 *Transfer bag*: In NWL the Patient transfer bag [10] is used in every Hospital. Individuals should be familiar with the contents and information about the contents is also included in the Safer Transfer App (STrApp). Remember to take emergency items such as money, a mobile phone (with appropriate number) and something to eat and drink in the event of a long transfer or delay.
- 55 *Airway bag*: In the event of an airway emergency, there is no substitute for having an ‘ambu-bag’ with simple airway adjuncts, a laryngoscope and spare endotracheal tube contained in a transparent bag and secured to the head-end of the patient’s trolley. Most disposable ‘ambu-bags’ are supplied in a transparent bag with draw-string which can easily be used for the above. In the event of tracheostomy decannulation, rapid insertion of an endotracheal tube through the stoma can be life-saving and avoids the need for hasty attempts to access an appropriate replacement tracheostomy tube.
- 56 *Oxygen*: This is the most important drug that we carry during transfers. To run out is always a little embarrassing; especially when traveling long-haul at 35000 feet! Modern transfer ventilators will indicate oxygen consumption allowing ‘worse case’ calculation of necessary oxygen requirements. It is prudent to carry 150% of this requirement to allow for unforeseen situations and delays.

## Organisation

- 57 Communication failure is often the root cause of mishaps. Organizational issues rely upon sound written and verbal communications and one

individual should be responsible for coordinating the transfer. The nurse is often the most appropriate team leader, as equipment competencies and knowledge of the unit transfer procedures will be part of their ongoing professional education. This allows the other escort to concentrate on note-making, referral letters, discussion with relatives and liaising with other clinicians at receiving hospitals. **It is always important to identify the team leader and keep them appropriately informed.**

- 58 Finally, a plan for the return journey should always be made from the outset in the event of the transferring ambulance crew being diverted elsewhere.

### **Departure**

- 59 At the time of departure all check-lists should be complete. One of the most frequent communication errors is failure to inform the receiving team that the referring team is about to leave. While making this call it is worth checking the exact destination and how the ward is accessed via the hospital (e.g. via the Emergency department or main entrance). The transfer form and check-list provide documentation of adequate preparation, and their completion after handover to the receiving hospital team completes the legal record of the transfer.

### **Notes**

## Section 8

## Subspecialty transfers

### Neurosurgical

- 60 Neurosurgical emergencies are the most common clinical indication for patient transfer in North West London. Patients with neurotrauma or other acute brain injury often receive their initial treatment at a local hospital, without a neurosciences unit. While no precise time targets have been set between injury and surgery, a maximum of 4 hours is aimed at because it is clear that the sooner an expanding haematoma is evacuated, the better for the patient.
- 61 Transfer of patients with brain injury can be potentially hazardous if poorly performed and poor transfers can result in significantly greater secondary brain injury with worse patient outcome as a result [9]. If the basic principles of a 'good' transfer are applied, many of these risks can be prevented. The main causes of secondary brain damage that should be considered are raised ICP, hypotension, hypoxia, hypercarbia, cardiovascular instability and hyperpyrexia. There are however a few additional principles that need to be considered when transferring these patients:

### Preparation

- 62 As with all transfers, thorough resuscitation and stabilisation of the patient before transfer is the key to avoiding complications during the journey. There is a slight paradox with neurosurgical emergencies however, as we know that surgery within 4 hours of the injury can produce significantly better outcomes than if this is delayed. Thus there is a balance between

adequate preparation and expeditious transfer for surgery. The fundamental requirements before transfer are to ensure:

- Satisfactory oxygen delivery
- A mean blood pressure greater than 90 mmHg
- A PaO<sub>2</sub> greater than 13kPa
- A PaCO<sub>2</sub> between 4.5 – 5.0 kPa

63 **Monitoring should include**

- pupillary size and reaction to light
- ECG
- pulse oximetry
- invasive blood pressure
- urine output by urinary catheter
- capnography
- central venous pressure monitoring where indicated
- temperature (preferably core and peripheral)

64 There exists a balance, however, between the ideal list above and the real world environment where difficulties gaining invasive access may significantly delay life-threatening surgery. Sometime compromise is needed and it always worth discussing these with the surgeons / anaesthetists at the receiving hospital if you are in doubt.

65 Appropriate respiratory and airway support must be established prior to transfer as tracheal intubation during transfer is both difficult and dangerous.

