ROYAL AUSTRALASIAN
COLLEGE OF SURGEONS

MAY 2012

GUIDELINES

For a Structured Approach
to the Provision of

OPTIMAL TRAUMA CARE

CONTENTS

CONTENTS

Background

The scale of disease burden due to traumatic injuries can be enormous in the global sense. In New Zealand, injury is the leading cause of death and disability. It is estimated that injury was responsible for more than 1700 deaths and 50,000 hospitalisations per annum.[1] Injuries in the home, the workplace, and as a result of sports and leisure activities contribute significantly to the total burden of healthcare. Road traffic crashes are the single leading cause of traumatic death in western motorised countries. In 2011, there were 1.5 million new claims accepted by the Accident Compensation Corporation (ACC)[2]. During the same period, there were also approximately 1.9 million existing active claims.[2] It is estimated that the social and economic costs for the care of the injured are 60 billion dollars per year.[1] Although recent road safety measures have been associated with a decrease in total fatality rates there is ample evidence that the number of deaths and serious disabilities could be reduced further by ensuring that the resources for managing trauma accurately match the requirements of the injured patients. The development of a trauma system in New Zealand for the care of trauma patients needs to be focused on ensuring that trauma facilities can provide appropriate resources for injured patients in all situations.

Preamble

The Guidelines for a "Structured Approach to the Provision of Optimal Trauma Care" were first developed in 1993 by the New Zealand Trauma Committee of the Royal Australasian College of Surgeons (RACS) under the leadeship of its then Chair, Mr Ian Civil, as a project funded by the Ministry of Health. These Guidelines were subsequently revised in 1996 and again in 2003.[3] The principle of this document is to ensure that injured patients throughout New Zealand are managed appropriately wherever they receive their care. Over the last decade, this document has served as a resource for matching the level of trauma service care to the severity of injury for New Zealand trauma patients.

Funds to revise these Guidelines were made available by the Health Quality and Safety Commission to the RACS and the New Zealand Trauma Committee of the RACS was requested to undertake this project. The Project Implementation Plan is attached (*Appendix 1, pp37-41*). This revision supports the development of the Major Trauma Clinical Network of New Zealand. These guidelines will be an integral part of a mature trauma system in New Zealand. This document will relate to trauma care at acute care facilities from the time of injury through to the completion of rehabilitation. Appropriate matching of the level of trauma services to patient injures will ensure the best utilisation of resources, prevent inappropriate management and ensure optimal outcome for the patient.

These Guidelines aim to provide clear guidance to purchasers of trauma services as to the appropriate components (including intensive care and support services) required to deliver the best patient outcomes.

Objective

To formulate national guidelines defining the level of trauma care services (including intensive care and support services) required to deliver optimal patient outcomes for specified categories of trauma.

Tasks

❑ Assess the current availability of trauma care services (including intensive care and support services).

❑ Revise national guidelines outlined above. This task includes:
- definition of physical trauma
- categorisation of types and severity of trauma
- specification of the level of trauma care (including intensive care and support services) required for the most optimal management of each identified category of trauma.

Membership of the Committee (in 2012)

Li Hsee	Chairman, Trauma Surgeon, Auckland (Editor-in-Chief)
Shanthi Ameratunga	Clinical Epidemiologist, Auckland
Grant Christey	General Surgeon and Trauma Surgeon, Hamilton
Grant Coulter	General Surgeon, Christchurch
Alf Deacon	General Surgeon, Nelson
Geraint Emrys	Corporate Medical Advisor, Accident Compensation Commission
Nicholas Finnis	Neurosurgeon, Christchurch
James Hamill	Paediatric Surgeon, Auckland
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Dave Parsons	National Advisor, Road Safety Training, Police National Headquarters
Rhondda Paice	Trauma Coordinator, Auckland
Mark Sanders	General Surgeon, Whangarei
Tony Smith	Clinical Director, St John
Celia Stanyon	Executive Officer, Royal Australasian College of Surgeons
Mark Stockdale	Senior Policy Analyst, Automobile Association
Andrew Vincent	Orthopaedic Surgeon, Christchurch
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It is recommended that...

Prehospital Care

1. *Page 12* while most pre-hospital care is delivered by ambulance officers, the participation of general practitioners in some geographical areas is necessary and desirable.

Triage

2. *Page 12-14* where the patient is regarded as having potentially major trauma with immediate threat to life, they should be taken directly to a facility identified as having the capability to stabilise or definitively manage severe trauma.

CHILDREN: Paediatric triage criteria are used for children but the same principles apply.

Transport

3. *Page 14* as standard practice, emergency ambulances should be staffed by two crew members. Ongoing training and financial support should be aimed at ensuring that where case volume is adequate at least one of the crew members is a Paramedic or Advanced Paramedic.

CHILDREN: Wherever possible, children are transferred by a specific paediatric transfer service.

Hospital Management

4. *Page 15* procedures are developed for the coordination of the various surgical and non-surgical specialists, not only in the initial assessment and early definitive care phases, but also in the intensive care units and surgical wards.

CHILDREN: Additionally, for children in particular, involvement of prevention and rehabilitation services early in the hospital course.

Trauma System Coordination

5. *Page 24* regional emergency care committees, based on advanced trauma services and integrated at a national level, are vital.

CHILDREN: Paediatrics is represented at all levels of coordination.

Data Collection

6. *Page 24* a national minimum data set on injury should be instituted and comprehensive trauma registries also be maintained by all advanced and district trauma services.

CHILDREN: Consideration is given to specific data items required for paediatric injury prevention.

Remote Geography

7.   *Page 24-25*   GPs be encouraged to undertake specific trauma training, such as the EMST/ATLS® Course, APLS and PRIME, and subsequent refreshers, and be conversant with ambulance service training, to ensure that their background knowledge and skills are adequate.

8.   *Page 25*   any financial disincentives for healthcare providers to participate in trauma care must be recognised and removed.

9.   *Page 25*   GP participation in the delivery of trauma care is on a prearranged basis.

CHILDREN: Paediatric training is incentivized for rural GPs.

Retrieval Services

10.   *Page 25*   all air ambulance services meet minimum standards such as those promulgated by the NZ Society for Air Rescue Trusts or CICMANZ IC-10.

11.   *Page 25*   destination policies should be developed to ensure appropriate patients are transported to appropriate facilities.

12.   *Page 25*   there should not be more than one overall service functioning in a given area at any time.

13.   *Page 26*   district and advanced trauma services should be supported by 24 hour/7 day EMS ambulance helicopters.

14.   *Page 26*   all advanced trauma services should be supported by a retrieval/transport service capable of providing 24 hour/7 day intensive care level transfers.

15.   *Page 26*   tertiary retrieval/transport services should provide a coordination service for hospitals and services within their region when requested to do so.

16.   *Page 26*   inter-hospital transport for the critically ill should be crewed by personnel deemed appropriate by the unit carrying out the service.

CHILDREN: Wherever possible, children are transferred by a specific paediatric transfer service.

Neurosurgery

17. *Page 26*   advanced trauma services must have the capability for craniotomy and immediately life saving neurosurgical intervention.

18. *Page 27*   when patients with severe head injury present to less resourced facilities than an advanced trauma service, they should be managed initially according to the EMST® principles.

CHILDREN: All children with serious injury should be transferred to a facility with resources and expertise for managing injured children.

Those initially assessing injured children and those involved in definitive management have appropriate knowledge, training, equipment, facilities and resources to meet paediatric needs.

Burns

19. *Page 27*   patients with significant burn injuries (a burns >10% TBSA, 5% in child, extremes of ages and complicating pre-existing medical disorders) should be managed at a Regional Burns Unit.

Paediatrics

20. *Page 28*   all children with serious injury should be transferred to a facility with resources and expertise for managing injured children.

21. *Page 28*   those initially assessing injured children and those involved in definitive management have appropriate knowledge, training, equipment, facilities and resources to meet paediatric needs.

Spinal Injuries

22. *Page 28*   when the spinal cord injury has been stabilised and associated injuries have been identified and managed, patients with spinal cord injuries are transferred expeditiously to the appropriate tertiary referral spinal unit.

Rehabilitation

23. *Page 29*   effective linkages are created between acute medical care, primary care practitioner, family support, ongoing rehabilitation, and return to community life.

CHILDREN: Paediatric rehabilitation involvement from early in the acute hospitalisation of severely injured children.

The Trauma System

A fully inclusive trauma system is planned, organised and coordinates injury control in a defined geographic area.[4] This concept includes: the delivery of trauma care from the time of injury to rehabilitation, active engagement in surveillance and injury prevention strategies, as well as access to rehabilitation care and integration back into society. A comprehensive trauma system will also need to include active research and clinical training at all levels of care. The ideal solution to the problem of injury is effective injury prevention strategies. When prevention fails, however, injuries occur and these require treatment. The appropriate environment in which this treatment should be delivered is a trauma system.

The trauma system embraces the whole spectrum of injury, from trivial to catastrophic. It functions from the moment of injury until the full potential of rehabilitation has been achieved. The trauma system is the framework in which institutions and individuals provide care within a broad geographic area. This geographic area must be "logical" and as patients are optimally treated in the **closest appropriate** hospital it may be necessary to cross administrative boundaries.

The trauma centres do not constitute the trauma system. The clinical components of a trauma system are to ensure the continuum of care. These elements include:

❑ **Pre-hospital care**
1. Prevent further injury
2. Timely transport of the injured patient to the most appropriate centre by matching the patient's needs to institutional capabilities
3. Utilisation of ground and air transport with appropriate personnel
4. Well developed communication and triaging systems
5. Education and training

❑ **Hospital care**
1. Trauma Centre and Acute Care facilities including the Emergency Departments
2. Intensive Care Units
3. Definitive surgical and medical care

❑ **Rehabilitation**
1. Appropriate screening for functional and psychological disabilities
2. Access to physical rehabilitation programmes and community support

CHILDREN:

Trauma is the single biggest killer of children and cause of long-term disability. The stratification of care for children will be different to adults. Transport and transfer patterns must logically reflect hospital paediatric capabilities. Paediatric facilities are less numerous; New Zealand has one Paediatric Intensive Care Unit. This therefore results in additional paediatric specific transport requirements. An essential component of a paediatric trauma system is its integration with child trauma prevention organisations.

Categories of Trauma Patient

Trauma patients are often classified according to the location of their injuries. This is appropriate where the only major injury is to a single body region. Thus there may be "head injury patients", "spinal cord injury patients", "abdominal injury patients" etc. These patients are ideally cared for in locations that have the capability for that particular type of injury. Where patients have multiple body region injuries, a grading system needs to be used which will define that subgroup of patients who have severe total body injury. These patients are optimally cared for in a location with the most comprehensive trauma resources.

CHILDREN:

In children, injury to more than one body region is common. These children are optimally cared for in a facility with a spectrum of paediatric specialties.

Outcome

The goal of these guidelines is to better define the resources available to provide optimal care to injured patients within the designed and funded system of care. These guidelines are based on evidence based practice. Other successful trauma systems in the western world are used as examples[5]. In an optimal trauma system, the best trauma outcome is the achievement of the least amount of disability and minimal number of deaths. Overall costs to the community should be minimised for any given injury, although increased costs in certain areas (e.g. pre-hospital care) may be required to save expenses in other areas (e.g. disability support services).

CHILDREN:

Care outcomes in children include non-operative rates for solid organ injury. Significantly lower splenectomy rates are documented at children-specific trauma facilities. Long term outcomes for many children are largely determined at the time of injury; prevention may be not only the most cost effective, but the only effective approach. Professionals caring for injured children are usually particularly well placed to guide injury prevention efforts.

Provision of Optimal Care

It has often been stated that the most important ingredient for optimal care of the injured is commitment, both personal and institutional to the concept. Personal commitment comes from individuals who, sensing a need for their expertise, are prepared to make themselves available to care for the injured. Such people must also be committed to maintaining their skills through adequate exposure and ongoing education and be prepared to audit the results of their intervention. Institutional commitment implies both support for the personal commitment of employees and provision of adequate physical resources for injury care.

CHILDREN:

Institutional support for health professionals committed to children's trauma competes with pressures from an adult and aging population. Careful planning is required to ensure children's trauma services are adequately and consistently resourced. Maintaining skills is also recognised as being more difficult because of lower paediatric population density.

Guidelines

These guidelines set achievable standards to treat injured patients and promote the utilisation of appropriate trauma resources. In formulating guidelines, which attempt to ensure that the needs and requirements of injured patients are matched, the RACS NZ Trauma Committee is essentially describing a trauma system. It is not describing what resources named institutions must have, but rather outlining the range of personnel and facilities that must be available to provide optimum care for injured patients of a given severity.

A functioning trauma system ensures the right patient gets the right care at the right time.

The **right care** is that which brings appropriate resources and skills for management of that specific patient's injuries and injury severity.

The **right time** is the time at which appropriate care will reverse the adverse physiological and psychosocial consequences of the injuries and prevent unnecessary complications. In pre-hospital and early hospital care the term "Golden Hour" has been used to encapsulate this concept.

CHILDREN:
The guidelines describe adult and child trauma systems integrated and in parallel. The principle of 'the right care at the right time' is the same for children, but patterns of transport and facilities will differ. The special needs of children are addressed at every level.

International Precedents

Australia

Death and disability following injury has been recognised in Australia, as in other countries as a major public health problem. Road traffic crashes have been the dominant cause of severe injury. Most states and territories have identified or implemented components of trauma systems.[6] Recognising the importance of trauma systems, education and research in the delivery of optimal trauma care, the Royal Australasian College of Surgeons has developed a trauma committee to review trauma polices. More recently, relevant trauma position statements *(Appendix 2, pp. 42-69)* have been published and endorsed by the Trauma Committee. These strongly promote vital principles of trauma management. Key among these are that seriously injured patients should be transported to the nearest **appropriate** hospital, hospitals should be categorised with respect to the level of trauma care they provide, and medically staffed retrieval services should be provided from each major metropolitan area. One of the trauma subcommittees of the Royal Australasian College of Surgeons is a verification committee based on the American College of Surgeons verification program. Verification is that process whereby the resources and organisation of a facility are matched against a level of care, thereby confirming the status of the facility. The verification committee has representation from key stakeholders such as Intensive Care, Emergency Medicine and Trauma Co-ordinators.

In 1993 the National Road Trauma Advisory Council (NRTAC) was established to provide a national focus for Australia's continuing effort to improve road safety. In an effort to improve the standard of care of the injured, NRTAC formed a working party on trauma systems. The NRTAC report contained a frame work for trauma systems development and leadership. The terms of reference of this working party were as follows:

1. Take into account the differing needs of urban and rural regions in Australia, develop standards defining the organisational arrangements and resources required for optimal care of the injured patient in Australia and develop guidelines for assessing hospital facilities, and how they integrate with prehospital care and relate to patient outcomes.

2. Develop procedures for inspection of hospital facilities; the assessment of outcome of trauma systems; establishment of the requirements for surveyors and the development of a panel of surveyors; establishment of methods of preparing reports; and establishment of methods of reporting to hospitals and State and Territory authorities.

Their report[7] addresses the formation of an Australian trauma system and guides delivery of care in that country.

In 2000, Victorian State Trauma System (VSTS) was established in response to the **Review of trauma and emergency services** (RoTES) report. This report made more than 100 recommendations that provided a framework for an integrated system for severely injured patients. Over the last decade, VSTS has overseen improvements in major trauma care with the reduction of mortality rates by benchmarking international centres, reducing length of stays and fostering a positive trend of injury prevention.[8,9]

United States

The efficiency of trauma systems in reducing death from injury was most prominently documented in the USA in the late 70s[10,11]. Subsequently many States and regions have developed trauma systems. In some areas this has arisen from local commitment but in others State legislation has ensured their development. The American College of Surgeons, through its Committee on Trauma (ACS-COT) has been active in establishing trauma systems and its model system guidelines are widely recognised[5]. In 1990, the US Congress passed the Trauma Care Systems Planning and Development Act[12]. This legislation requires that States develop a model trauma care system plan. Responding to this legislation the US Department of Health and Human Services developed a Model Trauma Care System Plan[13] which is used as a blueprint in many regions.

