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GUIDELINES FOR TRANSPORT OF CRITICALLY ILL PATIENTS

1. INTRODUCTION

Critically ill patients have life-threatening injuries or illnesses that are associated with reduced or exhausted physiological reserves. Transporting such patients exposes them to additional risks and requires the services of highly trained and skilled practitioners.

Safe transport of the critically ill patient requires accurate assessment and optimisation of the patient before transport. There should be appropriate planning of transport and maximised utilisation of communications. Safe transport requires the deployment of appropriately trained staff with essential equipment, and effective liaison between referring, transporting and receiving staff at a senior level.

As a guiding principle, the level of care provided during transport must aim to at least equal that at the point of referral and must prepare the patient for admission to the receiving service.

2. PURPOSE

To assist medical practitioners and hospitals develop and implement strategies and protocols for the safe transport of critically ill patients. The goal of this document is to minimise risks and maximise safety for patients during transport.

3. SCOPE

These guidelines are intended for medical practitioners and apply to all stages of critical patient transport be that prehospital, interhospital or intrahospital.

4. BACKGROUND

With constantly evolving technology and knowledge, guidelines need to be reviewed regularly to ensure that they are current and evidence-based. Earlier “minimum standards” were divided into two separate documents, one for intrahospital transfers and the other for interhospital transfers. Despite some specific differences, there are sufficient similarities to combine them into the one set of guidelines.

5. ADMINISTRATIVE GUIDELINES

Administrative guidelines for organisations engaging medical practitioners in patient transport should cover all aspects of transport of the critically ill. For interhospital transfers these may include guidelines for such matters as insurance, budgeting and personnel. Staff training, safety and protection are the responsibility of the employing authority, which should carry appropriate insurance for all contingencies related to patient transport activities and should also provide personnel with personal protective equipment and instruction.

5.1 Initiation and response

Medical transport services using road ambulance, fixed and rotary wing aircraft must be coordinated for prompt, rapid, efficient and safe transport of critically ill patients on a 24 hour basis.

Initiation of patient transport should be simple, with clear guidelines and communication channels. Ideally, the referring doctor should have to make only one telephone call to initiate retrieval or patient transfer.

In all situations requiring transport of the critically ill, rapid response of the transport system and minimal delays are paramount. In emergency interhospital transports, dispatch of the prehospital and retrieval team to the referring hospital should not be delayed pending the identification of a receiving hospital.

5.2 Coordination and communication

Coordination of transport services for the critically ill should be centralised to ensure optimum utilisation of resources. Designated individuals need to be available immediately for consultation and planning at a specialist level. Coordinating clinicians need to have an understanding of referring hospital capabilities and in-depth knowledge of receiving hospital capabilities. Coordinating clinicians need to have an intimate knowledge of the benefits and limitations of the transport frames at their disposal as well as the management capabilities of the retrieval team. To best understand this, coordinating clinicians should be suitably trained in prehospital and retrieval medicine and have ongoing operational experience relevant to the type of transport undertaken.

Reliable communication must be available at all times between the prehospital and retrieval team and the referring and receiving hospitals and ambulance services. At the time of first contact, clinical advice can be provided to referral staff and sought from senior specialty receiving staff as well as appropriate planning and advice provided to the retrieval team.

5.3 Responsibility

The chain of responsibility must be clear throughout the transfer. Responsibility for patient care during transport must be vested in an appropriately qualified medical practitioner. Formal handover from referring doctor to retrieval doctor and from the latter to the receiving hospital doctor is essential (see ACEM document *Guideline on Clinical Handover in the Emergency Department* and ANZCA professional document *PS53 Statement on the Handover Responsibilities of the Anaesthetist*). This is equally as important for intrahospital transport.

5.4 Documentation

The clinical record should document the patient's clinical status before, during and after transport, relevant medical conditions, environmental factors, therapy given, adverse logistical events, and procedures undertaken.

5.5 Governance

Organisations involved in prehospital transfers and retrieval should have an effective quality management system that can monitor and audit performance and safety, and make recommendations for appropriate improvements as part of their reporting structure.

5.5.1 Clinical effectiveness and research

Operational and clinical performance indicators should be established using an evidence-based approach. These performance indicators should be monitored, benchmarked and regularly reported.

Research should be encouraged to develop evidence and enhance patient care.