### Intubation

66 All patients with a GCS of 8 or less should be intubated prior to transfer. In addition, intubation should be undertaken in *all* patients in whom there is a drop of 2 or more in their motor score and it should be considered in *any*

- patient (irrespective of the baseline GCS) if the level has fallen by 2 or more points. Intubation techniques vary, but should address the issues of a potentially full stomach / aspiration risk; potential cervical spine injury; the requirement for adequate sedation, analgesia and muscle relaxation to avoid an increase in ICP. This normally involves rapid sequence induction with in-line stabilisation of the cervical spine.
- 67 Once [intubated](#), care should focus on achieving adequate sedation, analgesia and muscle relaxation while avoiding hypotension and reduced cerebral perfusion pressure (CPP). Ventilation should target PaO<sub>2</sub> levels of greater than 13 kPa and PaCO<sub>2</sub> levels of 4.5 – 5.0 kPa.
- 68 If there are clinical or radiological evidence of raised intracranial pressure more aggressive hyperventilation may be justified, however this should not achieve PaCO<sub>2</sub> levels below 4 kPa.
- 69 When [hyperventilation](#) is used the inspired oxygen concentration should be increased to allow increased oxygen delivery given the greater vascular constriction.
- 70 While [end-tidal CO<sub>2</sub>](#) monitoring should be maintained throughout the transfer, serial measurement of arterial blood gas values prior to departure will assist in pre-transfer stabilisation and will reduce the risk of deterioration during the transfer. It is worth noting the minute ventilation values used to achieve these blood gas results as these are often easily monitored during the transfer.
- 71 Patients who require chest drain insertion prior to transfer should consider replacing the underwater seals with one-way valve systems (e.g. Heimlich valves). Drains should never be clamped and meticulous attention should

be provided to their position, making sure they are never raised above the level of the patient.

- 72 **Hypovolaemic patients** tolerate transfers poorly and the circulating volume should be maintained at normal or supra-normal levels prior to transfer by using colloids, crystalloids or blood products, but avoiding 5% dextrose solution. Haematocrit should ideally be maintained above 30%.
- 73 If patients remain **hypotensive** despite fluid resuscitation, it is imperative to look for and treat other sources of bleeding. If bleeding sources are found, they must be treated and stabilised prior to transfer.
- 74 If all other causes of hypotension have been excluded, cautious use of inotropes or vasopressors should be introduced. Noradrenaline is the most commonly used drug (pressor) due to concerns over the high lactate that can be produced when using adrenaline. It should be reiterated that persistent hypotension adversely affects neurological outcome.
- 75 For patients who have suffered seizures, anticonvulsant drugs such as usually phenytoin should be administered prior to transfer. Unstable or compound long bone fractures should have preliminary toilet and be splinted to provide neurovascular protection and analgesia.

### Calling the ambulance

- 76 Once these preparations have taken place, the ambulance should be called with the clear request for a ***'Hospital Transfer 2'***. This 'Priority' is used by the London Ambulance Service to denote that an ambulance should be there within 60 minutes of the request. Any concerns about the impact to the patient of these timings, should be raised by the clinician to the LAS Clinical Hub at the time of the call. Incidents have occurred in the past because of the use of incorrect call signs which has resulted in significant delays.

## **The Transfer**

- 77 The escorting team should be familiar with all aspects of the patient's injuries and care to this point. The patient should be positioned with a 20° head up tilt with care meticulous focusing on maintaining oxygenation and adequate blood pressure and minimising rises in ICP. Communication with the ambulance driver is essential as rapid acceleration and deceleration forces can cause significant alterations in ICP and exacerbate secondary brain injury. A relatively slow and continuous transfer is almost always more preferable.

## **Notes**

## Vascular Emergencies

- 78 Therapy for vascular emergencies is rapidly evolving with increasing emphasis on radiological diagnosis and the development of endovascular therapeutic procedures.
- 79 The **most common emergency** is that of the leaking aortic aneurysm. This condition often precedes complete rupture which is fatal; however the progression to complete rupture can take up to 24 hours. When calling London Ambulance Service for these patients request a "**Hospital Transfer 1**" and they should arrive within 18 minutes
- 80 **Meticulous preparation** of the patient with particular attention to haemodynamic control is the mainstay of managing these patients. This is required in order to reduce the wall stress on the leaking vessel. If this stress increases, this can lead to rapid progression to rupture and death.
- 81 **Guideline target parameters** should include:
- Blood pressure in the range 70-100mmHg
  - Pulse rate < 100bpm
- 82 These parameters may be achieved using beta-blockers, clonidine or nitrates. In fact the most important factor is to use drugs with which you are familiar and which are immediately available.
- 83 **Fluid resuscitation** should be kept to the **minimum** required to maintain adequate organ perfusion.