The ACS-COT focuses on improving the care of injured patients abiding to the principle that "all injured patients are addressed whenever they are injured and whenever they receive care."[5] Over the last decade there has been development concentrating on the building of effective trauma systems. In 1999, ACS-COT published "Consultation for Trauma Systems" to facilitate objective evaluation of trauma systems. In 2005, Health Resources Services Administration revised guidelines on "Model Trauma System Planning and Evaluation" to aid states in the development and evaluation of regional trauma systems. In 2008, the ACS-COT system and planning committee developed documents on optimal elements, integration and assessment for regional trauma systems.[14]

United Kingdom

In 1988 the Royal College of Surgeons of England reported that management of the severely injured in that country left much to be desired[15]. It was suggested that up to one-third of deaths occurring after major injury were potentially preventable. Subsequently the College of Surgeons made recommendations which addressed many aspects of the system of care. These recommendations related to:

❑ prehospital care

❑ hospital care

❑ quality assurance and audit

This situation was unchanged in 2007 when the National Confidential Enquiry into Patient Outcome and Death (NCEPOD) published its executive summary and principal recommendations in a document called Trauma: Who Cares? (2007)[16]

In a more recent development, the Royal College of Surgeons of England published "Regional Trauma Systems- Interim Guidance for Commissioners, the intercollegiate group on trauma standards" in December 2009. This document highlights the development of standards and provides guidance to support the planning and delivery of high-quality trauma care in the U.K.[17] The trauma-system model is built upon the results of ongoing health care for the London major trauma project. A national process for the delivery of regional trauma systems will be led by the National Director for Trauma Care.[17]

The following guidelines recognise the international precedents, particularly those of the Australian NRTAC Working Party and Victorian State Trauma Systems and draw heavily on their work and recommendations.

While the trauma system comprehensively covers all injuries, an inadequate trauma system compromises outcomes particularly amongst those with injuries that pose a threat to life or risk of significant disability.

These guidelines, therefore, which aim to optimise patient outcomes, are particularly directed towards patients with major or severe trauma.

Prehospital Care

Prehospital care is a fundamental component of the system of care and the process where an injured patient enters and first interacts with the trauma system.

While most prehospital care will be delivered by ambulance officers, in many geographic areas, the participation of general practitioners in this process is both desirable and necessary[18].

An effective and efficient prehospital care service ensures that patients are treated promptly and appropriately. Essential elements of such a service include:

❑ readily accessible by the public via the use of a well known single emergency telephone number

Calling a single number, such as 111, should immediately put the caller on line to an experienced prehospital triage person who can interpret the request for assistance and who is familiar with the vehicles and personnel available to respond.

❑ prompt dispatch and arrival of appropriately trained and staffed prehospital care resources including a fully crewed ambulance

❑ direct and immediate communication between the providers of prehospital emergency care and the hospital to which the patients are being transported

❑ clinical outcome and peer review of the process of prehospital care

Triage

Triage is the process of sorting patients according to the severity of their injuries. When attempting to match patient requirements and system resources such a process is essential. The ideal triage tool would be applied quickly and easily under field conditions. The goal is to get the patient to the right hospital at the right time.[19]

Many methods of sorting patients exist and the process can take place both in the field and at the facility to which the patient is first taken. In general there are three methods of sorting patients:

Physiological Criteria

Physiological triage is based on the present state of vital signs of the patient. It thus sorts patients according to the immediate threat to life. This is usually appropriate in the field as it is simply performed and requires no investigative process.

Prehospital care providers must assess vital signs and level of consciousness. The presence of the following signs indicates the potential for major injuries to be present and the requirement for the patient to be expeditiously transported to an appropriate hospital.

❑ Respiratory distress - less than 10 or more than 30 breaths per minute and/or cyanosis

❑ Systolic blood pressure less than 90 or pulse greater than 130

❑ Difficulty in arousal, or falling level of consciousness, GCS<13

While initial management including provision of an airway, oxygen, and stopping external bleeding is important in the field, it should be recognised that stabilisation of the severely injured can not be accomplished at the roadside. If any of the above criteria are met, the patient should be regarded as having potentially major trauma with immediate threat to life and be taken directly to a facility identified as having a capability to stabilise or definitively manage severe trauma, usually a district or advanced trauma service.

CHILDREN:
In children, the same general principles apply. However, physiological criteria must be taken in context of both the age and physical size of the child, as well as specific paediatric differences like relative resistance to hypotension. A paediatric trauma triage tool which uses both physiological and anatomic criteria to identify severe injury should be used.

Anatomical Criteria

Specific injuries or injury complexes signify major forces have been involved and there is potential threat to life. These are not usually apparent in the field and this form of triage has particular relevance when the patient is being assessed at the first facility, particularly if that is not an advanced trauma service.

Some specific injuries will require transfer of the patient to a district or advanced trauma service. Possible examples include:

- ❑ Penetrating injury to head, neck, chest, abdomen, perineum, or back

- ❑ Head injury with coma, a dilated pupil, open head injury, or severe facial injury

- ❑ Chest injury with flail segment or subcutaneous emphysema

- ❑ Abdominal injury with distension and/or rigidity

- ❑ Spinal injury with weakness and/or sensory loss

- ❑ Limb injury involving vascular injury with ischaemia of the limb, amputation, crush injury of the limb or trunk, or bilateral fractures of the femur, complex pelvic injury

- ❑ Burns, partial or full thickness, more than 20% in adults, or more than 10% in children

- ❑ CHILDREN: Burns, partial or full thickness, more than 10% in children

If any of these anatomical factors are recognised the patient should be transferred to a facility with the capability to not only deal with these problems but the likely associated injuries, usually a district or advanced trauma service.

Mechanism of Injury Criteria

Occasionally patients who have no overt physiological or anatomic evidence of injury nevertheless have severe trauma. Such patients may occasionally be identified because the mechanism of injury they sustained gives them a high probability of harbouring occult severe injury. Mechanism of injury should always be taken into account when considering the potential for serious injury. In particular the following mechanisms, which imply high energy transfer, should trigger very careful evaluation of the patient:

- ❑ Vehicle crash at over 60km/h
- ❑ Major deformation of the vehicle, entrapment >30 minutes
- ❑ Fatal injury in the same vehicle, ejection from the vehicle
- ❑ Fall from over 3 meters
- ❑ Unrestrained child in a motor vehicle crash
- ❑ Cyclist or pedestrian hit by vehicle at over 30km/h, driveway run-over injuries
- ❑ Caustic ingestions - liquid or powder in children
- ❑ Any mechanism causing injuries to multiple body regions
- ❑ CHILDREN: Driveway run-over injuries
- ❑ CHILDREN: Caustic ingestion – liquid or powder

In general, **field triage** will need to rely on **physiologic criteria**.

Patients in hospital also need triage. Each hospital must use criteria such as those outlined above to develop guidelines for transfer of injured patients to the next level of care. If the overall severity of injury is greater than the facilities at that hospital can cope with, transfer to a better resourced hospital will be necessary. In multiple casualty situations, patients may need to be transferred because the overall amount of trauma is greater than can be coped with locally, rather than the severity of injury in any one particular patient being too extensive to manage successfully in that facility. This in-hospital triage will generally be based on anatomic injury criteria although sometimes physiological needs (e.g. requirement for prolonged ventilation) may mandate transfer.

Transport

Transport of the injured patient requires timeliness, ongoing care, and the use of the appropriate mode of transport. This applies both with regard to the primary transport from the field and any secondary, interhospital transfer. An important principle is that transport of the critically ill should be aimed at achieving improved patient care. The quality of management during interhospital transport must be equal to, or better than at the point of referral.

Emergency ambulances for prehospital transport, staffed by two crew members, should be the standard and ongoing training and financial support should be aimed at ensuring that, where case volume is adequate, at least one of the ambulance officers is a Paramedic or Advanced Paramedic. All forms of prehospital transport need to be coordinated by a dispatch control room such that ground and air services provide an integrated

transport service. Where local conditions preclude immediate contact with ambulance control an appropriate primary response should be initiated by the health professional responsible for the injured person's care. The College of Intensive Care Medicine of Australia and New Zealand (CICMANZ), Australian and New Zealand College of Anaesthetists (ANZCA), and the Australasian College for Emergency Medicine (ACEM) have outlined the minimum standard in their document "Minimum standards for transport of the critically ill" (IC-10, 2010, *Appendix 4, pp. 71-79*)

Retrieval services have a definite role in ensuring that the quality of care during transportation is maintained or improved. The Australian and New Zealand College of Anaesthetists (ANZCA), College of Intensive Care Medicine of Australia and New Zealand (CICMANZ) Australasian College for Emergency Medicine (ACEM) have outlined the minimum standard in their document "Minimum standards for intrahospital transport of the critically ill" (PS 39, 2010 *Appendix 5, pp. 80-84*)

CHILDREN: (Guidelines on inter-hospital transport of children, Paediatric Society of New Zealand, *Appendix 6, pp. 85-92*)

Transport from the scene

Ground and air ambulance transport units must be equipped with suitable equipment for infants and children of all ages.

Inter-hospital Paediatric Intensive Care Unit (PICU) transfer

Transfer to PICU is often achieved by PICU retrieval to ensure optimal prior 'stabilisation' and 'in-flight care'.

Inter-hospital non-PICU transfer

Facilities are equipped for timely, quality transport of non-ventilated patients. Coordination between clinicians involved requires a central command and communication service. The referring doctor(s) in particular find a single point of contact valuable in facilitating timely transfer.

Hospital Management

In-hospital management of the injured requires integration of all aspects of the delivery of care. This includes ready availability of relevant specialists and a smooth transition between the Emergency Department, Operating Room, ICU, and other sites at which care is delivered. Procedures must exist for the coordination of the various surgical and non-surgical specialists, not only in the initial assessment and early definitive care phases, but also in the intensive care units, surgical wards and discharge to the community. Such coordination has the potential to improve outcomes, facilitate early rehabilitation, minimise the length of stay in hospital, and optimise the use of other hospital and primary healthcare resources.

CHILDREN:

In-hospital management of children requires the same integration of services as adults. In addition, hospital rehabilitation and prevention professionals must be involved from the commencement of PICU or ward care.

Resource Guidelines

A critical element in matching health care resources to severity of injury is the ability to categorise hospitals and other location based providers of injury care according to their capabilities. This process has been undertaken in other countries and resulted in a description of "levels of care". A principle underlying such categorisation is that any given facility should receive enough trauma patients to be able to maintain the skills, experience and expertise of both the staff and system.

Although the principles of categorising locations of care is accepted, none of the existing systems accurately describe the types of facilities and the distribution of resources found in, and relevant to, NZ. Accordingly, it has been necessary to describe types of facility unique to NZ which are similar but not identical to those found in other trauma systems.

Advanced Trauma Service (ATS)

An advanced trauma service is the hub of the trauma system. The care is based around a comprehensive (Level III) intensive care unit (refer to definition in *Appendix 7, pp. 93-106*, Minimum Standards for Intensive Care Units, IC-1, CICMANZ, 2011) committed to providing treatment to the injured. The hospital also has many 24hour/7day resources and is complete with regard to contemporary diagnostic services.

These facilities carry the major responsibility to coordinate trauma services in urban and rural areas, for given regions. Hospitals with advanced trauma services should provide a rapid retrieval and primary response service within their geographic area. Access for both road ambulance and helicopter should be readily available with direct access to the Emergency Department.

CHILDREN: ATS-C

A paediatric trauma service is defined by the presence of a PICU and range of specialised paediatric surgical, medical and support services.

Literature on children's intensive care is available from "Intensive Care Services for Children in New Zealand: tertiary paediatric review & literature summary/reference list, 1998" (*Appendix 8, pp. 107-130*).

District Trauma Service (DTS)

A district trauma service would usually be a regional base hospital. It is capable of initial management and resuscitation of injured patients and the stabilisation or definitive management of most. It has a Level II intensive care unit (*Appendix 7, pp. 93-106*) but where patients need specific trauma treatment which cannot be provided locally they would need to be transferred to an advanced trauma service.

CHILDREN: DTS-C

Paediatric district trauma services require paediatric surgery and orthopaedic services. The intensive care unit will be capable of ventilating children for short periods prior to transfer. ATS-A hospitals will achieve DTS-C status if they have paediatric surgical facilities, if not they will be best classified as RTS-C.

Rural Trauma Service (RTS)

A rural trauma service would usually be based at a smaller provincial hospital. It is capable of initial management and resuscitation of injured patients and the stabilisation or definitive management of many. It has a Level I intensive care unit (*Appendix 7, pp. 93-106*) and where patients need ventilation for longer than 24 hours or have injuries which cannot be treated locally they would need to be transferred to an advanced trauma service.

CHILDREN: RTS-C

Children presenting to RTS-C facilities will generally require transfer to an alternative facility, usually ATS-C, where they require complex surgery, ventilation, rehabilitation and prolonged hospital stay.

Basic Trauma Service (BTS)

These facilities are non-specialist based. Small rural hospitals run by general practitioners and urban urgent care centres fall into this category as well as the services provided by rural GPs. Injured patients may present to these facilities because there are no alternatives, or because they are perceived to be appropriate by the patient. They are able to initiate resuscitation of an injured patient but would almost always need to transfer the patient to a more extensively resourced facility. This could be either a district or advanced trauma service depending on location.

RECOMMENDED MINIMUM RESOURCE REQUIREMENtS FOR DELIVERY OF TRAUMA CARE AT DIFFERENT LEVELS OF TRAUMA SERVICE PROVISION (ADULT)

Advanced Trauma Service	**ATS**	Specialist facilities
District Trauma Service	**DTS**	
Rural Trauma Service	**RTS**	
Basic Trauma Service	**BTS**	Non-specialist facility

Essential = E   Desirable = D

PREHOSPITAL TRANSPORT AND CARE	ATS	DTS	RTS	BTS
Triage guidelines	E	E	E	E
Communications between ambulance and hospital doctors	E	E	E	D
TRAUMA SERVICE ORGANISATION[20]				
Medical director of the trauma service	E	D	D	-
A trauma committee	E	D	D	-
Organisation chart	E	D	D	-
Written procedural guidelines	E	E	E	-
Written patient management guidelines	E	E	E	-
Surveillance data systems, Registry	E	D	D	-
Injury management data systems	E	D	D	-
Trauma education & research	E	D	E	-
Emergency preparedness	E	E	E	E
Quality Improvement and Performance Assurance	E	E	E	-
STAFFING				
Doctors present in the hospital 24 hours	E	E	E	-
Doctors on call 24 hours	E	E	E	E
Doctors with EMST/ATLS®[21] or PRIME training	E	E	E	E
Nursing staff with trauma training	E	E	E	D
(e.g. the Trauma Nursing Core Course, TNCC)				
Specialists available for resuscitation and early management				
emergency medicine	E	E	E	D
surgery	E	E	E	-
anaesthetics	E	E	E	-
intensive care	E	E	D	-
Access to Surgical Specialties				
general	E	E	E	-
orthopaedic	E	E	E	-
obstetric & gynaecological	E	E	E	-
cardiothoracic	E	-	-	-
neurosurgical	E	-	-	-
ophthalmic	E	D	-	-
ORL	E	D	-	-
plastic	E	D	-	-

oral-faciomaxiliary/Dental	E	D	-	-
urological surgery	E	D	-	-
paediatric surgery	E	D	-	-
burn surgery	E	D	D	-
vascular	E	D	D	-
spine surgery	E	D	D	-
On call access to other specialists				
radiology	E	E	E	-
medicine	E	E	E	-
paediatrics	E	E	D	-
haematology	E	D	-	-
infectious disease	E	D	-	-
nephrology	E	D	-	-
pathology	E	E	D	-
psychiatry	E	E	D	-
critical medicine	E	E	D	-
social work, child protection and family support	E	E	D	-

EMERGENCY DEPARTMENT

General criteria as established in ACHS/NZCHS
Guidelines: Emergency Medical Services[22]

ED open 24 hours	E	E	E	-
Radio communication with ambulance	E	E	E	D
Ambulance access (same level)	E	E	E	E
On site aircraft access	E	E	E	D
Triage on arrival	E	E	E	E
Documented policies and protocols	E	E	E	-
Research and education programs	E	D	D	-
Designated medical director	E	E	E	-
Specialist doctor (FACEM)				
in house or on call 24 hours	E	E	D	-
Trained trauma nurse in charge of nursing				
resources for trauma	E	E	D	-
Trained nurses and aides	E	E	E	D
Radiology in proximity	E	E	E	D
Equipment including but not limited to:				
Resuscitation				
blood warmer	E	E	E	D
portable ventilator	E	E	E	D
airways and endotracheal tubes	E	E	E	E
laryngoscope	E	E	E	E
oxygen supply	E	E	E	E

IV fluids and drip sets	E	E	E	E
portable monitor/ defibrillator	E	E	E	E
cricothyroidotomy set	E	E	E	E
intercostal tubes and drains	E	E	E	E
intraosseus needles	E	E	E	E
intraosseus drills	E	E	E	E
Diagnostic/monitoring				
capnography	E	E	E	E
focused abdominal sonography in trauma	E	E	D	D
invasive BP	E	E	D	D
mobile x-ray	E	E	E	D
portable pulse oximeter	E	E	E	D
portable non-invasive BP monitor	E	E	E	D
12-lead ECG	E	E	E	E
auroscope	E	E	E	E
ophthalmoscope	E	E	E	E
cardiac monitor	E	E	E	E
Miscellaneous				
blood refrigerator	E	E	E	D
infusion pump	E	E	E	D
humidifier	E	E	E	D
full range of splints	E	E	E	D
protective clothing	E	E	E	D
photocopier and fax	E	E	E	E
internet access	E	E	E	E
minor operations set	E	E	E	D
nebuliser	E	E	E	D