A means of patient follow-up after transport should be available to clinical staff involved to assist in evaluating of individual, organisational and system performance.

5.5.2 Audit

There should be a system for regular case review to assess level of care provided, transport processes and logistics. These reviews should include all aspects of the retrieval and transport process and be inclusive of coordination, transport factors, crew issues, crew resource management as well as the medical management component. Provision should be made for feedback to and from the referring and receiving centre.

5.5.3 Risk management

A system for reporting and reviewing sentinel events in a timely and non-accusatory framework needs to be in place. Sentinel events should include patient death and any other major adverse events relating to the patient, crew or equipment.

5.5.4 Education and training

There should be opportunities for peer review within the organisation. The system should also provide an educational function for all components for the transport service.

5.5.5 Credentialing and scope of clinical practice

Prehospital and retrieval clinicians should undergo a formal credentialing process to ensure their competence, performance and professional suitability to provide safe, high quality medical care within the prehospital and retrieval environment. Credentialing should take into account formal qualifications, professional training and clinical experience as well as their continuing professional development directly relevant to prehospital and retrieval medicine. The credentialing process should help to define the prehospital and retrieval clinicians' scope of clinical practice within an organisation.

6. CATEGORIES OF TRANSPORT

Transport of critically ill patients may be required in three sets of circumstances, namely, prehospital transport, interhospital transport, and intrahospital transport.

6.1 Prehospital transport refers to:

Transport of a critically ill patient from the scene of trauma or illness to hospital. Standards for prehospital transport, not involving medical practitioners, are determined by ambulance and emergency services and are not covered by this policy document. Where prehospital transport is carried out by medical personnel, the same standards apply as for interhospital transport.

6.2 Interhospital transport may be:

6.2.1 *Emergency interhospital transport:*

For acute life-threatening illnesses emergency interhospital transport may be needed due to either lack of diagnostic facilities, staff, clinical expertise and/or facilities for safe and effective therapy in the referring hospital.

6.2.2 *Semi-urgent interhospital transport:*

For transport of the critically ill patient, either to a higher level of care or for a specialty service.

6.3 Intrahospital transport refers to:

Transport of critically ill patients from one area of a hospital to another area within the hospital.

7. STAFFING

Medical staff engaged in the role of prehospital transfers and retrieval of critically ill patients will be required to work in a range of challenging environments. Patients are entitled to the best standard of care available, regardless of location. Consequently, prehospital and retrieval medical staff need to have the requisite skills and knowledge to provide the highest level of care in these environments and for the patients they are likely to encounter. Prehospital and retrieval personnel must be trained in all aspects of patient transport relevant to their practice and participate in the organisational quality and teaching activities (section 5.5 above), as well as relevant continuing professional development.

Consultant staff with relevant current experience in prehospital and retrieval need to be available to instruct and supervise junior staff and to provide real-time clinical support as required. The ability of prehospital and retrieval personnel to communicate effectively and to function as part of a team is essential.

Staff must be briefed on, and be familiar with, emergency and evacuation procedures for the transport frames in which they work. Medical staff undergoing helicopter retrieval and transport where flights occur over water should complete a helicopter underwater escape training course and maintain competency. All staff undertaking critically ill patient transport must be aware of the capabilities and limitations of available equipment and the working transport environment.

For intrahospital transport the team must be freed from other duties. For prehospital and interhospital retrievals a team dedicated solely for such transports should be available.

7.1 Prehospital transport

Physicians who are deployed to provide prehospital treatment and transport as part of a prehospital retrieval team can provide care that approaches that available in a hospital resuscitation room. Prehospital and retrieval physicians require training in their expected prehospital roles including scene organisation and safety, patient assessment, treatment and extrication, mass casualty and chemical, biological and radiological incidents, and the prehospital and retrieval environment. As part of their training they must demonstrate the required skills and knowledge to operate safely and effectively as part of a team in the prehospital and transport environment.

Prehospital and retrieval staff should be provided with adequate personal protective equipment so that their safety is not compromised and that they are highly visible and easily identifiable at any prehospital scene.

Prehospital and retrieval physicians need to be familiar with local ambulance and emergency service protocols, roles, responsibilities and equipment.

Prehospital retrieval physicians must be familiar with local, regional and state disaster plans. They must have appropriate logistical skills, understand the roles they may be required to perform, and be adequately trained and equipped to perform these roles. Medical personnel involved in disaster response planning and coordinating should be fully aware of the skills and expertise the prehospital retrieval team is capable of bringing to the scene of a mass casualty disaster response.