**Whether it is a 100 yards or 100 miles the same principles should be applied**

84 There are several factors to consider when selecting a mode of transport:

- Speed
- Distance
- Availability
- Clinical condition
- Training
- Cost

### Road Ambulance

85 The ideal road transfer should be slow and steady. It is exceptionally rare for secondary transfers to require anything other than steady driving with minimal braking and accelerating; if necessary, this should be facilitated by the use of blue lights and siren to clear obstructing traffic. It is rare to require a police escort, and such situations provide difficult and demanding circumstances for the ambulance driver: in the event of an accident, the lead clinician needs to be able to justify such actions.

86 *Advantages of Road Ambulance:*

- Low cost
- Rapid mobilisation
- Purpose built
- Familiarity
- Door to door
- Few weather restrictions

87 *Disadvantages*

- Long journey time
- Acceleration
- Deceleration
- Travel sickness often for staff

## **Helicopter & Fixed-Wing Transfer**

88 *Advantages*

- Speed
- Reach

89 *Disadvantages*

- Cramped environment. Access to patients can be limited
- Noisy
- Vibration
- Altitude
- Number of transfers: as with fixed wing transfers, rotary transfers usually come with a '3 for the price of 1' offer. Both fixed-wing and rotary transfers often require the use of local air-strips (unless helipads are available) and a road ambulance transfer will thus be required at each end of the air transfer. This requires considerable coordination and presents many possibilities for communication error.
- Training: this is expensive
- Poor-preparation: there is no leeway for this. Forgotten or faulty equipment is not readily replaced.

## **Section 10**

### **Transfer Documentation**

- 90 The Critical Care Network introduced Transfer documentation in 2004 to improve the record of care of critical care patients being transferred between hospitals within and outside the network.
- 91 The 'transfer form' provides a record of the transfer, advice on undertaking the transfer, protects the staff transferring the patient (as it's a legal record for the receiving and referring hospital) and enables audit across the network.
- 92 The forms have been designed to take you (and the patient) through the transfer process and include a handy checklist. They are available in all network hospitals. They can be used for level 3 (ITU) and level 2 (HDU) patients. If you are not sure if a form is needed – fill it out anyway.
- 93 More information about the Transfer Forms can be found in Appendix 1.

### **Notes**

## Section 11

### Top Tips

- 94 A transfer wallet that will accommodate scans and radiographs is extremely useful. On the front of the wallet should be a laminated checklist of what needs to be inside: Handover notes, scans, patient valuables etc this can be reused for subsequent transfers.
- 95 Loss of PEEP while transferring ventilation from one machine to another can be avoided by clamping the endotracheal tube with a soft clamp prior to disconnection and unclamping once reconnection and commencement of gas flow occurs.
- 96 If the transfer team has to return by taxi, it is important to note that only vehicles displaying a green compressed gas sticker and license can carry compressed gas cylinders. Thus it is best to leave any cylinders at the receiving hospital, remembering to disconnect the regulator and the ventilator adaptor. If the regulator and adaptor are left behind, they will not be available for subsequent patient transfers.
- 97 If the transfer monitor records observations these can be printed in order to avoid writing in the back of an ambulance.
- 98 The use of helicopters for secondary transfer should be minimised.
- 99 Training and familiarity are the most significant issues. An increasing number of regional training courses are being developed.
- 100 Many of the problems would be solved if the transfer forms which are available in all network hospitals are utilised.

101 Network solutions can make the process of transfer much smoother such as the development of standardised transfer forms and agreements between organisations.

102 Trusts can also consider the purchase of dedicated transfer trolleys (Figure 3).

**Figure 3.**

An example of a dedicated transfer trolley:



## Section 12

## Summary

103 Adequate preparation, communication and anticipation of potential problems are the key to performing safe transfers for critically ill patients. Despite these measures, the nature of the patient group dictates that incidents will happen; the duty of the transfer team is to ensure that such incidents are not directly attributable to the transfer process. After equipment problems, communication errors are the most common incidents emphasizing the need to standardize the process and utilize transfer documentation as an *aide-memoir*.