INTENSIVE CARE UNIT

Staffed and equipped in accordance with CICMANZ IC-1, (*Appendix 7, pp. 93-106*) Minimum Standards for Intensive Care Unit (L III = Level III)	L III	L II	L I	-

RADIOLOGY AND MEDICAL IMAGING

General criteria as established in the ACHS/NZCHS Guide[22]

Equipment including but not limited to:

angiography	E	D	-	-
sonography	E	E	E	-
transoesophageal echo	E	E	D	-
nuclear scanning	E	D	-	-
CT scanning	E	E	E	-
MRI	E	D	-	-
teleradiology	E	E	E	E
Plain films	E	E	E	E

OPERATING THEATRES AND RECOVERY ROOM

Anaesthetic capability according to ANZCA (*Appendix 9, pp. 131-138*)
Recommendations on Minimum Facilities for Safe Anaesthesia Practice in Operating Suites

Staff immediately available 24 hours	E	E	E	-

LABORATORY SERVICE

General criteria as established in the ACHS/NZCHS Guide[22]

Available 24 hours a day	E	E	E	-
Services including but not limited to				
standard analyses of blood etc	E	E	E	D
blood typing and cross matching	E	E	E	-
coagulation studies	E	E	E	-
blood bank	E	E	E	-
blood gas and pH	E	E	E	-
serum and urine osmolality	E	E	E	-
microbiology	E	E	E	-
drug and alcohol screening	E	E	E	-
Massive transfusion protocol	E	E	D	D

QUALITY ASSURANCE, TRAINING AND RESEARCH

General criteria as established in the ACHS/NZCHS Guide[22]

QA organisation structure	E	E	E	E
Multidisciplinary trauma audit	E	E	E	E
Use of clinical indicators	E	E	E	-
Perform trauma outcome studies	E	E	D	-
Undertake trauma research programs	E	D	D	-
Run trauma training programs				
doctors	E	D	D	D
nurses	E	D	D	D
allied health personnel	E	D	D	D

COMMUNITY EDUCATION	E	E	E	E

DISASTER PLAN	E	E	E	E

RECOMMENDED MINIMUM RESOURCE REQUIREMENTS FOR DELIVERY OF TRAUMA CARE AT DIFFERENT LEVELS OF TRAUMA SERVICE PROVISION (Paediatrics)

Advanced Trauma Service-Child	ATS-C
District Trauma Service-Child	DTS-C
Rural Trauma Service-Child	RTS-C

Essential=E   Desirable=D

PRE-HOSPITAL TRANSPORT AND CARE	ATS-C	DTS-C	RTS-C
Paediatric trauma guidelines	E	E	E
Triage guidelines for children	E	E	E
Communication between ambulance and hospital doctors	E	E	E

TRAUMA SERVICE ORGANISATION			
Medical Director of Paediatric Trauma	E	D	-
Paediatric Trauma Committee	E	D	-

STAFFING			
Doctors with Advanced Paediatric Life Support (APLS) training	E	E	E

Specialists for Resuscitation and early Management:

Paediatric Emergency Medicine	E	D	-
PICU	E	-	-
Paediatric anaesthesia	E	E	-

Access to surgical specialties:

Paediatric Surgery	E	E	-
Paediatric Orthopaedic Surgery	E	E	-
Paediatric Urology	E	D	-
Paediatric Neurosurgery	E	-	-
Paediatric Cardio-thoracic Surgery	E	-	-
Paediatric ORL	E	D	-
Paediatric Plastics Surgery	E	D	-

On call access to:

Paediatric Radiology	E	E	D
Paediatric Pathology	E	-	-
Paediatric Infectious Disease	E	-	-
Paediatric Endocrine & Metabolic	E	-	-
Paediatric Nephrology	E	-	-
Paediatric Respiratory	E	-	-
Paediatric Psychiatry	E	-	-
Paediatric Haematology	E	-	-
General Paediatric	E	E	D
Spinal Surgery	E	-	-
Rehabilitation Specialist	E	-	-

EMERGENCY DEPARTMENT			
Children's ED	E	-	-
Documented paediatric policies and procedures	E	E	D
Research and Education programmes	E	D	-
Equipment specific to children of all ages	E	E	E

INTENSIVE CARE UNITS			
PICU	E	-	-

MEDICAL IMAGING			
Paediatric radiology equipment	E	D	-
Paediatric interventional radiology facilities	E	-	-

OPERATING THEATRES AND RECOVERY ROOM			
Paediatric anaesthesia	E	E	-

QUALITY ASSURANCE, TRAINING AND RESEARCH

Paediatric QA organisation structure	E	D	-
Paediatric multi-disciplinary trauma audit	E	D	-
Paediatric trauma outcome studies	E	D	-
Paediatric research programmes	E	D	-
Run paediatric trauma training programmes	E	D	-

SPECIALISED REQUIREMENTS

Trauma System Coordination

Coordination and integration of trauma care is an essential component of the system. In many areas the equipment and medical skills for optimum management already exist but are not linked in an ideal fashion.

The establishment of regional emergency care committees, based on advanced trauma services and integrated at a national level is vital. These bodies must ensure linkages are established and maintained between various components of the trauma care system. They must also relate at a national level to ensure that integration occurs even across regional boundaries.

CHILDREN:
At least one paediatric representative should be present on each committee.

Data Collection

Standardised information is required covering the characteristics of patient demographics, injuries sustained, pre-hospital and acute hospital care, and outcomes. The ability to systematically and reliably collect such data is widely regarded as an essential component of trauma systems[23] – to determine resource allocation and prioritisation, evaluate trauma services and impact of interventions, and for multidisciplinary clinical audit.

A number of data collection models are possible ranging from national minimum data sets on injury to detailed epidemiological register-based data sets (e.g. the American College of Surgeons National Trauma Data Bank, NTDB). Systems of varying complexity have been implemented in settings as diverse as Australia, US, Canada, Mexico, Ghana and Uganda[24-26]. There is substantial support for and consensus regarding the components of a nationally coordinated system capturing acute trauma data.

It is recommended that a national minimum data set on injury be instituted and comprehensive trauma registries be maintained by all advanced and district trauma services. In addition to the immediate benefits noted above, such a population-based data source constitutes a unique and valuable addition to the proposed national injury surveillance system.

CHILDREN:
The minimal data set for children should include additional items pertinent to injury prevention in the young.

Remote Geography

In rural and remote areas the role of the appropriately trained general practitioner in being able to bring advanced life support skills to the injured patient needs to be recognised. In many such areas prehospital care resources are limited. General practitioners who identify their personal commitment to provide care to the injured must be encouraged to be part of the trauma system. The following factors need to be considered:

❑ Initial and ongoing education in trauma care must be provided. Community education in basic first aid skills is essential. GPs should be encouraged to undertake specific trauma training, such as the EMST/ATLS® Course[21] and Primary Response in Medical Emergencies (PRIME) programme[27] and subsequent refreshers, and be conversant with ambulance service training, to ensure that their background knowledge and skills are adequate.

❏ Any financial disincentives for healthcare providers to participate in trauma care must be recognised and removed. It must be appreciated that the severity of trauma or even its existence can not be confirmed prior to initiating calls for assistance. On some occasions GPs may have to travel considerable distances to determine that no significant injuries have occurred. At other times equipment must be used to provide adequate care. Satisfactory methods of funding such time and equipment must be available.

❏ GP participation in the delivery of trauma care should be on a prearranged basis as part of the system, not on an ad hoc basis.

CHILDREN:

Consideration should be given to support rural GP participation in paediatric courses, such as Advanced Paediatric Life Support (APLS).

Retrieval and Transfer Services

Provision of retrieval services should take account of certain principles:

❏ As with ground based services all air ambulance services should meet minimum standards (e.g. those promulgated by the NZ Society for Air Rescue Trusts or CICMANZ IC10: Minimum standards for transport of the critically ill, *Appendix 4, pp. 71-79*).

❏ Services should be provided based on the medical facilities to which the patient is being transported. Thus patients with major injury should not be retrieved to basic trauma services and the most advanced retrieval services should be linked to advanced trauma services.

❏ Destination policies should be developed to ensure appropriate patients are transported to appropriate facilities. This may mean bypassing a smaller hospital.

❏ There should not be more than one overall service functioning in a given area at any one time (multiple aircraft may be used).

❏ Geographic considerations need to be taken into account as physical distances often do not reflect patient recovery difficulties and transport time.

❏ Allocation of resources should broadly reflect patient demography and population bases.

❏ Coordination and cooperation between different transport services is essential to ensure the efficient and timely transfer of patients.

Prehospital retrievals

❏ District and advanced trauma services should be supported by 24 hour/7day EMS ambulance helicopters.

❏ CHILDREN: specialised paediatric equipment, for all ages, should be present on all EMS ambulance helicopters. Paramedics on EMS helicopters should receive specific paediatric training.

Interhospital transfers

❑ All advanced trauma services should be supported by a retrieval/transport service capable of providing 24hour/7day intensive acre level transfers.

❑ These tertiary retrieval/transport services should take responsibility for providing transfers for hospitals within their region for hospitals which cannot provide such transport themselves.

❑ The tertiary retrieval/transport services should provide a coordination service for hospitals and flight services within their region when requested to do so.

❑ Interhospital transport for the critically ill should be crewed by personnel deemed appropriate by the unit carrying out the service. The transport team must be appropriately trained and oriented for flight or road transfers and must be capable of providing the level of care needed for the acuity of the patient.

❑ CHILDREN: whenever possible, children should be transferred by dedicated paediatric inter-hospital transfer services. Coordination between the many clinicians involved requires a central command and communication service. The referring clinician(s) in particular find a single point of contact valuable in facilitating timely transfer.

District trauma services with Level II ICUs may provide interhospital transport utilising road ambulances, helicopters or fixed wing to supply a service for their region. The level of local service will rely heavily on the commitment and expertise of the personnel involved.

All aspects of these transports must comply with the document "Minimum Standards for "Transport of the Critically Ill" (*Appendix 4, pp. 71-79*) and "Minimum Standards for the intrahospital transport of the Critically Ill" (*Appendix 5, pp. 80-84*).

Emergency Departments

Emergency Departments comprise distinct physical facilities and organisational structures established in hospitals to deliver emergency medical care to the acutely ill and injured. (Statement on responsibility for care in Emergency Departments, ACEM policy nr-18, *Appendix 10, pp. 139-142*).

The role and level of function of a hospital based emergency service depends on various factors , including the type of hospital in which it is located, its geographical location and the place of the hospital within a health system network. The role delineation of an Emergency Department is a major determinant of the level of staffing, resources and physical design required. A hospital based emerency service must have facilities and functions greater than the minimum standard for "Rural Emergency Service" role delineation in order to be considered an Emergency Department. (Statement on Emergency Department Role Delineation – ACEM, *Appendix 11, pp. 143-147*).

The features of an Emergency Department, including structure, staffing, patient care, network role and access to specialist consultation and support services are well defined (ACEM policy on standard terminology, *Appendix 12, pp. 148-152* and Guidelines on Emergency Department Design, *Appendix 13, pp.153-177*).

Neurosurgery

Severe head injuries should be treated at an advanced trauma service which will have a Level III ICU and a CT scanner and be able to provide all forms of emergency intervention. Moderate head injuries may be treated in a district trauma service which will have a Level II ICU and a CT scanner, in consultation with the regional neurosurgical service. Immediate neurosurgical intervention may be required however. Advanced trauma services must have the capability for craniotomy and immediately life-saving neurosurgical intervention. Surgical staff responsible for trauma must ensure that their procedures and skills are continually updated such that a contemporary standard of care can be provided.

Intracranial pressure monitoring can aid the management of severe head injuries. Where neurosurgical services are not available (in district trauma centres) this form of monitoring should be available and its use discussed with the regional neurosurgical service.

When patients with severe head injury present to less resourced facilities than an advanced trauma service they should be managed initially according to the principles of the EMST® Course and as outlined in the document "The management of acute neurotrauma in rural and remote locations: A set of guidelines for the care of head and spinal injuries" published by the Neurosurgical Society of Australasia 2009[29] (endorsed by RACS).

Burns

Patients with significant burn injuries should be managed in a Regional Burn Unit (RBU). Although burn injury represents a major threat to life, initial resuscitation and management can be performed in either a district or advanced trauma service and the patient can then be transferred appropriately. The guidelines for initial assessment and management of burn injuries and referral pathways to RBU (Middlemore, Waikato, Lower Hutt and Christchurch) can be found at the national burn service website (*Appendix 14, pp. 178-189*). Patients with the following injuries require referral to RBU:

Burns greater than 10% Total Body Surface Area (TBSA), or 5% TBSA in a child

Burns of Special Areas – Face, Hands, feet, Genitalia, Perineum and Major Joints

Full thickness burns greater than 5%

Electrical Burns

Chemical Burns

Burns with associated inhalational injury

Circumferential burns of limbs or chest

Burns at the extremes of age – children and the elderly

Burn injury in patients with pre-existing medical disorders which could complicate management, prolong recovery or effect mortality

Any burn associated with other blunt or penetrating trauma

It is important that coexisting blunt or penetrating trauma be recognised and managed prior to transfer. Prior communication with the burns unit is essential such that basic care of the burn is in line with the policies of that unit. Access to the National Burn Centre (NBC) for the care of the most severe burn injuries is via discussion with the RBC first.

In the event of a national burn emergency, guidelines are published in 2011 by the Ministry of Health under National Health Emergency Plan: Multiple Complex Burn Action Plan (***Appendix 15, pp. 190-224***).

Plastic Surgery

In addition to burn care, Plastic Surgery is involved in the soft tissue coverage of traumatic wounds, hand injuries, craniofacial injuries (often in conjunction with neurosurgery and maxilla-facial surgery) as well as the salvage of the mangled extremity, particularly the upper limb. Both adult and paediatric patients are cared for within the Plastic Surgery service.

Management of these patients typically occurs at one the four Plastic Surgery Units in New Zealand (Auckland, Hamilton, Hutt Valley and Christchurch). Transfer of patients should follow initial stabilization and management of other life-threatening 'core' injuries (head, chest and abdominal).

Successful management of mangled extremities requires a multidisciplinary approach but follows stabilization and treatment of other life-threatening blunt and penetrating trauma.

Spinal injuries

Spinal injuries can occur in isolation but often occur in a context where other injuries are possible. Patients should be identified as trauma patients first and spinal injury patients second. When the spinal injury has been stabilised and associated injuries have been identified and managed it is important that patients with spinal cord injuries are transferred expeditiously to the appropriate tertiary referral spinal unit. Hospital based health care providers at all levels should be familiar with the procedures and guidelines for the relevant spinal unit to ensure that spinal injury patients receive appropriate and timely care. All patents with proven or potential spinal injury should be admitted. Acute spinal service should be consulted if there is evidence of spinal cord damage or concern regarding spinal stability. The guidelines established by the Neurosurgical Society of Australasia[29] are also relevant here.

Cardiothoracic Surgery

Cardiothoracic surgery is a specialty infrequently required in trauma management. Thoracic injuries such as blunt thoracic aortic rupture in particular, are now managed by combined vascular and interventional radiology specialties. Survivors of this injury are usually stable and definitive repair is an urgent, rather than an emergency problem. These patients will need to be managed by an advanced trauma service. Some conditions, however, which might optimally be treated by a cardiothoracic service, will not fall into this category. Penetrating chest injuries, for example, may on occasion require emergency intervention.

When patients with emergency cardiothoracic surgical problems present to less resourced facilities than an advanced trauma service they should be managed initially according to the principles of EMST. In district and rural trauma services, it is vital that the capability for thoracotomy and limited cardiac and thoracic surgery exist.

Paediatrics

Management of the injured child presents unique problems. The physiology, anatomy and psychology of young children all vary significantly from that of adults and these differences must be appreciated in their treatment. To provide optimal management for an injured child also requires appropriate care of the child's family. All children with serious injury should be transferred to a facility with resources and expertise for managing injured children. Tertiary referral to a specific paediatric facility should occur with particularly complex injuries. Recognising that a significant number of patients presenting to prehospital care providers and trauma facilities will be children, those initially assessing them and those involved in definitive management must have appropriate knowledge, training, equipment, facilities and resources to meet paediatric needs.

Services for the Elderly

The elderly already constitute a significant demographic group in the population. Trends for the size of this group to increase will continue throughout the next 25 years. In road trauma, and in other trauma mechanisms, the numbers of injuries per 10,000 population rises significantly after the age of 65. Such patients often consume considerable resources. Because their physiology is less resilient than that of younger patients they are less able to withstand inadequate care and therefore a lower threshold for eliciting a trauma call should be considered. While recognising that supportive treatment may well be appropriate in some very old or significantly disabled people, poor outcomes are common if patients with the potential for good recovery are not treated actively. Inadequate treatment in this group will often generate substantial costs to the community.