Prehospital and retrieval teams should be familiar with local radio protocols and the range of communication devices used.

Medical staff involved in prehospital rescue work must be in a state of health and of adequate fitness to perform these tasks safely. Medical staff involved in helicopter winch rescue work must have undergone suitable training and competency assessment. This competency must be maintained whilst they remain clinically active.

7.2 Interhospital transport

Interhospital transport of critically ill patients must be performed by an appropriately qualified retrieval team including an experienced medical practitioner. This team must be familiar with their transport equipment particularly power and oxygen supply limitations. The retrieval team needs to have adequate clinical understanding of the patient's medical condition and potential transport complications (that is, altitude, temperature, movement, etc). The team must also be aware of the treatment options available to them prior to and during transport of the patient.

On extended journeys, sufficient staff should be carried to allow maintenance of high standards of patient care, and to allow for staff rest periods.

Where it would be immediately lifesaving, the transport of expert medical assistance, for example, a neurosurgeon, to the referring hospital should be considered. At all times the risk of placing untrained personnel in an unfamiliar transport environment must be balanced with the likely benefit to the patient.

Specifically trained personnel are required for the transport of neonates, infants, and patients requiring extracorporeal life support or an intra-aortic balloon pump.

Bariatric patient retrievals pose particular clinical and logistic challenges. Services undertaking transport of bariatric patients should have policies addressing manual handling and safe transport issues around this patient group.

Special considerations are also required for long-haul/international patient retrievals – not detailed in this document.

7.3 Intrahospital transport

Key personnel for each transport event should be identified. The transport team should consist at least of an appropriately qualified nurse, an orderly, and a medical practitioner with the specific skills and training required for such transport.

Whilst most intrahospital transports are not done by dedicated teams, the principles of transport are similar to prehospital and interhospital retrieval.

Each team must be familiar with the equipment used on the transport and be sufficiently experienced with securing airways, ventilation of the lungs, resuscitation, and other anticipated emergency procedures.

8. TRANSPORT

Mode of transport used will depend partly on clinical requirements, on vehicle availability and on conditions at the referring and receiving sites.

8.1 Choice of transport vehicle will be influenced by:

- 8.1.1 Nature of illness.
- 8.1.2 Possible clinical impact of the transport environment.
- 8.1.3 Urgency of intervention.
- 8.1.4 Location of patient.
- 8.1.5 Distances involved.
- 8.1.6 Number of retrieval personnel and volume of accompanying equipment.
- 8.1.7 Road transport times and road conditions.
- 8.1.8 Weather conditions and aviation restrictions for airborne transport.
- 8.1.9 Aircraft landing facilities.
- 8.1.10 Range and speed of vehicle.
- 8.1.11 Availability of resources at the referring site.
- 8.1.12 Familiarity and training of retrieval staff on transport frame(s) available.
- 8.1.13 Medical and transport team fatigue limitations.

8.2 Transport vehicle requirements

Vehicles should be appropriate to the task in terms of design (including cabin environment) and equipment in accordance with local regulations. Regular inspection and servicing of vehicles and on-board equipment is required. Particular requirements relate to:

- 8.2.1 Safety of both patient and staff.
- 8.2.2 Adequate space for patient access and to perform acute medical interventions. As a minimum, ready access is needed to the head and one complete side of the patient.
- 8.2.3 Adequate power and gases for life support systems.
- 8.2.4 Adequate suction.
- 8.2.5 Easy access for safe embarkation and disembarkation.
- 8.2.6 Adequate lighting and internal climate control.
- 8.2.7 Restraints for stretcher, equipment and passengers.
- 8.2.8 Acceptable noise and vibration levels and noise protection for all passengers.
- 8.2.9 Adequate speed and response times.
- 8.2.10 Good communication systems, both internal and external.
- 8.2.11 Both auditory and visual patient monitoring alarms.
- 8.2.12 Impaired gravity drip of fluids.

In general, medical fittings to aircraft, and bulky items carried need to be approved by aviation authorities.

8.3 Air transport exposes patients and crew to particular risks including:

- 8.3.1 Reduced oxygen partial pressure.