104 In short: Remember:

- **'If it can go wrong it will go wrong'**
- **'Full patients travel better'**
- **'Whether it is 100 yards or 100 miles, the principles are the same'**
- **'Assume nothing and trust no-one'**
- **" Use the Network transfer documentation - if in doubt, fill it out"**

**Congratulations on finishing the handbook. Have a break..... then go back and read it all again!**

**Enjoy the course & good luck with your transfers.**

## Section 13

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### Questions & Answers

#### **Why do we need to use “transfer forms” when critical care patients are being transferred?**

1. The Critical Care Network introduced Transfer documentation to improve the record of care of level 3 patients being transferred between organisations.
2. The documentation (transfer form) provides a record of the transfer, advice on undertaking transfers, protects the staff undertaking the transfer (its a legal record) and – through audit- improves the quality of care patients receive during the actual transfer process.
3. The form is now linked to a Network wide transfer reporting system and transfer training programme - the latter is recognised for 5 CPD points by the RCOA.

#### **What are the benefits of using transfer documentation and the Network wide standard of transfer?**

4. Completion of the form promotes the delivery of a “competent “ and well organised transfer. It ensures that the transfer process and care received by the patient has been documented. It promotes reduction of known transfer risks. It also means there is an appropriate record for the patient notes at the receiving **and** transferring hospitals.
5. The form also provides the Network and Trusts with information/data on organisational issues for audit and governance purposes. This helps to inform strategic discussions about critical care capacity and flow within North West London and across London, as well as identifying staff training needs. This data has had a significant role in justifying cross organisational investment in the Network transfers work stream.
6. The use of the transfer documentation and the Network wide reporting system and transfer training programme also supports Trusts in meeting their Health Care Commission development standards for the annual Trust HCC declaration in May. These are:

#### **Health Care Commission declarations**

- **The healthcare organisation enhances safety through applying best practice in assessing and managing risks to patients when they move from one organisation to another**

- **The healthcare organisation has integrated structures and processes with other health and social care organisations, as appropriate, to deliver services that control the risk to patients as they are transferred between organisations.**

**Which hospitals are using the transfer forms in North West London?**

7. All hospitals within the North West London Critical Care Network use the form. These are:

<b>NWL CC Network Hospitals</b>
<p><b>NHS</b></p> <ul style="list-style-type: none"> <li>• Central Middlesex Hospital,</li> <li>• Charing X Hospital</li> <li>• Chelsea and Westminster Hospital</li> <li>• Ealing Hospital</li> <li>• Hammersmith Hospital</li> <li>• Harefield Hospital</li> <li>• Hillingdon Hospital</li> <li>• Northwick Park Hospital</li> <li>• Royal Brompton Hospital</li> <li>• Royal Marsden Hospital (from April 2007)</li> <li>• Royal National Orthopaedic Hospital (from Nov 07)</li> <li>• St Mary's Hospital</li> <li>• West Middlesex Hospital</li> </ul>
<ul style="list-style-type: none"> <li>• <b>Independent hospitals</b> - Clementine Churchill, Cromwell Hospital, King Edward vii, the Wellington, the Lister, the Harley Street Clinic, Princess Grace and the Portland, St John and St Elizabeth hospitals, Highgate Hospital</li> </ul>

8. North East London has recently adopted the form for use in hospitals within the former East London sector. North Central London will be using a version of the form from late 2009-10

**How long have the NWL forms been in use?**

9. The forms were introduced on a pilot basis on 12 January 2004 and on a permanent basis from April 2004. Not all hospitals listed above had joined the network at that time. They have been the subject of extensive consultation prior to production and have been revised regularly. In 2006 and 2008 to include

a checklist linked to a mnemonic aide memoire, increased Microbiology reporting, and additional trusts and contact numbers. In 2011,13,15 and 17 to include risk assessment and update contact details.

**What is the format for the Transfer forms and who supplies them?**

10. The forms are A3 size and mostly tick box format. They are triplicate, two hole punched, and one side glued documents (pink, white and blue copies) and come in books of 50.
11. They are supplied by the Network and further books can be obtained from the Network office – Tel: 020 3350 4801.

***What sort of patients need to have these Transfer forms completed?***

12. The Network Transfer forms are designed for use with level 3 (ITU) inter hospital transfers. They are for adult patients.
13. Occasionally they may need to be used for paediatric transfers where no retrieval service is used (such as head injury transfers) and where paediatric transfer documentation is not available. This is for local staff to determine.
14. Some trusts also use them for level 2 adult inter hospital transfers. The Network is happy for them to be used in this way – just call the office for a new book before you run out of forms.