Rehabilitation

Significant rehabilitation resources are required to maximise the recovery of the injured person. Efforts are needed in rehabilitation of trauma patients after the acute treatment phase is completed. Most injury related disabilities are due to trauma in the extremities. Having access to basic physiotherapy and occupational therapy are vital at all hospital levels. Mental distress from trauma can result in long-term psychological problems. It is recommended that psychological counselling be available at all hospital levels.[27] Specialised rehabilitative services to manage spinal injuries, cognitive dysfunction and disordered communication should be available. Knowledge of community rehabilitation services and assistance to help patients accessing these services should be available. Effective linkages need to exist between acute medical care, primary care practitioners, family support, ongoing rehabilitation and return to community life.

CHILDREN:
Rehabilitation for severely injured children should commence at the start of their hospitalisation, even within PICU. This requires an on-site rehabilitation service with ATS-C facilities.

Transfer from a Basic Trauma Service → a District or Advanced Trauma Service

The underlying principle supporting patient transfer is that it must be considered to improve care and subsequent outcome. Initial resuscitations should be commenced and patient should almost always be transferred. During transport, the clinical management should equal, or better, management at the referral point.

1. Physiologic status

   Consider transferring patients who, 60 minutes or more after intervention, have:

i) Glasgow Coma Scale < 13 and/or abnormal pupillary responses or localising signs

   ii) Systolic blood pressure < 90mmHg in adults (SBP < 50mmHg or not palpable in children)

   iii) Respiratory rate < 6 or > 30bpm; SaO2 < 93% on 4L oxygen

2. Specific anatomical injury, for example

   Consider transferring patients who have:

   i) Head injuries.

   ii) Spinal injuries with paralysis or potential paralysis

   iii) Burns > 5% full thickness BSA, > 10% partial thickness BSA or special area burns

   iv) Flail chest, haemopneumothorax or widened mediastinum

   v) Multiple fractures

   vi) Severe abdominal trauma

3. Any other identified injury unable to be managed or treated locally

It is important to note that assessment of serious injury in pre-school children and the elderly is more difficult. In these age groups transfer should be considered at an earlier stage.

Transfer from a Rural Trauma Service → an Advanced Trauma Service

The underlying principle supporting patient transfer is that it must be considered to improve care and subsequent outcome. During transport, the clinical management should equal, or better, management at the referral point.

1.   Patients for whom there is no service at the Rural Trauma Service

     Consider transferring patients who have:

     i)   Head injuries: For example patients requiring urgent (but not immediate) neurosurgical intervention (e.g. surgery for a subdural haematoma)

     ii)   Spinal injuries: For example patients with significant spinal cord or major peripheral nerve injuries requiring specialist repair and rehabilitation skills

     iii)   Burns: For example adult patients with > 10% TBSA burns, > 5% full thickness burns, > 5% TBSA burns in children, or special area burns

     iv)   Cardiothoracic injuries: For example patients requiring urgent (but not immediate) cardiothoracic diagnosis and intervention (e.g. investigation and treatment of thoracic aortic rupture)

     v)   Musculo-skeletal injuries: For example patients requiring specialised surgery for spinal column injuries or any limbs with a compromised circulation

     vi)   Soft tissue injuries: For example patients requiring treatment for major soft tissue injuries or microvascular free flap reconstructions

     vii)   Abdominal injuries: For example patients requiring definitive hepatic surgery after initial emergency perihepatic packing or resectional debridement

     viii) Urogenital injuries: For example patients requiring renal angiography and/or complex reconstructions in conjunction with injuries to other body regions

     ix)   Maxillofacial injuries: If combined with neurosurgical or soft tissue injuries requiring surgical intervention

     x)   Ocular injuries: For example patients requiring vitreo-retinal surgery, complex oculo-plastic or complex lacrimal repairs

     xi)   Vascular injuries: For example patients requiring specialised surgery for complex aortic or renal artery injuries

     xii)   Complex pelvic and multiple orthropaedic injuries: For example patients requiring angioembolisation and stabilisation surgery

     xii)   Diving related illnesses

2.   Patients for whom the duration and intensity of care is greater than can be provided at a Rural Trauma Service

     Consider transferring patients who have:

     i)   Head injuries needing ICP monitoring

     ii)   Any patient requiring ventilation for >24 hours

It is important to note that assessment of serious injury in pre-school children and the elderly is more difficult. In these age groups transfer should be considered at an earlier stage.

Transfer from a District Trauma Service → an Advanced Trauma Service

The underlying principle supporting patient transfer is that it must be considered to improve care and subsequent outcome. During transport, the clinical management should equal, or better, management at the referral point.

Patients for whom there is no service at the District Trauma Service.

Consider transferring patients who have:

i) Head injuries: For example patients requiring urgent (but not immediate) neurosurgical intervention (e.g. surgery for a subdural haematoma)

ii) Spinal injuries: For example patients with significant spinal cord injuries requiring specialist intervention and rehabilitation skills

iii) Burns: For example adult patients with > 5% full thickness BSA burns, >10% partial thickness BSA burns, and children with >5% TBSA, or special area burns

iv) Cardiothoracic injuries: For example patients requiring urgent (but not immediate) cardiothoracic diagnosis and intervention (e.g. investigation and treatment of thoracic aortic rupture)

v) Musculo-skeletal injuries: For example patients requiring specialised surgery for complex pelvic or spinal column injuries

vi) Soft tissue injuries: For example patients requiring treatment for major soft tissue injuries or microvascular free flap reconstructions

vii) Abdominal injuries: For example patients requiring definitive hepatic surgery after initial emergency perihepatic packing or resectional debridement

viii) Urogenital injuries: For example patients requiring renal angiography and/or complex reconstructions in conjunction with injuries to other body regions

ix) Maxillofacial injuries: If combined with neurosurgical or soft tissue injuries requiring surgical intervention

x) Ocular injuries: For example patients requiring vitreo-retinal surgery, complex oculo-plastic or complex lacrimal repairs

xi) Vascular injuries: For example patients requiring specialised surgery for complex aortic or renal artery injuries

xii) Diving related illnesses

It is important to note that assessment of serious injury in pre-school children and the elderly is more difficult. In these age groups transfer should be considered at an earlier stage.

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ROYAL AUSTRALASIAN COLLEGE
OF SURGEONS

QUALITY AND SAFETY CHALLENGE 2012
PROJECT IMPLEMENTATION PLAN

Project title:	Revise the New Zealand Trauma Guidelines
Project Description:	Revise, publish and distribute an updated version of the New Zealand Trauma Guidelines
Contracted agency:	Royal Australasian College of Surgeons
Key contact:	Justine Peterson, New Zealand Manager
Best contact number:	04 385 8247, 027 279 7455
Email:	Justine.Peterson@surgeons.org

What are you planning to do?	1. Establish multi disciplinary project working group to undertake Guideline review
	2. Complete literature review/gap analysis of 2003 Guidelines vs 2012 recommended best practice
	3. Determine data/methodology to evaluate impact of revised Guidelines
	4. Produce a revised draft Guideline document for consultation
	5. Complete a consultation process of revised draft Guideline and incorporate feedback into final revised Guideline as appropriate
	6. Publish and distribute final revised Guideline document
	7. Support distribution of Guidelines via planned communication activities

Why are you doing this? (*problem definition*)	Trauma is a major health burden in New Zealand. Approximately 2500 New Zealanders die per year as a result of trauma and approximately 30,000 require hospital care for their injuries. Trauma is the leading cause of death and hospitalisation between the ages of 5 to 45[1]. It is estimated that trauma patients in New Zealand have a 20% rate of preventable mortality as a result of the lack of an organised system of major trauma care throughout the country. The rate of preventable morbidity is not known but is expected to be many times greater than the predicted preventable mortality rate. Of all trauma admissions to hospital, approximately 10% have severe or life-threatening injuries. These patients are time-critical, highly vulnerable to any deviation from best practice in early decision-making and service provision, and require the comprehensive input of specialised trauma services. Major trauma care is fragmented in its quality and consistency throughout New Zealand and this is undoubtedly impacting upon patient morbidity and mortality. The New Zealand Trauma Guidelines were developed by RACS with support from the Ministry of Health in 1994 and have been revised twice in 1996 and 2003. With the recent development of a Major Trauma National Clinical Network updated contemporary guidelines are required to support a nationally consistent approach to deliver safe and appropriate trauma care in New Zealand.
What is the scale and scope of your project? (*eg we will be implementing this in three wards across two different hospitals, or analysing the records of 200 patients*)	The project will commence the review phase in March 2012. This will involve the establishment of a multi disciplinary project working group. The revision will be a consultative exercise led by the RACS NZ Trauma Committee and will incorporate feedback from a range of trauma care providers and key stakeholders. The project will provide revised New Zealand Trauma Guidelines for national publication in July 2012. In addition a Communication Plan will be developed and implemented to support the distribution of hard copies of the Guidelines and the placement of the Guidelines on websites etc.
What is your current baseline position?	The "Guidelines for a Structured Approach to the Provision of Optimal Trauma Care" RACS NZ Trauma Committee May 1994, last revision 2003 is the current national guideline document in circulation in New Zealand.

What are your key deliverables and milestone date?	Deliverable	Milestone date
	Phase 1. Review of the Guidelines • Complete project implementation plan as per Commission template	End March 2012

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[1] Injury as a leading cause of death and hospitalisation. New Zealand Injury Prevention Research Unit; Fact Sheet Number 38, 2007. ISSN 1172-8388

	• Establish multidisciplinary project working group to undertake guideline review	End of March 2012
	• Complete literature review/gap analysis of 2003 Guidelines vs 2012 recommended best practice	April 2012
	• Determine data/methodology to evaluate impact of revised Guidelines	April 2012
	• Updated first draft Guidelines	May 2012
	• Undertake consultation/feedback process on first draft updated Guidelines	May/June 2012
	• First draft revised based on feedback	June 2012
	• Final updated Guidelines ratified and available to publish	July 2012
	Phase 2. Distribution of Guidelines • Communication Plan developed to support distribution of revised Guidelines – this will include communication activities identified e.g. placement on websites, support for providers, education opportunities	30 June 2012
	• Publication and distribution of revised Guidelines	August 2012
	Phase 3. Evaluation • Monitor change in practice and implement ongoing updates to Guidelines as required	Ongoing with support as negotiated with Major Trauma National Clinical Network

Who are your key stakeholders in this project and what is your approach to getting them involved?	Stakeholder	Approach
	20 DHBs including clinical and management staff from relevant service areas	Will have the opportunity to review a draft
	ACC and other government agencies; providers of major trauma services particularly pre-hospital e.g. ambulance providers, primary care providers	Several are included in project group. Others are represented on RACS Trauma Committee, so will review work of project group.
	Various health professional Colleges e.g. ACEM	Several are included in project group. Others are represented on RACS Trauma Committee, so will review work of project group
Measurement and evaluation activities to be conducted	Activity	Date to be completed
	Determine data/methodology to evaluate impact of revised Guidelines	April 2012
	Process agreed with Major Trauma National Clinical Network to complete post project evaluation of impact of the revised Guidelines	July 2012 (impact evaluation likely to occur 6-12 months following publication of the revised Guidelines)
When will you be able to see a difference?	Difference we expect to see	Estimated timeframe to make this difference
	Increased awareness of national trauma quality improvement processes amongst key stakeholders.	Three months following publication and distribution of revised Guidelines
	Improved inter service communication and links between service providers.	Three months following publication and distribution of revised Guidelines
	Improved management and clinical outcomes for major trauma patients.	Six months following publication and distribution of revised Guidelines
What are the risks you have identified and how will you mitigate those risks?	Risk	Mitigation
	Project extends beyond its designated timeframes	Accurate predication of tasking, appropriate scheduling of project working group meetings and frequent reassessment of progress.
	Poor buy-in of key stakeholders	Undertake comprehensive consultation on proposed draft revisions. Implement robust communication plan to support the publication and distribution of the revised Guidelines.
	Alignment of revised Guideline with	Utilise methodologies which review

	other inter related regional and national Guidelines	contemporary best practice and apply appropriately to New Zealand context.
What is your projected budget for this project?	$16,500 GST EXCLUSIVE	
Are there any issues or concerns that you would like to raise with us at this stage?		

ROYAL AUSTRALASIAN COLLEGE OF SURGEONS
New Zealand Trauma Committee

Trauma Position Statements of the Trauma Committee of the
Royal Australasian College of Surgeons

List of Trauma Position Statements

Burn Injuries Position Paper

Farm Injury

Frontal Protection Systems

Gun Control

Position Paper: The Use of Chain Saws

Position Paper: Neurological Trauma in Sport

Position Paper: Railway Crossing Injuries

Quad Bikes

Road Trauma: Cycling Position Paper

Road Trauma: Motorcycle Safety Position Paper

Road Trauma: Speed Position Paper

Road Trauma: Vehicle Safety Systems Position Paper

Trauma Alcohol and Other Drugs Position Paper

Note: Position Statements are revised triennially, for the latest versions please visit
www.surgeons.org

BURN INJURIES POSITION PAPER

BACKGROUND

In the mid-1980s the Royal Australasian College of Surgeons saw that it would need to widen its role in trauma prevention and management beyond those injuries which resulted from road crashes. In July 1991, the College Trauma Committee was formed which continued the College's double commitment: prevention and mitigation of injuries, and management of injuries, extending its scope to encompass injuries resulting from all causes. The purpose of this position paper is to express a united view of the College in regards to trauma prevention and management, particularly trauma associated with burns.

This position statement recognizes the seriousness of burn injuries and emphasizes that preventive measures are paramount in all domestic and workplace settings.

POSITION

The most common causes or types of burns are:

Children:
- Hot drink scalds (mostly tea and coffee)
- Hot fluid scalds (mostly heated hot water, not tap)
- Contact with hot household appliances (ovens, hotplates, heaters)
- Contact with contained hot tap water in bath, bucket or tap

Seniors (over 70)
- Hot fluids, hot drinks, contact with running hot water – particularly from inadvertently turning on the hot tap during a fall.

Domestic:
- Hot fat
- Petrol
- Respiratory burns
- Electric
- Hot wax for hair removal
- Friction burns (treadmills)
- Hot one-minute noodles

Industrial:
- Chemical – caustic soda and hydrofluoric Acid
- Explosion after opening large drums with angle grinder

Indigenous populations:
- Scalds
- Contact
- Flame
- Friction

Prevention

Burns are very common and affect approximately 1% of the population each year. Therefore, we encourage safe practices and support prevention programs. In particular, the safe handling of flammable liquids, away from naked flames, is paramount. Properly fitted and functional smoke alarms and temperature regulators for domestic hot water supply should be obligatory. Special precautions need to be made for children and the elderly.

Royal Australasian College of Surgeons

Manual:	**Guidelines and Position Papers**	**Ref. No.:**	**FES_FEL_006**
Division:	**Fellowship and Standards**	**Approval Date:**	**June 2009**
		Review Date:	**June 2012**
Subject:	**BURN INJURIES POSITION PAPER**		

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BURN INJURIES POSITION PAPER

First Aid

Early instigation of app ropriate first ai d can limit i njury and decrease scarring and th e need fo r surgical intervention. Clean water should be applied to the b urn injured area for twenty minutes. M easures such as heating the environment to kee p the patient warm sh ould be simultaneously implemented. Wet dressi ngs have a limited effect as the layer next to the skin is quickly warmed to body temperature. If this technique is used the dressing should be ch anged each few minutes, to optimize o ngoing cooling of the wou nd. Application of ice may cause harm and should be avoided.

Referral

Early referral of appropriate patients to recognized Burn Units is recommended in line with the following Early Management of Severe Burns(EMSB) guidelines.

Patients with:

> Burns >10% Total Body Surface Area (TBSA)
> Burns >5% TBSA in children
> Full thickness burns >5% TBSA
> Burns to special areas – hands, face, feet, perineum, major joints, circumferential limb or chest burns
> Burns with inhalational injury
> Electrical burns
> Chemical burns
> Burns with pre-existing illness
> Burns associated with major trauma
> Burns at the extremes of ages, children and the elderly
> Non-accidental injury

It is acknowledged that optimal outcomes following burn injury are achieved through care delivered by multi-disciplinary teams in units dedicated to burn care.

Treatment

The College Trauma Committee strongly supports the Austra lian & New Zealand Burn Associatio n's (ANZBA) guidelines on the prevention and treatment of Burns.