- 8.3.2 The need for pressurisation to sea level when clinically indicated.
- 8.3.3 Risk of rapid depressurisation.
- 8.3.4 Expansion of air filled cavities both within the patient and the equipment, such as endotracheal tube cuff, middle ear, air-filled spaces under airtight dressings etc.
- 8.3.5 Limb swelling beneath plaster casts.
- 8.3.6 Worsening of air embolism or decompression sickness.
- 8.3.7 Danger from agitated patients.
- 8.3.8 Limited space, lighting and facilities for interventions.
- 8.3.9 Noise.
- 8.3.10 Extremes of temperature.
- 8.3.11 Extremes of humidity.
- 8.3.12 Acceleration, deceleration and turbulence.
- 8.3.13 Vibration.
- 8.3.14 Electromagnetic interference between avionics and monitoring devices.
- 8.3.15 Danger from loose, mobile equipment.
- 8.3.16 Motion induced illness.

8.4 With all modes of transport, provision of a secure airway and intravenous access, securing of all catheters and provision of appropriate monitoring before departure is fundamental to safe transport. Stabilisation of vital signs should occur prior to transport. The only exception to this is if stabilisation can only occur with treatment available only at the receiving hospital (for example, ongoing internal haemorrhage secondary to trauma).

8.5 Final preparation of the patient should be made prior to transport, with anticipation of clinical needs. Examples include giving appropriate doses of muscle relaxants or sedatives, replacing near-empty inotropic and other intravenous solutions with fresh bags, and emptying drainage bags.

8.6 The patient must be reassessed before transport begins, especially after being placed on monitoring equipment and the transport ventilator (if used). Transport preparations must not overshadow or neglect the patient's fundamental care.

9. EQUIPMENT

Equipment carried should be appropriate for each transport. The duration of transport, the patient's diagnosis and severity of illness and the level of therapeutic intervention required should be taken into account. In choosing equipment, attention must be given to size, weight, volume, battery life, oxygen consumption and durability, as well as to suitability for operation under conditions of transport.

Supplies, including oxygen and pharmacological agents, should be in excess of that estimated for the maximum transport time.

Patient stretchers and all equipment must be restrained, in compliance with regulatory guidelines. Electrical and gas supply fittings of all equipment must be compatible with those of the transport vehicle. All equipment to be used in aircraft must be assessed for compliance with regulatory requirements. All equipment must be maintained appropriately, stored securely and items that may be required during transportation must be readily available.

Specialised equipment is required, for example, for neonatal and paediatric transport, as well as for patients requiring extra-corporeal life support.

Equipment that should be considered includes:

9.1 Respiratory support equipment

- 9.1.1 Airways (range of oral and nasopharyngeal airways and a range of laryngeal mask airways).
- 9.1.2 Oxygen, masks, nebuliser.
- 9.1.3 Self-inflating bag for hand ventilation.
- 9.1.4 Positive end-expiratory pressure valve.
- 9.1.5 Suction equipment of appropriate standard.
- 9.1.6 Portable ventilator with disconnect and high pressure alarms.
- 9.1.7 Intubation equipment and endotracheal tubes.
- 9.1.8 Emergency surgical airway set.
- 9.1.9 Difficult airway equipment.
- 9.1.10 Pleural drainage equipment.

9.2 Circulatory support equipment

- 9.2.1 Monitor/defibrillator/external pacer combined unit.
- 9.2.2 Pulse oximeter.
- 9.2.3 Aneroid sphygmomanometer (not mercury-containing) with a range of cuff sizes.
- 9.2.4 Vascular cannulae, peripheral and central.
- 9.2.5 Intravenous fluids and pressure infusion set.
- 9.2.6 Infusion pumps.
- 9.2.7 Arterial cannulae and pressure transducer kit.
- 9.2.9 Syringes and needles.
- 9.2.10 Pericardiocentesis and thoracotomy equipment.
- 9.2.11 A sharps disposal container and a bag for biological waste.

9.3 Other equipment

- 9.3.1 Nasogastric tube and bag.
- 9.3.2 Urinary catheter and bag.
- 9.3.3 Nasal decongestant spray.
- 9.3.4 Instruments, sutures, dressing, antiseptic lotions, gloves.
- 9.3.5 Thermal insulation and temperature monitor.
- 9.3.6 Splints and equipment for spinal and limb immobilisation.
- 9.3.7 Neonatal/paediatric/obstetric transport equipment when applicable.