***Who needs to fill in the Transfer form?***

15. The forms are to be filled in by those undertaking the transfer –usually ODAs, nurses and anaesthetists. The nurse /ODA will start filling in the form (it acts as a useful aide memoire when arranging transport etc). The anaesthetist /dr accompanying the patient will complete the form and ensure handover at the receiving hospital.

***Who is responsible or accountable for filling in the Transfer form?***

16. The filling in of the form is a joint responsibility for the nurse/ODA and the anaesthetist. It is the anaesthetist/Dr that is accountable for its final completion and the documentation of handover of the patient.

**Where are the forms kept –they are needed 24 hrs per day and accessible for staff from A&E, Theatres, Wards and Critical Care?**

17. Precise arrangements are up to each individual hospital to decide but most Trusts keep them in ITU or theatres and in A&E.

**Where do the forms go when completed?**

18. The forms are in triplicate so one copy goes in the transferring hospital's notes, one copy goes in the receiving hospital's notes and a copy is sent to the Network office for audit. Some hospitals have a central point of collection for the forms so an audit can be kept locally before Network copies are returned to the Network. Each book has a cheque book style stub in which

brief details such as patient number, destination and transferring doctor can be kept, if desired, locally.

### **What happens to the information on the forms at the Network?**

19. The information on the forms is used to inform service planning, pick up transfer practice and any incidents and is used to audit the number and nature of transfers within and out of the Network. Data is fed back to hospitals at least monthly and, in most cases, more frequently.
20. Annual audit reports are also prepared and shared with organisations and clinical staff in the network
21. Any potential governance incidents identified are referred back to the Trust for local assessment and, where appropriate, investigation.
22. **It is recommended that all transfer incidents are routinely reported via the referring and receiving Trust local clinical governance routes. Incidents identified at Network level are also fed into the Network wide transfer training programme.**

### **What about patient confidentiality?**

23. The Network treats all information in accordance with Caldicott Principles. The Network staff are NHS employees with Trust contracts and as such are contractually required to ensure patient confidentiality. Audit information shared at Network level will **not** use patient identifiers and will always be anonymised. Examples of incidents (suitably anonymised in terms of patient, staff and organisation) will be used for training purposes and feedback to staff and organisations.

### **What are hospitals doing about developing a local process for ensuring transfers are documented and reported?**

24. Each hospital needs to ensure that forms are completed locally and that staff are aware of the local process for doing this. This is most effective when Consultants take the lead in directing their junior doctors in the importance of transfer documentation, patient safety and the Network standard for transfers.

### **How do we get more copies of the forms when we need them?**

25. The forms are supplied by the Network in books of 50. Further books of forms can be ordered from the Critical Care Network Office by emailing [Critcarenetworknwl@nhs.net](mailto:Critcarenetworknwl@nhs.net).

### **What about Training for staff undertaking Critical Care Transfers?**

26. Clinical staff have identified training for staff undertaking transfers as a priority area for the Network. All Trusts in NWL have allocated funds to facilitate this work by the Network and we have been working with clinical staff, the RAF and the London Ambulance Service to make any training as

realistic, relevant and cross organisational as possible – and available to those staff most likely to undertake transfers as well as critical care leads etc.

### **Transfer Training Faculty**

27. The Network is supporting a Transfer Training Faculty. This Faculty has now developed a transfer training course that has been made available to all hospitals in the network on CD. There is an accompanying network transfer course booklet and a laminated pocket sized transfer aide memoire. The course covers both intra and inter hospital transfers and is suitable for all staff working with and moving level 2 and 3 patients and those that have responsibility for such staff.

28. The Network also organises centrally run transfer training courses (at the good clinical practice centre at Chelsea and Westminster Hospital) to which all hospitals can send delegates. We are now trying to increase the frequency of these courses due to the excellent feedback and exceptional demand for places. All trusts can apply to run the course locally if they wish and use trainers from the Network Faculty.

**If you wish to be part of the Network Transfer Training Faculty please contact Dr Jonathan Handy on [j.m.handy@imperial.ac.uk](mailto:j.m.handy@imperial.ac.uk) or Angela Walsh on [angelam.walsh@nhs.net](mailto:angelam.walsh@nhs.net)**

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