IT IS RECO MMENDED that doctors who encounter burns patients in thei r practice should refer to the ANZBA website (www.anzba.org.au) which contains information on

- criteria for specialized burns treatment
- clinical guidelines
- prevention
- first aid

IT IS RECOMMENDED that doctors who are likely to encounter burn patients in their practice should attend an Emergency Management of Severe Burns (EMSB) course. The EMSB course is designed for workers in the healthcare industry that would come into contact with burns victims. This course is run by the Australian and New Zealand Burn Association (ANZBA), PO Box 5993, Stafford Heights, QLD 4053; Telephone: 61 7 3325 1030 or email info@anzba.org.au

Approver   "[Manager or Director]"
Authorizer   "[Director or EGM or Council]"

Royal Australasian College of Surgeons

Manual:	**Guidelines and Position Papers**	**Ref. No.:**	**FES_FEL_006**
Division:	**Fellowship and Standards**	**Approval Date:**	**June 2009**
		Review Date:	**June 2012**
Subject:	**BURN INJURIES POSITION PAPER**		

Royal Australasian College of Surgeons

Manual:	**Policies and Procedures**	**Ref. No.:**	**FES_TRA_2403_P**
Division:	**Division of Fellowship & Standards**	**Issue Date:**	**February 2003**
		Review Date:	**February 2006**
Subject:	**FARM INJURY**	**Revision No.:**	**0**

1.0   PURPOSE AND SCOPE

To express a united view of the College in regards to trauma prevention and management, particularly trauma in the farming environment

2.0   KEY DIRECTION STATEMENT

As a fellowship based organisation, the Royal Australasian College of Surgeons commits to ensuring the highest standard of safe and comprehensive surgical care for the community we serve through excellence in surgical education, training, professional development and support.

3.0   VALUES

- Service and Professionalism
    - performing to and upholding the highest standards

- Integrity
    - upholding professional values

- Respect and Compassion
    - being sympathetic and empathetic

- Commitment and Diligence
    - being dedicated, doing one's best to deliver

- Collaboration and Teamwork
    - working together to achieve the best outcome

4.0   BACKGROUND

As written by GW Trinca[1], in the mid-1980's, the College saw that it would need to widen its role in trauma prevention and management beyond those injuries which resulted from road crashes. In July 1991, the College Trauma Committee was formed which continued the College's double commitment: prevention and mitigation of injuries, and management of injuries, however, encompassing injuries resulting from all sources.

Recognising the nature of serious injury occurring in the farming environment, the College's Farm Injury policy was developed with the formation of the College's Trauma Committee. The most current Farm Injury policy detailed below, was ratified by College Council in February 2003.

5.0   BODY OF POLICY

The College recommends that:

1.   Tractor safety

Roll over protective structures [ROPS] and effective occupant restraints be installed on all tractors.

2.   Tetanus

The farming community be continually alerted to the importance of maintaining immunity to tetanus.

Manual:	**Policies and Procedures**	Ref. No.:	**FES_TRA_2403_P**
Division:	**Division of Fellowship & Standards**	Issue Date:	**February 2003**
		Review Date:	**February 2006**
Subject:	**FARM INJURY**	Revision No.:	**0**

3. Helmets

   Research be continued into the fea sibility of developing suitable helmet standards fo r farming activities.

4. Machinery/tool design

   Encouragement and support be offe red to the refe rence group established to examine a nd improve safety design in farm m achinery and equipment, to review impediments to safety design, to gather relevant data and to liase with manufacturers and suppliers.

5. Motor Vehicle Deaths on Rural Roads

   A management system be developed to reduce road traffic injury on rural roa ds, to define risk factors and implement a rural road safety strategy.

6. Farm Rescue

   The Australian Manual of Farm Rescue be made av ailable to rural rescue personnel and the farming community.

7. Emergency Care

   Improved access to a cute/emergency care man agement courses be provided for rural health-care professionals.

8. Medical Education-Specific Injuries

   Manuals outlining the principles of treatment of specific farm injuries be made available, with training support, to rural medical practitioners.

9. Rehabilitation Services for those Injured on Farms

   Manuals on injury rehabilitation, specific to returning workers to farming activities, be made available to rural physiotherapists with training support.

10. Counselling Services

    a) Counselling services be made available for families and others affected by farm injury.
    b) Debriefing and counselling services be made available for rural health a nd emergency care workers.

11. Developing Safety Skills and Resources in the Farming Community

    a) The farming community continue to be targeted in farm safety programmes.
    b) The emergency card with -
       I. Emergency telephone numbers
       II. Instructions to the site of accidents/emergency
       III. Nature and cause of the injury/emergenc y and initial assessment, be available to all farming communities.
    c) Improved access to relevant first aid and training be facilitated for farming communities.

12. Farm Injury Data.

    a) Data on farm injury be sta ndardised and collected in a universal way so that useful preventative and management strategies can be developed.
    b) Effective coordinating mechanisms be established.
    c) Rural general practitioners and surgeons be encouraged to participate in farm inju ry data collection.

13. Trauma Communication Systems

Royal Australasian College of Surgeons

Manual:	**Policies and Procedures**	Ref. No.:	**FES_TRA_2403_P**
Division:	**Division of Fellowship & Standards**	Issue Date:	**February 2003**
		Review Date:	**February 2006**
Subject:	**FARM INJURY**	Revision No.:	**0**

a) The National Road Trauma Advisory Council of Australia [NRTAC] Report of the Working Party on Trauma Systems, 1993, be implemented.

b) A suitable identification system of farm locati on be adopted by emergency services in all state s and territories of Australia and New Zealand.

c) Direct communication systems between ambulances and treating doctors be established.

d) Communication technology be exploited to improve emergency communication in rural areas, and the digital/CDMA system be extended to cover all areas.

14. Ongoing Collaboration for Improving Farm Safety

The College continues its involvement with Fa rmsafe Australia (and the equivalent organisation in New Zealand) on Fa rm Safety Referen ce Groups, to oversee pro gress on re solutions and to collaborate on key programmes in the farm safety area.

References

1. Trinca GW. The Royal Australasian College of Surgeons and Trauma Care. *Aust. N.Z. J. Surg.* 1995; **65**: 379-382

Approver	Director
Authoriser	Council

POSITION PAPER   **Royal Australasian College of Surgeons**

FRONTAL PROTECTION SYSTEMS

Background

Frontal protection systems (FPS) are here defined as any system attached to the front of a vehicle for the purposes of protecting the vehicle and its occupants. Bull bars are an example of a FPS.

The use of FPS in Australia is widespread on four wheel drive vehicles and vehicles operated predominantly in rural areas. They are most common where the risk of animal strike is highest. Anecdotal evidence suggests that use of FPS in Australia is significantly higher than in other major international markets such as Europe and the United States[i]. Research has suggested that some bull bar designs increase injury severity to pedestrians and other unprotected road users in a collision[ii]. This research also suggests a more appropriate design such as that described in the Australian Standard, AS 4876.1[iii] is far less likely to be a major cause of serious injury to a pedestrian. According to this Standard however, the acceptable Head Injury Criterion (HIC) is 1500 – above the current Economic Commission for Europe (ECE) pedestrian impact standard. A lower HIC might be more acceptable.

Position

Support for Australasian FPS to be compliant with standards that offer the best outcome for pedestrians such as the current ECE pedestrian impact standard.

Support for policies to reduce the number of non-conforming FPS particularly in the metropolitan-based fleet, which might include prohibiting the sale of and use of non-compliant FPS to all vehicles from a specified date.

Support for debate on the legality of some FPS in urban areas where the probability of a crash occurring involving a pedestrian is much higher. Consideration in this case could be given to research and development of removable FPS for use by vehicles that are required in both urban and rural areas.

Approver: Director, Fellowship and Standards
Authoriser: Council

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[i] National Transport Commission *Australian Vehicle Standards Rules Amendment Package 2008 Draft Regulatory Impact Statement*, August 2008

[ii] Anderson, R. W. G., van den Berg, A.L., Ponte, G., Streeter, L.D., McLean, A.J., *Performance of bull bars in pedestrian impact tests*, Centre for Automotive Safety Research, CASR Report Series CASR020, July 2006.

[iii] Standards Australia, 2002, AS 4876.1:2002 – Motor vehicle frontal protection systems (Part 1: Road user protection), p.2.

Division:	Fellowship & Standards	Ref No.	FES_FEL_016
Document Owner:	Director	Version:	1
		Approval Date:	February 2010
		Review Date:	February 2013

POSITION PAPER

Royal Australasian College of Surgeons

GUN CONTROL

Background

In 1991 the College Trauma Committee replaced the role of the previous Road Trauma Committee to widen the college's commitment to prevention and reduction of death and injury from trauma, and management of traumatic injuries including those resulting from the use of firearms. Major gun reform following the 1996 Port Arthur massacre, in which 35 people died, has doubled the rate of decline of firearm death, homicide and suicide[1].

Yet firearms have been a major cause of death over the years. Available deaths data covering the period 1979–2002 show that, in 1987, the year in which the highest number of firearm-related deaths was recorded, there were 711 such fatalities. Hospitalisations data covering a recent one-year period (2001–2002) record 443 cases of firearm-related hospitalisation over that period and 299 firearm-related deaths[2].

Suicide was consistently the most common type of firearm-related death over the period 1979–2002, accounting for a mean annual proportion of 77% of all firearm deaths during that time frame. The next most frequent type of case was homicide, which accounted for 15% of all firearm deaths. The frequency of unintentional firearm-related deaths was comparatively low (6%).There has been a downward trend in the rate of firearm deaths since 1979. The all-Australia rate of deaths for persons in 1979 (5.1 per 100,000 population) was 3.4 times higher than the equivalent rate in 2002 (1.5 per 100,000)[2].

The gun death rates in New Zealand from suicide and homicide are considerably higher than in Australia. In 2005, these gun death rates per 100,000 people were .91 in Australia and 1.3 in New Zealand[3,4]. After the Aramoana massacre in New Zealand, in November 1990, the government tightened gun laws. The laws were passed in 1992 and stipulated that: written permits were required to order guns or ammunition by mail-order; ammunition sales were restricted to firearms licence holders; photographs were added to firearms licences; licence holders were required to have secure storage for firearms at their homes; and all licence holders had to be re-vetted for new licences, valid for only 10 years. The law also created the new category of "military-style semi-automatic" guns which required a special endorsement, security and registration in the same manner as pistols. The reforms however fell short of the compulsory registration of all firearms and banning of all semi-automatic and pump-action rifles and shotguns as has occurred in Australia since 1996[5]. There has also been some concern in New Zealand that high-powered air guns are not considered firearms despite the injuries that have been seen by NZ surgeons.

Position

The College's Gun Control position statement recognizes the seriousness and frequency of trauma associated with firearms in our two countries.

The College recommends that -

Strict gun control including the compulsory national register of all firearms, the banning and prohibition of importation by individuals of semi-automatic and pump-action rifles and shotguns and compulsory training, education and licensing measures in Australia that have been in place since 1996 should continue. In addition should be a mechanism for regular review of such firearms control measures.

New Zealand should toughen its gun control laws and review licensing and prohibition aspects of gun ownership including high powered air guns that should be registered in the same way as other fire-arms.

References
1. Chapman S et al. *Australia's 1996 gun law reforms: faster falls in firearm deaths, firearm suicides, and a decade without mass shootings.* Inj Prev 2006 12: 365-372

Division:	Fellowship & Standards	Ref No.	FES_FEL_036
Document Owner:	Director	Version:	3
		Approval Date:	August 2011
		Review Date:	August 2014

POSITION PAPER

Royal Australasian College of Surgeons

2. Kreisfeld R. 21 February 2005. *NISU Briefing: Firearm deaths and hospitalizations in Australia*

3. Australian Government (2008) *Australian Crime, Facts & Figures 2007.* Canberra: Australian Institute of Criminology.

4. Injury Prevention Research Unit. (2009) National Injury Query System. Otago University, New Zealand: http::/www.otago.ac.nz/IPRU/statistics/niqs.html. Retrieved 07/01/09.

5. Ruler A. (2009) *Making the Case for Gun Law Reform.* Kai Tiaki Nursing New Zealand, march 2009, Vol 15. No. 2

Approver: Chief Executive Officer
Authoriser: Council

Division:	Fellowship & Standards	Ref No.	FES_FEL_036
Document Owner:	Director	Version:	3
		Approval Date:	August 2011
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Manual:	**Policies and Procedures**	**Ref. No.:**	**FES_TRA_2402_P**
Division:	**Division of Fellowship & Standards**	**Issue Date:**	**February 2007**
		Review Date:	**February 2010**
Subject:	**POSITION PAPER: THE USE OF CHAIN SAWS**	**Revision No.:**	**1**

1.0 PURPOSE AND SCOPE

To express a united view of the College in regards to trauma prevention and management associated with the use Chainsaws.

2.0 KEY DIRECTION STATEMENT

As a fellowship based organisation, the Royal Australasian College of Surgeons commits to ensuring the highest standard of safe and comprehensive surgical care for the community we serve through excellence in surgical education, training, professional development and support.

3.0 VALUES

- Service and Professionalism
  - performing to and upholding the highest standards

- Integrity
  - upholding professional values

- Respect and Compassion
  - being sympathetic and empathetic

- Commitment and Diligence
  - being dedicated, doing one's best to deliver

- Collaboration and Teamwork
  - working together to achieve the best outcome

4.0 BACKGROUND

Since the mid-1980's[1], the College saw that it would need to widen its role in trauma prevention and management beyond those injuries which resulted from road crashes. In July 1991, the College Trauma Committee was formed which continued the College's double commitment: prevention and mitigation of injuries, and management of injuries, however, encompassing injuries resulting from all sources.

More than 50 people are injured at work by chainsaws each year in WA alone[2]. Because of the frequency and severity of chainsaw injuries, the College has produced this position statement.

5.0 BODY OF POLICY

The College recommends that in conjunction with endorsing Standards Australia AS 2727 *Chainsaw – Guide to safe working practices* -

5.1   All persons intending to use a chainsaw be required to receive instruction and certification from an accredited instructor.

5.2   The use of appropriate protective equipment [ie. Approved safety helmets with visor or goggles, earmuffs, protective leggings, steel capped safety boots and gloves] be advocated at the point of sale (ie where chainsaws are available for purchase or hire).

Royal Australasian College of Surgeons

Manual:	**Policies and Procedures**	**Ref. No.:**	**FES_TRA_2402_P**
Division:	**Division of Fellowship & Standards**	**Issue Date:**	**February 2007**
		Review Date:	**February 2010**
Subject:	**POSITION PAPER: THE USE OF CHAIN SAWS**	**Revision No.:**	**1**

5.3   Regulations into the safe use of chainsaws be developed and published by appropriate authorities in each state and territory.

5.4   Suitable courses and videos be made available to intending users of chainsaws and be advertised at the point of sale or hire.

References
1. Trinca GW. The Royal Australasian College of Surgeons and Trauma Care. *Aust. N.Z. J. Surg.* 1995; **65**: 379-382
2. Worksafe. Department of Consumer and Employment Protection, Government of WA. Educational Article – Chainsaws, January 2006. http://www.worksafe.wa.gov.au/newsite/worksafe/pages/agritool0001.html

Approver   Director
Authoriser   Council

Royal Australasian College of Surgeons

Manual:	**Policies and Procedures**	**Ref. No.:**	**FES_TRA_2408_P**
Division:	**Division of Fellowship & Standards**	**Issue Date:**	**June 2006**
		Review Date:	**June 2009**
Subject:	**POSITION PAPER – NEUROLOGICAL TRAUMA IN SPORT**	**Revision No.:**	**0**

1.0   PURPOSE AND SCOPE

The intention of this position paper from the Trauma Committee is to express a united view from the College regarding prevention and management of neurological trauma associated with sport.

2.0   KEY DIRECTION STATEMENT

As a fellowship based organisation, the Royal Australasian College of Surgeons commits to ensuring the highest standard of safe and comprehensive surgical care for the community we serve through excellence in surgical education, training, professional development and support.

3.0   VALUES

- Service and Professionalism
    - performing to and upholding the highest standards
- Integrity
    - upholding professional values
- Respect and Compassion
    - being sympathetic and empathetic
- Commitment and Diligence
    - being dedicated, doing one's best to deliver
- Collaboration and Teamwork
    - working together to achieve the best outcome

4.0   BACKGROUND

In the mid-1980's the College saw that it would need to widen its role in trauma prevention and management beyond those injuries which resulted from road crashes. In July 1991, the College Trauma Committee was formed which continued the College's commitment to prevention and mitigation of injuries, and to the management of injuries, widening its scope to encompass injuries resulting from all causes, including road crashes and others.

This position statement recognises the seriousness and frequency of neurological trauma associated with sport, as also recognised by the Neurosurgical Society of Australasia and the National Health and Medical Research Council of Australia.