- 9.3.8 Dressings, bandages, slings, splints and tape.
- 9.3.9 Cutting shears and portable torch.
- 9.3.10 Gloves and glasses for staff protection.
- 9.3.11 Consideration should be given to:
 - 9.3.11.1 Alternative vascular access such as intraosseous devices for adults and children.
 - 9.3.11.2 Blood for transfusion when indicated.

9.4 Pharmacological agents

All drugs should be checked and clearly labelled prior to administration. The range of drugs available should include all drugs necessary to manage acute life-threatening medical emergencies and those specific to the patient's clinical condition. Close attention must be paid to drugs that require refrigeration to maintain effectiveness.

9.5 Documentation

Prehospital and retrieval teams should document the handover history and clinical examination findings of their patients. Documentation should include an ongoing record of physiological status, clinical procedures, and any subsequent interventions. A copy of this patient record should be provided to the receiving hospital along with the clinical record and investigations from the referring facility, where available. For intrahospital transport, this documentation may form part of the inpatient notes.

10. MONITORING

Monitoring of certain physiological variables should be carried out during transport. Some or all of these basic recommendations will need to be exceeded routinely depending on the physical status of the patient.

Clearly any monitoring method may fail to detect unfavourable clinical developments and monitoring does not guarantee any specific patient outcome.

10.1 Clinical patient monitoring

10.1.1 Circulation

The circulation must be monitored and recorded at frequent and clinically appropriate intervals by detection of the arterial pulse, measurement of the arterial blood pressure and assessment of peripheral perfusion.

10.1.2 Respiration

Respiratory rate should be assessed and recorded at frequent and clinically appropriate intervals.

10.1.3 Oxygenation

The patient's oxygenation should be assessed at frequent and clinically appropriate intervals by observation and use of pulse oximetry.

10.1.4 Level of consciousness by Glasgow Coma Scale and pupil reaction.

10.1.5 Pain score

Patients' pain should be monitored including regular assessment of pain scores, and managed appropriately.

10.1.6 Patient comfort

Even deeply-sedated patients should be provided with appropriate noise, eye and environmental protection.

Pressure care, including invasive devices, is essential for all patients who are unconscious, immobilised or have impaired movement, sensation and/or perfusion.

Ventilated patients in particular require continuous attention to eye care and effects of the ETT and other invasive devices.

10.2 Equipment monitoring

10.2.1 Pulse oximeter and capnography

A pulse oximeter must be used for every critically ill patient during transport. All patients undergoing artificial ventilation (for example, via a tracheal tube or supraglottic airway) must have a form of capnography, ideally waveform. Waveform capnography should also be considered for sedated patients.

10.2.2 Alarms for breathing system disconnection or high pressure and ventilator failure

When an automatic ventilator is in use, a device capable of warning promptly of low and high pressure in the breathing system should be in continuous operation.

10.2.3 Electrocardiograph

Equipment to monitor and continually display the electrocardiograph must be used for every critically ill patient during transport.

10.2.4 Physiological pressures

Equipment for the invasive or non-invasive recording of blood pressure must be used. Where clinically indicated, other physiological pressures should be available for all critically ill transported patients.

10.2.5 Other equipment

When clinically indicated, equipment to measure other physiological variables, such as temperature and point of care blood analysis should be available.

Portable ultrasound is recommended where appropriately trained and credentialed personnel are available.

10.2.6 Equipment alarms

Equipment should incorporate audible and visual alarms.

11. TRAINING

All new staff involved in patient transport should undergo appropriate training in all aspects of patient transport outlined in this document and undertake supervised patient transports prior to independent transport duties. In particular, training should include instruction in local retrieval systems, organisational and transport vehicle related matters and the defined team role and functions of both medical and non-medical retrieval team personnel.

Training for safety and other operational issues should occur on a regular and recurrent basis, with due consideration for occupational health and safety and infection control issues.

All medical staff participating in patient transport activities must remain current and compliant with continuing education standards of their specialty and/or other governing body in addition to those of the retrieval organisation.

RELATED COLLEGE DOCUMENTS

ACEM Guideline on Clinical Handover in the Emergency Department.

ANZCA professional document PS53 *Statement on the Handover Responsibilities of the Anaesthetist*.

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This guideline has been prepared with regard to general circumstances, and it is the responsibility of the practitioner to have regard to the particular circumstances of each case, and the application of this document in each case.

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