5.0   BODY OF POLICY

The College Trauma Committee support the Neurosurgical Society of Australasia's Trauma Committee position on the Prevention of head and spine injuries in sport, which includes positions in relation to: the sport of boxing; head injury in contact sport; spine injury in sport.

Approver	Director
Authoriser	Council

Manual:	Policies and Procedures	Ref. No.:	FES_TRA_2405_P
Division:	Division of Fellowship & Standards	Issue Date:	February 2003
		Review Date:	February 2006
Subject:	POSITION PAPER - RAILWAY CROSSING INJURIES	Revision No.:	0

1.0   PURPOSE AND SCOPE

Position paper from the Trauma Committee - To express a united view of the College in regards to trauma prevention and management, particularly trauma associated with Railway Crossings.

2.0   KEY DIRECTION STATEMENT

As a fellowship based organisation, the Royal Australasian College of Surgeons commits to ensuring the highest standard of safe and comprehensive surgical care for the community we serve through excellence in surgical education, training, professional development and support.

3.0   VALUES

- Service and Professionalism
    - performing to and upholding the highest standards

- Integrity
    - upholding professional values

- Respect and Compassion
    - being sympathetic and empathetic

- Commitment and Diligence
    - being dedicated, doing one's best to deliver

- Collaboration and Teamwork
    - working together to achieve the best outcome

4.0   BACKGROUND

As written by GW Trinca[1], in the mid-1980's, the College saw that it would need to widen its role in trauma prevention and management beyond those injuries which resulted from road crashes. In July 1991, the College Trauma Committee was formed which continued the College's double commitment: prevention and mitigation of injuries, and management of injuries, however, encompassing injuries resulting from all sources.

There are about 12,500 level crossings in Australia, 88% of which are *unprotected* by boom gates. Most are not associated with crashes but have the potential.

Although level crossing crashes account for only about 0.5% of total a ccidents in Australia, they d o account for 2% of the deaths.

The risk of major injury is also much higher.

70% of level crossing crashes occur in rural areas.

65% of crashes at level crossings occur in daylight.

60-70% of level crossing crashes do not involve a train, but trains are associated with nearly all the deaths and well over half of all casualties.
Surveys have shown that vehicle speeds are generally not infl uenced by t he presence of a railway crossing.

Royal Australasian College of Surgeons

Manual:	**Policies and Procedures**	**Ref. No.:**	**FES_TRA_2405_P**
Division:	**Division of Fellowship & Standards**	**Issue Date:**	**February 2003**
		Review Date:	**February 2006**
Subject:	**POSITION PAPER - RAILWAY CROSSING INJURIES**	**Revision No.:**	**0**

Recognizing the seriousness and frequency of trauma associated with Railway Crossings, the College's Railway Level Crossing Injuries policy was developed into a new policy detailed below and ratified by College Council in February 2003.

5.0   BODY OF POLICY

The College recommends that -

1. A programme to elimin ate level cro ssings be pursued and, where this is not possible, automatic boom gates, rumble strips, warning signs with flashing lights and speed restriction zones be installed.

2. All level crossings be illuminated when in use.

3. All railway cars and engines be marked with appropriate reflector tape along the sides.

4. When railway crossings are use d infrequently and seasonally, the deci sion to use the cro ssing be assessed by safety office rs from the road traffic authority, police and rail a uthorities before and during use, and sig nage and illumination be erected if not already in place; an d police be gi ven the power to veto the use of such a crossing if they consider it unsafe.

5. A campaign to educate drivers of vehicles on the dangers of level crossings be pursued.

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Approver   Director
Authoriser   Council

POSITION PAPER

QUAD BIKES

Background

The College recognises the seriousness and frequency of injuries caused by riding Quad Bikes. Internationally there is increasing concern regarding fatal and serious incidents involving Quad Bikes. Australian mortality data indicate there were 11 fatalities for children under 14 years (66 in total for all age ranges) between 1989 and 1992[1] and 17 between 2000 and 2005[2]. New Zealand experienced 2 ATV fatalities and one 2-wheeler fatality in the year to June 2006[3]. Australian Hospital data suggests they are responsible for 8-11% of all on-farm injuries[1]. Rollover of the vehicle was associated with largest number of fatalities (39%) with head injuries occurring in 24% of cases[2]. In cases where the slope of the ground at the accident site was recorded, 69% of those accidents occurred on a steep slope, evidence for the instability of the Quad Bike[2].

Position

The College recommends that:

1. Public awareness of the problems associated with the use of Quad Bikes be raised, with particular reference to:

- The instability of Quad Bikes
- The dangers associated with children using Quad Bikes
- Restriction of their use by the under-16 age group
- The severity of injury of the head, spine, chest and pelvis associated with their use.
- Limitation of speed to less than 55 km / hr
- Restriction to use off public roads.
- Use only in situations where risk of collision with another vehicle is removed

2. The use of helmets for riders is strongly recommended. Until an appropriate helmet specific to the use of Quad Bikes is developed, the use of AS NZS 3838 (2006) helmets for horse riding and horse related activities is suggested.

3. Research towards the design of an appropriate helmet for Quad Bike use is promoted.

4. Information on the safe use and dangers of Quad Bikes be available and promoted at point of sale.

5. Research into the design and development of Quad Bikes which allow for roll over protection be encouraged.

6. Consideration be given to the mandatory provision of speed limiters

7. A requirement for training of workers who operate Quad Bikes to ensure competency and knowledge of safety measures.

8. Information is provided to users of Quad Bikes, as to the most appropriate use of forms of transport for particular tasks.

9. Removal from sale 3-wheel ATVs [trikes] [4].

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Authoriser: Council

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ROAD TRAUMA CYCLING POSITION PAPER

BACKGROUND

Helmet wearing

The world first introduction of bicycle helmet legislation Australia-wide in the early 1990's was the culmination of almost a decade in which the College of Surgeons played a leading role in gaining public awareness, acceptance and demand for bicycle head injury countermeasures. The Committee had shown that bicyclist casualties sustained head injuries three times more frequently than motorcyclists casualties[1]. The first standard-approved helmet was produced in 1981. The Committee convened a meeting with organisations with potential interests in promoting safety helmet wearing by bicyclists, ranging from schools, bicycle groups and the media.

The Victorian Government was subsequently asked to publicize helmet wearing and help with bulk purchase schemes for schools. Further meetings and submissions to the parliamentary inquiries into road safety in 1982 and 1983 recommending mandatory legislation were met with comments that helmets were expensive and that their degree of acceptance was low. The Committee therefore promoted helmet rebate schemes and worked to gain support from the Royal Automobile Club of Victoria and the Australian Medical Association. In 1984, the Road Traffic Authority (RTA) established the Helmet Promotion Taskforce to further increase voluntary safety helmet wearing. The first rebate scheme exceeded expectations.

During the 1980's, McDermott, Lane and Brazenor of the Committee undertook a prospective controlled trial of 1,710 bicyclists casualties wearing and not wearing helmets. This demonstrated that bicyclist casualties wearing Standards Australia Association-approved helmets had a 45% reduction in the frequency of head injury[2].

In 1987, the Social Development Committee of the Victorian Parliament finally recommended that helmet wearing be made compulsory. In 1990, world first legislation was introduced by the Victorian Government. Soon after, all other Australian states followed[3].

Other Cyclists Safety Issues

In addition to vulnerability to head injury, the very nature of cycling makes riders extremely vulnerable to injury, either by falls or collisions with other cyclists and motor vehicles. The most common type of crash in which cyclists are fatally injured is when they are being hit from behind by a motor vehicle traveling in the same lane in the same direction, particularly on rural roads[4]. The next most common crash type was the cyclist riding from the footway into an intersection or onto a road and being hit by an oncoming motor vehicle. These common crash types indicate visibility may be an issue as well as inadequacies of cyclists and motor vehicles awareness of each other. Of cyclists seriously injured, 46% were aged under 16 years in 2000 and 2001[4].

Data on cycling activity is required in order to understand any trends in cyclist safety. It is unfortunate that currently there is little data available nationally which measures this. The popularity of cycling however, appears to be on the increase with sales data indicating that the number of bicycles imported into Australia is increasing[5].

Studies have shown that regular cycling is beneficial to health by reducing heart disease and obesity and that benefits gained are quite likely to outweigh the loss of life through accidents[6,7]. It seems logical to assume that encouraging cycling would lead to more deaths and serious injuries however studies have indicated that this may not be so in some European and Californian towns. These studies in fact showed a reduction in the rate of deaths and serious injuries[8]. This may indicate that cyclists and motorists in these areas have an increasing level of consideration for one another.

POSITION

Royal Australasian College of Surgeons

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ROAD TRAUMA CYCLING POSITION PAPER

The College supports the following:
1. Adequate law enforcement of legislation of mandatory wearing of nationally approved safety helmets with regular review of compliance.
2. Continued promotion of bicycle helmet wearing by national, state and local campaigns, through community road safety councils, municipal councils, school authorities and parents.
3. Expansion of bicycle path networks in cooperation with local government and other agencies, supporting those networks that separate motor vehicles, bicycles and pedestrians.
4. Mandatory use of approved tail lights, fixed reflectors, light-coloured clothing and reflectors on clothing and helmets particularly for night bicycling.
5. Support for initiatives which encourage all road users to 'share the road'.
6. The development of national primary school bicycle education programs for primary school aged children.

Approver   Director or CEO
Authorizer   Council

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ROAD TRAUMA MOTORCYCLE SAFETY POSITION PAPER

BACKGROUND

Everyday in Australia, approximately 5 people die and 60 are seriously injured on our roads[i],[ii].

The number of motorcyclists fatalities has increased on average, 3.1% in the last five years to 2007, however as reported by the Federal Chamber of Automotive Industries (FCAI) consumers took to two wheels in record numbers in 2008 with sales of road motorcycles and scooters increasing by approximately 8% when compared to sales in 2007 and the Australian Transport Safety Bureau (ATSB) reported a 29 per cent increase in the decade to 2003[iii]. When taking into account an increasing number of motorcycles on the road, the fatality rate has actually decreased - the fatality rate per 10,000 registered motorcycles was 4.67 in 2007 decreasing on average by 3% per annum since 2002[i].

Of concern however, is that the motorcycle fatality rate is significantly higher than the fatality rate for motor vehicles – only 1.09 per 10,000 registered motor vehicles[i]. The concerning statistic is reflected when comparing the risk of death per 100 million kilometres traveled for motorcycles compared to motor vehicles – in the period 1998 to 2002, motorcyclists had a risk of death per 100 million kilometeres travelled of between 18 and 25 times that of motor vehicle occupants[iii]. Research evidence points to two major reasons why this is the case – riders involved in fatal crashes are more likely to have been involved in risky behaviour such as speeding, intoxication, inappropriately licensed or unlicensed at the time of the crash than drivers of motor vehicles and, motorcyclists are relatively unprotected increasing the severity of injuries[iii]. The proliferation of on-road scooters in recent years add to the concern of a possible rise in fatalities and serious injuries[ix].

Over 40% of fatal motorcycle crashes are single-vehicle 'loss of control' crashes. It has been suggested by the Australian Government that safer speeds and safer roads and roadsides would directly benefit motorcyclists and could be seen as particularly important to reduce the risks of these types of accidents[iv].

Also of concern is the doubling of motorcycle rider fatalities aged over 40 years in the 10 years to 2003. This coincides with a steady decline in fatalities involving 17 to 25 year olds and little change in the 26-39 year age group which suggests that with the increasing popularity of motorcycling in the older age group, road safety programs may need to focus on older riders[iii]. In many jurisdictions in Australia, licensing systems allow motorcycle licences to remain current at no additional costs to those that hold full car licenses hence making it quite easy for those who have not ridden for a considerable amount of time to take up riding again[v].

Riding a motorcycle requires high levels of vehicle control and cognitive skill, more so that driving a car. Some research has suggested that licensing programs can improve the safety of motorcyclists if they feature particular components which have been shown to improve road safety outcomes. While there is little definitive evidence as to what are the best components of a motorcycle licensing system in terms of road safety outcomes, research has suggested that granting a motorcycle licence should ultimately be seen as a higher step in licensing than granting a car licence, similar to a heavy vehicles licence being a more advance form of a car licence, or if this is not possible, the minimum age for solo riding (ie. Minimum age for obtaining a learner motorcycle licence) should be equal to the minimum age for obtaining a probationary car drivers licence[v]. A longer provisional period and training duration are also features as well as restrictions for learner and provisional licences to apply to riders who already hold a full car licence.

The effectiveness of motorcycle helmets and laws that mandate helmet wearing has been undisputed. Victoria, Australia was the first place in the world to introduce motorcycle helmet use laws on January 1st, 1961. It is clear however that other forms of protection for the vulnerable motorcyclist are needed. International research has shown the benefits of the use of motorcycle protective clothing, however much

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of the focus has been on leather products which are not as suited to the Australian conditions and climate[vi]. Detailed crash and injury studies in the Australian environment need to be undertaken in the first instance in order to develop suitable protective clothing. Other safety technologies which show promise include technologies such as vehicle airbags and airbag jackets and Anti-lock Braking Systems (ABS).

International research into the benefits of daytime running lights on motorcycles have had mixed results, however they often provide some evidence for the reduction in the risks of accidents involving motorcyclists[vi,vii]. An Australian paper presented by Paine et al in 2005 entitled 'Daytime Running Lights (DRL) for Motorcycles' found that if the safety benefits of DRLs achieved in Europe could be achieved in Australia, then 11 per cent of all fatal crashes and 15 per cent of all other crashes could be prevented[viii]. There have been some suggestions however that the benefits of DRLs in Europe will not transfer to Australia because lighting conditions are brighter[vii]. In 1992, Australia introduced mandatory DRLs for motorcycles, however the legislation was rescinded in 1996. It has been suggested that this was mainly due to pressure from motorcycle lobby groups[viii]. As well as dispute over the effectiveness of DRLs on motorcycles, there is also little research into the effectiveness of motorcycle DRLs when other vehicles are also using DRLs. The Victorian Parliamentary Road Safety Committee highlighted its concerns about the effect on motorcycle conspicuity if other vehicles were to widely use DRLs[vii].

To date, much of the research and emphasis has been placed on on-road motorcycling with relatively little attention paid to the safety of off-road motorcycling, a sport increasing in popularity with a 5 per cent increase in sales of off-road motorcycles in 2007, second only to their on-road counterparts[ix]. Monash University Accident Research Centre reports that in Victoria, off-road motorcycle fatalities cluster in the age groups 15-19 years and 20-24 years compared with on-road fatalities clustering in the 20-24 year and 44-49 year age groups. Similarly, on-road hospital treated cases peaked at 20-29 year olds for on-road motorcyclists and 10-19 year olds for off-road motorcyclists. The report suggests measures to reduce off-road motorcycle injuries include age restrictions, special licensing and registrations schemes, encouraging helmet wearing and protective clothing use, risk awareness training, development of mentoring schemes such as those delivered by experienced riders through off-road motorcycle clubs and increasing the number and access to such clubs so as to expand the provision of supervised off-road riding. Such a strategy would also provide a structured environment where effective safety promotion is much more possible[x].

POSITION

Recognising the serious nature of road trauma, the College recommends that the following measures be supported:

1. Mandatory wearing of approved helmets by all motorcycle riders and pillion passengers on and off the road continues to be supported, and there be no exemptions on medical grounds.

2. Support for further research into injury patterns of motorcycle riders and pillion passengers and proven motorcycle protective clothing suitable for Australasian conditions.

3. Support for further research into the effectiveness of Daytime Running Lights for all motorcycles in Australasia.

4. Support for the further development and research into other safety features such as motorcycle airbags, airbag jackets, ABS etc.

5. Motorcycle licensing programs to take into account the higher levels of vehicle control and cognitive skill required to ride a motorcycle compared with driving a vehicle and therefore support for graduated licensing programs such as those which require a minimum age for solo riding (ie.

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Minimum age for obtaining a learner motorcycle licence) equal to the minimum age for obtaining a probationary car drivers licence with longer probationary periods and evidence-based training programs (and support for their further research) for gaining both learner and probationary motorcycle licenses.

6. Support for similar restrictions to those that apply to drivers of motor vehicles in regards to alcohol and other drugs and consideration be given to further research into toughening these restrictions in light of the knowledge that riding a motorcycle requires high levels of vehicle control and cognitive skill than driving.

7. Support for Governments to view motorcycles as a significant, increasing and distinct mode of transport and form of recreation when planning roads and safety strategies.

8. Support for Governments to place emphasis on off-road motorcycle strategies and measures such as age restrictions, mandatory helmet wearing, appropriate training and supervision, particularly for younger riders, to reduce off-road motorcycle injuries.

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ROAD TRAUMA SPEED POSITION PAPER

BACKGROUND

Coroner's records indicate that excessive speed causes about 26 per cent of fatal road traffic crashes[1]. Speed affects both the severity of a crash and the risk of being involved in a crash[1,2,3]. Research shows that speeds only 5km/h above average in urban (60km/h) areas, and 10 km/h above average in rural areas, double the risk of a casualty crash, roughly equivalent to the increase in risk associated with a Blood Alcohol Concentration of 0.05%[1]. Small reductions in urban travel speeds significantly reduces the number of fatal pedestrian crashes. An Adelaide study found that 32 per cent of pedestrians who died may have survived if the vehicle was traveling 5km/h slower before the accident; one in ten would not have been hit at all because the driver would have been able to stop in time[1,4]. Improving speed management therefore could make a substantial contribution to reducing the road toll.

Recent research has suggested that further reductions in speed, while having the desired effect of making accidents less likely and/or more survivable, also may have the added benefit of increasing participation in active transportation modes such as cycling and walking. For instance, a common feature of active transport promotion and participation is low neighbourhood speed limits[5]. Research is suggesting that a 'healthy' speed, rather than merely a 'safe speed' conceptualized as speeds that minimize risk of injury, may be preferable to reap the multiple benefits of active transport[6].

This statement summarises the College's position on speed and speed management in relation to road trauma.

POSITION

Recognizing the major role that excessive speed plays in the causation of serious road crashes, particularly in combination with alcohol, appropriate speed limits be adopted having regard to the environment, traffic density and such other considerations as may be relevant to safe road usage. This includes support for:

1. Intensification of enforcement programs and initiatives whereby there will be a higher perceived risk of detection and prosecution of drivers and riders who exceed the posted limits, and the banning of radar detection devices by drivers

2. Continued reduction of speed limits on both urban non-arterial roads and regional/ small towns, with particular priority given to the fixing of speed limits in shopping centres, schools and precincts of high risk to pedestrians, cyclists and other active transportation modes.

3. Support for cancellation of licence for drivers and riders exceeding the speed limit by the specified margin

4. The gradation of speed penalties should commensurate with level of risk

5. The fitting of all heavy vehicles such as trucks, coaches and buses with speed governors and effective monitoring programs and adequate penalties for tampering with such devices

6. Regular reviews of speed limits which are seen by road users to be appropriate in the circumstances

7. Signs advising changes in speed limits be prominently displayed on all roads

Approver   Director or CEO
Authorizer   Council

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ROAD TRAUMA VEHICLE SAFETY SYSTEMS POSITION PAPER

BACKGROUND

New and improved safety technologies in cars are such that today's models are much safer than their 10 or 15 year old counterparts. Airbags, seat belt reminder systems and electronic stability control (ESC) are examples of technologies that have vastly improved driver and passenger safety. Australian tests have shown that a functioning airbag at least halves the chance of serious head injury[1]. In the US, ESC was found to have reduced single-vehicle fatal crash involvement risk by 56 percent[2]. Failing to wear a seat belt in Australia contributes to about 300 road deaths per year. If they all wore belts, it is estimated that about half would survive[1]. Aggressive seat belt reminder systems would clearly be beneficial. Car design is also improving in the area of pedestrian safety. The benefits of rear-sight cameras and 'pedestrian-friendly' bonnets need no further explanation. While technologies are rapidly emerging, the uptake by car manufacturers as standard features and design policy-makers is painfully slow in Australia and needs priority action.

Evidence from Europe and particularly Sweden, indicate the advantages of keeping infants rear-facing until the age of four[3,4,5]. Other research suggests that the use of booster seats can reduce injury for children aged 4 to 7 or 8 years by up to 59%[6]. A typical child in that age range is too light and too short for a normal seatbelt designed for an adult of more than 140cm tall. Critical internal injuries and fatal strangulations in children can be caused by an ill-fitting seatbelt. A booster seat positions a normal lap-sash seatbelt low over the hips and over the chest where the force of an accident will have less impact. The bottom cushions of booster seats are also shallower than the vehicle seat so that a child's knees bend over the edge of the booster, encouraging the child to sit up straight and not slouch thereby reducing the likelihood that they will slip under the seatbelt in a crash and possibly be strangled by the seatbelt's webbing.

POSITION

Recognising the major role that vehicle standards and features play in the reduction of road trauma, the College recommends that the following measures be supported:

1. Vehicle safety features such as (and not limited to) front, side and curtain airbags, anti-lock braking systems, electronic stability control and aggressive seat belt reminder systems, that have been shown to improve driver, occupant and pedestrian safety in all new cars

2. Close liaison between vehicle designers, road engineers and those who treat road casualties to ensure vehicle safety improvements are in line with world's best practice. Clinical representation on National Design Rules Committees is therefore supported.

3. Programs such as the Australian New Car Assessment Program (ANCAP) and mandatory display of car safety ratings at point of sale to communicate to the public the importance of safety

4. Vehicle safety advertising codes that place safety as the highest priority

5. Mandatory wearing of approved 3-point seat belts or other restraints by all occupants wherever seated in the motor vehicle including buses and there be no categorical exemption from wearing a restraint on medical grounds

6. Mandatory wearing of approved child restraints and booster seats for all children up to 135cm. Support for Government loan and community-based schemes designed to improve availability of approved infant and child restraints

Approver	Director or CEO

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Authorizer   Council

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TRAUMA ALCOHOL AND OTHER DRUGS POSITION PAPER

BACKGROUND

Alcohol

Alcohol and other drugs remain significant causes of both road and general trauma over many years. Countermeasures such as random breath testing and public education has seen the involvement of alcohol in motor vehicle accidents reduce to approximately 25% in the decade to 2004, having fallen from 44% in 1981. However, despite such countermeasures the rate of alcohol involvement in road traffic crashes has not decreased beyond this level. Research has suggested factors that may be preventing further reductions in alcohol-related fatal crashes include the failure to reduce alcohol consumption in the last 15 years, a higher percentage of rural crashes involving alcohol when compared with metropolitan crashes, the disproportionate non-use of seat belts by drivers, and failure to reduce the rate of reoffending[1,2].

Injuries including assault linked to alcohol have remained high. Alcohol-involved road trauma caused over 32% of all alcohol-related acute deaths while alcohol-involved assault and other injury caused 49% of alcohol acute hospitalisations. The high percentage of assaults including homicide where both the victim and perpetrator are alcohol-affected remains significant and has increased despite reasonably stable levels of per capita alcohol consumption between 1993/94 and 2000/01[3,4,5]. Whilst drink-driving counter-measures have been effective, the case for interventions to reduce the incidence of non-road trauma is less clear. Recent evidence suggests the use of increasing alcohol taxation, regulating availability, partial or complete banning of alcohol advertising (particularly to younger people), more intensive enforcement of random breath testing and lowering the legal blood alcohol concentration level, with brief interventions by primary care physicians, could achieve a 48% reduction in alcohol-attributed deaths and significant reductions in the social cost of alcohol-related harm[6,7].

Other Drugs

While alcohol is a bigger problem than all other drugs combined (it is estimated that there would be a 24 per cent reduction in fatal crashes if no drivers used alcohol, and a 13 per cent reduction if no drivers used drugs), drug usage is nevertheless, a significant problem. Cannabis is the drug most commonly detected in fatally injured drivers and riders in Australia. Tetrahydrocannabinol (THC), the active ingredient of cannabis, has been detected in 8.5 per cent of drivers and riders tested, including 4.1 per cent who had used cannabis without alcohol or other drugs. For those with THC only in their system, the odds of involvement as the culpable driver in a fatal crash were 2.7 times those of drug and alcohol-free drivers. This odds ratio rose to 6.6 for those with a THC concentration over 5mg/ml. This compares with a culpability odds ratio of 6.0 for drivers and riders with a BAC over 0.05[1].

Many Fellows of the Royal Australasian College of Surgeons see the effects of drink and drug driving on a regular basis. Their own experiences coupled with scientific research and data from well-planned registries provide a compelling case for their involvement in lobbying Governments and stakeholders for change in this area. This statement summarises the College's position on alcohol & other drugs in relation to road trauma.

POSITION

Alcohol
Because of the continuing major influence of the misuse of alcohol in road crash causation and assault and violence, the following countermeasures aimed at drinking drivers and riders and the general community are supported:

Royal Australasian College of Surgeons

Manual:	**Guidelines and Position Papers**	**Ref. No.:**	**FES_FEL_008**
Division:	**FELLOWSHIP & STANDARDS**	**Approval Date:**	**June 2009**
		Review Date:	**June 2012**
Subject:	**TRAUMA ALCOHOL AND OTHER DRUGS POSITION PAPER**		

TRAUMA ALCOHOL AND OTHER DRUGS POSITION PAPER

1) The law of 0.05g/100mls blood alcohol concentration (BAC) for fully licensed drivers and riders.
   a) Learner and probationary licence holders not be permitted to have any alcohol in their blood whilst driving or in charge of a motor vehicle or motor cycle.
   b) Drivers of commercial vehicles such as trucks, passenger coaches and buses, taxis, trams and trains as well as operators and/or drivers of machinery (eg. Farm machinery), not be permitted to have any alcohol in their blood whilst driving or in charge of such a vehicle. The College recommends that alcohol ignition interlocks be fitted to those vehicles.
2) Intensification of random breath testing of drivers and riders.
3) Compulsory breath testing of all drivers, riders and pedestrians involved in an injury-producing crash or charged with a moving traffic offence, and police be empowered to perform such breath tests regardless of whether or not a traffic law infringement has been committed.
4) All road casualties of 16 years or older who attend hospital for treatment be tested for blood alcohol for both evidentiary purposes and for data collection for further research to inform future policy.
5) Improved drink driving education programs dealing with the effects of alcohol on driving skills and the incidence of road crashes, and on the amount of alcohol consumption which will lead to the legal limit being exceeded.
6) Knowledge of the effects of alcohol on driving skills, the role of alcohol in road crashes and the amount of alcohol consumption which will lead to the legal limit being exceeded be made part of licence examinations.
7) Relicensing of a driver or rider disqualified for having a BAC above 0.15g/100mls, or for a second or subsequent drink driving offence, be made conditional upon expert medical evidence establishing that such person has been effectively rehabilitated. These re-licensed drivers to drive only vehicles fitted with an alcohol ignition interlock for a specified time as recommend by further research.
8) Special attention be paid to the problem of aberrant road use by alcohol impaired pedestrians.
9) Corporations should be encouraged to develop responsible drink driving programs including driver education and the fitting of alcohol ignition interlocks to their vehicle fleet.

10) Strategies to reduce of rate of reoffending in regards to drink driving

11) Strategies be formulated and implemented to reduce the problem of alcohol abuse and/or misuse throughout the community such as:
   a) Regulating the physical availability of alcohol such as restricting the hours and days of sale of alcohol, the density of outlets, availability by alcohol strength, and mandatory and enforced server liability programs.
   b) Effective alcohol taxation and pricing policies
   c) Readily accessible early treatment and intervention programs particularly in the primary health setting and the workplace to reduce hazardous alcohol consumption
   d) Proactive policing of licensed venues
   e) Suitable breath alcohol testing devices (hand-held, coin-in-slot machines) be installed in hotels, restaurants and clubs
   f) Restriction of Alcohol Advertising particularly restricting advertising to young people, with effective enforcement of the Alcohol Beverages Advertising Code (ABAC) Scheme.
12) General support for both Government and broader community action to acknowledge the problem of alcohol misuse, to introducing legislation and regulation to protect the community, encourage appropriate alcohol use and support, embrace and model ways of responsible drinking; and respond with compassion to people who drink too much and consequently cause harm to themselves and others. For example supporting the Recommendations from the NSW Summit on Alcohol 2003 and Victoria's Alcohol Action Plan 2008-2013[8],[9].

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TRAUMA ALCOHOL AND OTHER DRUGS POSITION PAPER

Drugs Other Than Alcohol

Recognising that other drugs taken alone or in combination with alcohol may seriously impair driving and riding ability, the following measures be supported:

a. Continued research and improved data collection through the testing of all road traffic casualties whereby the effect on driving performance of drugs, whether prescribed, sold without prescription or illegal, when taken with or without alcohol, may be measured.

b. Support for improved methods of detection of any medications or drugs which result in impairment of judgment and such tests be performed on all road casualties.

c. Support for improved methods of detection at the roadside, of medications or drugs which result in impairment of judgment, subsequently support for the intensification of the random drug testing of drivers and riders. Results for initial roadside tests be confirmed via analysis of urine or blood samples.

d. Guidelines for doctors and pharmacists to enable them to properly warn patients concerning any likely or possible impairment of driving or riding skills which may result from the taking of a particular drug or other substance, and all such drugs as may diminish or impair driving performance be labeled by the manufacturers and pharmacists with appropriate warning.

e. A person using prescription drugs that may cause impairment with or without the addition of alcohol should not consume any alcohol then drive or ride, and should cross the road in a safe manner.

Approver   Director or CEO
Authorizer   Council

[1] Australian Transport Safety Bureau (ATSB) 2004 *Road Safety in Australia – A publication commemorating World Health Day 2004*

[2] Haworth NL & Johnston IR *Why isn't Involvement of Alcohol in Road Crashes in Australia Lower?* Proceedings of the 17th International Conference on Alcohol, Drugs & Traffic Safety, Glasgow UK, August 2004

[3] Chikritzhs T et al *Australian Alcohol Indicators, 1990-2110: Patterns of alcohol use and related harms for Australian states and territories.* National Drug Research Institute, Curtin University of Technology, Perth, Australia. ISBN 1-74067-300-X

[4] English DR et al. *The quantification of drug caused morbidity and mortality in Australia, 1995 Edition*. Canberra: Commonwealth Department of Human Services and Health, 2005.

[5] Steering Committee for the Review of Government Service Provision. *Overcoming indigenous disadvantage key indicators 2005 report*. Melbourne: Productivity Commission, 2005. Availabe from : http://papers.ssrn.com/sol3/papers.cfm?abstract_id=925776

[6] National Preventative Health Taskforce. *Technical Report No. 3: Preventing alcohol-related harm in Australia: a window of opportunity.* ISBN 1-74186-733-9. Available at: http://www.preventativehealth.org.au/internet/preventativehealth/publishing.nsf/Content/09C94C0F1B9799F5CA2574DD0081E770/$File/alcohol-cover.pdf

[7] Collins D and Lapsley H. *The avoidable costs of alcohol abuse in Australia and the potential benefits of effective policies to reduce the social costs of alcohol*. Canberra: Department of Health and Ageing, 2008. Available: http://www.nationaldrugstrategy.gov.au/internet/drugstrategy/publishing.nsf/Content/0A14D387E42AA201CA2574B3000028A8/$File/mono70.pdf

[8] NSW Summit on Alcohol Abuse 2003 *Changing the culture of alcohol use in NSW* ISBN 0 7313 54249 http://www.alcoholinfo.nsw.gov.au/

[9] *Victoria's Alcohol Action Plan 2008-2013*, Published by the Victorian Government, 50 Lonsdale Street, Melbourne. May 2008. http://www.health.vic.gov.au/drugservices/downloads/action_plan.pdf

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THE PAEDIATRIC TRAUMA SCORE

The Pediatric Trauma Score as a Predictor of Injury Severity in the Injured Child.
Tepas JJ Et Al. J. Pediatric Surg. 22: 14-18, 1987

PAEDIATRIC TRAUMA SCORE

PTS	+2	+1	-1
Weight	>44lbs (>20kgs)	22-44lbs (10-20kgs)	<22lbs (<10kgs)
Airway	Normal	Oral of Nasal Airway	Intubated Tracheostomy Invasive
Blood Pressure	>90mmHg	50-90mmHg	<50mmHg
Level of Consciousness	Completely Awake	Obtunded or any LOC*	Comatose
Open Wound	None	Minor	Major or Penetrating
Fractures	None	Minor	Open of Multiple Fractures
TOTAL:			

Loss of consciousness
(Mark the appropriate box with an X. Mark only six boxes)

IC-10
(2010)

College of Intensive Care Medicine
of Australia and New Zealand
ABN: 16 134 292 103

AND

AUSTRALIAN AND NEW ZEALAND COLLEGE OF ANAESTHETISTS
ABN 82 055 042 852

AND

AUSTRALASIAN COLLEGE FOR EMERGENCY MEDICINE
ABN 76 009 090 715

MINIMUM STANDARDS FOR TRANSPORT OF CRITICALLY ILL PATIENTS

INTRODUCTION

Safe transport of the critically ill patient requires accurate assessment and stabilisation of the patient before transport. There should be appropriate planning of transport and optimum 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.

Clinical management during transport must aim to at least equal management at the point of referral and must prepare the patient for admission to the receiving service.

1. ADMINISTRATIVE GUIDELINES

Administrative guidelines held by each establishment engaging in patient transport should cover all aspects of transport of the critically ill. These may include guidelines for such matters as insurance, budgeting and personnel. Staff safety and protection are the responsibility of the employing authority, who should carry appropriate insurance for all contingencies related to patient transport activities and should also provide personnel with personal protective equipment and instruction.

1.1 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 medical transport team to the referring hospital should not be delayed pending the identification of a receiving hospital.

1.2   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.

Reliable communication must be available at all times between the transport 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 allow for appropriate planning, advice and preparation by the retrieval team.

1.3   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.

1.4   Documentation

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

1.5   Audit, Quality Improvement and Teaching.

Organisations involved in medical transport should have an effective quality management system which can monitor and audit performance and make recommendations for appropriate improvements.

There should be a system for regular review of cases to assess the level of care provided, transport processes and logistics.

A means of patient follow-up after transport should be available as feedback to the clinical staff involved and to assist in evaluating the performance of the organisation and system overall. There should be opportunities for peer review within the organisation. Such audit activities should involve all members of the retrieval team (medical and non-medical), as well as administrators. (General principles of Quality activities are outlined in the College Document IC-8 "Quality Improvement").

Provision should be made for feedback to the referring centre. The system should also provide an educational function for all components for the transport service.

2.   CATEGORIES OF TRANSPORT

Transport of critically ill patients is necessary in two sets of circumstances, namely, prehospital transport and interhospital transport.

Intrahospital transport is the subject of the Joint Document PS39 "Intrahospital Transport of Critically Ill Patients".

2.1   Prehospital Transport refers to:

Transport of a critically ill patient from an accident or illness location to hospital. Standards for non-medical prehospital transport 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.

2.2   Interhospital Transport may be:

2.2.1   *Emergency Interhospital Transport:*

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

2.2.2   *Semi-urgent Interhospital Transport:*

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

3.   STAFFING

Personnel engaging in transport of critically ill patients should be selected for the transport role, be trained in the various aspects of patient transport that they would be expected to be involved with and participate in the organisational quality activities (1.5 above). Senior staff must also be regularly involved in these activities and be available for instruction and supervision of junior staff. Ability to communicate effectively, and to function as part of a team is essential.

Staff must be briefed on emergency procedures such as vehicle evacuation by the authority operating the vehicle. Staff undertaking patient transport must be aware of the limitations of available equipment and capabilities, the working transport environment and at the referral site prior to dispatch.

3.1   Prehospital Transport

Medical officers and/or nurses who are deployed to provide prehospital treatment and transport must have received training that is in keeping with their expected pre-hospital role (eg. scene organisation and safety, patient assessment, treatment and extrication, mass casualty and chemical, biological and radiological incidents etc.). They should be familiar with local pre-hospital ambulance and emergency service protocols, roles responsibilities and equipment. EMST training for medical personnel undertaking this role would be ideal.

Medical staff should also be familiar with the range of communication devices used.

3.2   Interhospital Transport

Interhospital transport of critically ill patients must be performed by an appropriately qualified retrieval team including an experienced medical

practitioner. 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 e.g. a neurosurgeon, to the referring hospital should be considered.

Specifically trained personnel are required for the transport of neonates, infants and young children.

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

4. TRANSPORT

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

4.1 **Choice** of transport vehicle will be influenced by:

- nature of illness
- possible clinical impact of the transport environment
- urgency of intervention
- location of patient
- distances involved
- number of retrieval personnel and volume of accompanying equipment
- road transport times and road conditions
- weather conditions and aviation restrictions for airborne transport
- aircraft landing facilities
- range and speed of vehicle

4.2 **Transport Vehicle Requirements**

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

- safety of both patient and staff
- adequate space for patient access and to perform acute medical interventions
- adequate power and gases for life support systems
- adequate suction
- easy access for safe embarkation and disembarkation
- adequate lighting and internal climate control
- restraints for stretcher, equipment and passengers
- acceptable noise and vibration levels and noise protection for passengers

- adequate speed and response times

- good communication systems, both internal and external

- auditory patient monitoring alarms routed through attendants' headsets where noise is unavoidable, in addition to usual visual alarms

- impaired gravity drip of fluids

In general, medical fittings to aircraft, and bulky items carried need to have approval of the aviation authorities.

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

- reduced oxygen partial pressure

- the need for pressurisation to sea level when clinically indicated

- risk of rapid depressurisation

- expansion of air filled cavities, such as endotracheal tube cuff, middle ear, air-filled spaces under airtight dressings etc.

- limb swelling beneath plaster casts

- worsening of air embolism or decompression sickness

- danger from agitated patients

- limited space, lighting and facilities for interventions

- noise

- extremes of temperature

- extremes of humidity

- acceleration, deceleration and turbulence

- vibration

- electromagnetic interference between avionics and monitoring devices

- danger from loose, mobile equipment.

4.4   With all modes of transport, stabilisation of vital signs, provision of a secure airway and IV access, securing of all catheters and provision of appropriate monitoring before departure is fundamental to safe transport.

5.   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.

Equipment should be adequately restrained, and continuously available to the operator. Patient stretchers should be capable of being adequately secured within the transport vehicle. 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.

Specialised equipment is required for neonatal and paediatric transport.

Equipment that should be considered includes:

5.1   Respiratory Support Equipment

- Airways (range of oral and nasopharyngeal airways and a range of laryngeal mask airways)
- Oxygen, masks, nebuliser
- Self-inflating hand-ventilating assembly, with PEEP valve available
- Suction equipment of appropriate standard
- Portable ventilator with disconnect and high pressure alarms
- Intubation set (including a range of laryngoscope blades and endotracheal tubes)
- Emergency surgical airway set
- Pleural drainage equipment
- Oxygen supply in excess of that estimated for the maximum transport time.

5.2   Circulatory Support Equipment

- Monitor/defibrillator/external pacer combined unit
- Pulse oximeter
- Aneroid sphygmomanometer (not mercury-containing) with a range of cuff sizes
- Vascular cannulae, peripheral and central
- IV fluids and pressure infusion set
- Infusion pumps
- Arterial cannulae
- Arterial monitoring device (pressure transducer)
- Syringes and needles (a needleless system would be ideal)
- Pericardiocentesis equipment
- A sharps disposal container and a bag for biological refuse

5.3   Other Equipment

- Nasogastric tube and bag
- Urinary catheter and bag
- Nasal decongestant spray
- Instruments, sutures, dressing, antiseptic lotions, gloves
- Thermal insulation and temperature monitor

- Splints and equipment for spinal and limb immobilisation

- Neonatal/paediatric/obstetric transport equipment when applicable

- Dressings, bandages, slings, splints and tape

- Cutting shears and portable torch

- Gloves and glasses for staff protection

5.4 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.

6. 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.

6.1 Clinical Patient Monitoring

6.1.1 *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 pressured assessment of peripheral perfusion.

6.1.2 Respiration

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

6.1.3 *Oxygenation*

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

6.1.4 *Level of consciousness by G.C.S*

6.1.5 *Pain score*

6.1.6 *Patient comfort* – even deeply-sedated patients should be provided with appropriate noise, eye and environmental protection.

6.2 Equipment Monitoring

6.2.1 *Pulse Oximeter and capnometer*

A pulse oximeter must be used for every critically ill patient during transport. A capnometer (preferably with a waveform display) must be used to monitor all patients receiving mechanical ventilation.

6.2.2 *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.

6.2.3 *Electrocardiograph*

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

6.2.4 *Physiological pressures*

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

6.2.5 *Other Equipment*

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

6.2.6 *Equipment Alarms*

Equipment should incorporate audible and visual alarms.

7. 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.

These guidelines should be interpreted in conjunction with the following Documents of the College of Intensive Care Medicine and the Australian and New Zealand College of Anaesthetists:

IC-8   "Quality Improvement"
PS39   "Recommendations on Standards for Intrahospital Transport of Critically Ill Patients"

Promulgated as FICANZCA: 1992

This policy document has been prepared having 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.

Policy Documents are reviewed from time to time, and it is the responsibility of the practitioner to ensure that the practitioner has obtained the current version. Policy Documents have been prepared having regard to the information available at the time of their preparation, and the practitioner should therefore have regard to any information, research or material which may have been published or become available subsequently.

Whilst the College endeavours to ensure that documents are as current as possible at the time of their preparation, it takes no responsibility for matters arising from changed circumstances or information or material which may have become available subsequently.

College Website: www.cicm.org.au

PS39 (2010)

AUSTRALIAN AND NEW ZEALAND COLLEGE OF ANAESTHETISTS
ABN 82055 042 852

AND

COLLEGE OF INTENSIVE CARE MEDICINE OF AUSTRALIA AND NEW ZEALAND
ABN 16134 292 103

AND

AUSTRALASIAN COLLEGE FOR EMERGENCY MEDICINE
ABN 76009 090 715

Minimum Standards for Intrahospital Transport of Critically Ill Patients

INTRODUCTION

Critically ill patients may have absent or small physiological reserves. Adverse physiological changes in these patients during intrahospital transport are common and can be life-threatening. Ventilator-dependent and haemodynamically unstable patients are at particular risk. Careful planning is required to move these patients between hospital facilities such as operating theatres, ICU, Emergency Department, imaging rooms, and wards. Such intrahospital transport is usually elective, but a need for urgency must also be anticipated (such as moving the patient to the operating theatres after a diagnostic procedure).

1. **PROTOCOL**

   1.1 Relevant staff should formulate their hospital's protocol of intrahospital transport of critically ill patients. The protocol should be made widely known and available.

1.2 The transport itself must be justified. Whatever benefits of proposed interventions must outweigh the risks of moving the critically ill patient and those posed by the interventions themselves.

2. EQUIPMENT

2.1 Equipment must be dedicated to intrahospital transport.

2.2 The equipment should be durable, and trolley-linked devices must be able to enter lifts and pass through all doorways en route.

2.3 All equipment must be able to function in the specific intervention area (e.g. a magnetic resonance imaging room) and facilities for remote patient monitoring should be available where required. Gas, suction, and electrical supplies at the destination must be present and compatible.

2.4 No equipment should be placed on the patient; specially designed receptacles or transport trolleys are useful.

2.5 Basic monitoring of ECG, heart rate, blood pressure (by invasive or an automated non-invasive monitor), and oxygen saturation by pulse oximetry must be used for all patients. A capnometer must be used to monitor all patients receiving mechanical ventilation.

2.6 A defibrillator and a suctioning device must be available.

2.7 A portable ventilator with a disconnect alarm is required for ventilator-dependent patients. Nonetheless, a manual resuscitator bag must always be available. Facilities to deliver PEEP and different modes of ventilation are necessary for some patients.

2.8 Infusion pumps are highly recommended for accurate administration of drug infusions. They should have alarms set appropriately.

2.9 Appropriate fully charged, spare battery packs for electrically driven devices must be available.

2.10 Equipment to secure the airway, and emergency drugs, analgesics, sedatives, and muscle relaxants must be available.

2.11 A procedure must be implemented to ensure that all intrahospital transport equipment is readily accessible and regularly checked.

3. STAFFING

3.1 Key personnel for each transport event should be identified. The transport team should consist at least of an appropriately qualified nurse, an orderly, and an appropriately trained doctor.

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

4.   PRE-DEPARTURE PROCEDURES

4.1   The transport team must be freed from other duties.

4.2   The receiving person or staff at the destination must be notified, and the arrival time must be clearly understood.

4.3   All pieces of equipment must be checked, and notes and imaging films gathered. An example of a checklist is listed below. Individual responsibilities for checking equipment must be defined.

    4.3.1   The monitors function properly and the alarm limits are set appropriately.
    4.3.2   The manual resuscitator bag functions properly.
    4.3.3   The ventilator (if used) functions properly; respiratory variables and alarms are set appropriately.
    4.3.4   The suction device functions properly.
    4.3.5   Oxygen (± air) cylinders are full.
    4.3.6   A spare oxygen cylinder is available.
    4.3.7   Airway and intubation equipment are all available and working.
    4.3.8   Emergency drugs, analgesics, sedatives, and muscle relaxants are all available.
    4.3.9   Additional drugs are made available if indicated.
    4.3.10   Spare IV fluids, inotropic solutions, or blood are available if needed.
    4.3.11   Spare batteries are available for all battery-powered equipment.
    4.3.12   Chest tube clamps (if an underwater chest drain is present) are available.
    4.3.13   Patient notes, imaging films, and necessary forms (especially the informed consent form) are available.

5.   PATIENT STATUS

5.1   Final preparation of the patient should be made before the actual move, with conscious anticipation of clinical needs. Examples include giving appropriate doses of muscle relaxants or sedatives, replacing near-empty inotropic and other IV solutions with fresh bags, and emptying drainage bags.

5.2   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. An example of a brief check on the patient is listed below.

    5.2.1   Airway is secured and patent.

5.2.2	Ventilation is adequate; respiratory variables are appropriate.
5.2.3	All equipment alarms are switched on.
5.2.4	Patient is haemodynamically stable.
5.2.5	Vital signs are displayed on transport monitors and are clearly visible to transport staff.
5.2.6	PEEP/CPAP (if set) and FIO_2 levels are correct.
5.2.7	All drains (urinary, wound, or underwater seal) are functioning and secured.
5.2.8	Underwater seal drain is not clamped.
5.2.9	Venous access is adequate and patent.
5.2.10	IV drips and infusion pumps are functioning properly.
5.2.11	Patient is safely secured on trolley.

6. IN-TRANSIT PROCEDURES

6.1 A best route should be planned. Lifts should be secured or reserved beforehand.

6.2 Adequate communication facilities during transit and at the destination must be available.

6.3 The status of the patient must be checked at intervals, especially if the journey takes considerable time. Any change in the patient's condition, unexpected event, or critical incident, must be acted upon immediately.

7. ARRIVAL PROCEDURES

7.1 On arrival at the destination, the receiving monitoring, ventilation, gas, suction, and power facilities are checked if the patient is to be transferred from the transport facilities.

7.2 The patient must be assessed when the new monitors, ventilators (if used), gas and power supplies are established.

7.3 If another team assumes responsibility of care, a complete hand over is given to the team leader. The transport staff must remain with the patient until the receiving team is fully ready to take over care.

8. DOCUMENTATION

The clinical record should document the patient's clinical status during transport until handover occurs at the destination.

9. QUALITY ASSURANCE

The process of intrahospital transport of patients should be continually evaluated to identify system problems and recommend improvements.

These guidelines should be interpreted in conjunction with the following professional document:

> PS52   *Minimum Standards for Transport of Critically Ill Patients.*

Professional documents of the Australian and New Zealand College of Anaesthetists (ANZCA) are intended to apply wherever anaesthesia is administered and perioperative medicine practised within Australia and New Zealand. It is the responsibility of each practitioner to have express regard to the particular circumstances of each case, and the application of these ANZCA documents in each case. It is recognised that there may be exceptional situations (e.g. some emergencies) in which the interests of patients over-ride the requirement for compliance with some or all of these ANZCA documents.

ANZCA professional documents are reviewed from time to time, and it is the responsibility of each practitioner to ensure that he or she has obtained the current version which is available from the College website (www.anzca.edu.au/). Each document is prepared in the context of the entire body of the College's professional documents, and should be interpreted in this way. These professional documents have been prepared having regard to the information available at the time of their preparation, and practitioners should therefore take into account any information that may have been published or become available subsequently.

Whilst ANZCA endeavours to ensure that its professional documents are as current as possible at the time of their preparation, it takes no responsibility for matters arising from changed circumstances or information or material which may have become available subsequently.

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ANZCA Website: http://www.anzca.edu.au
CICM Website: http://www.cicm.org.au
ACEM Website: http://www.acem.org.au

GUIDELINES ON INTERHOSPITAL TRANSPORT OF CHILDREN

PAEDIATRIC SOCIETY OF NEW ZEALAND

INTRODUCTION

Children are best treated by medical and nursing staff who are trained and experienced in their management, and may require transfer from a facility without specialist paediatric capability to one that can provide age appropriate health care.

In addition, some highly specialised children's facilities may exist in only one or two institutions nationwide, necessitating further transfer should such a level of care be required.

There are inevitably risks inherent in transfer (1,2). It is, therefore, imperative that systems are in place to minimise risks and enhance the benefit of access to additional care not available at the point of referral.

In order to minimise this risk, the transfer period should be viewed not as a gap between services but as a continuation of care at or above that available at the referral institution (1). There is no place for a "scoop and run" philosophy in the interhospital setting (5).

The skill and experience of the accompanying personnel are the single most important factors in risk reduction during transport (1,3-5,7,10). At the outset they must be capable of any intervention that may be anticipated to occur during transfer, and be experienced in the level of care that is required for the patient.

CATEGORIES OF PATIENT DEPENDENCY

1. **Ambulance first response service**

   For practical reasons, in most circumstances, this must remain the transport mechanism for seriously ill or injured children. It must be stated, however, that current paramedic training in the emergency care of children, equipment and protocols should be enhanced. Paramedics have little accumulated paediatric experience.

2. **Children who are referred to a medical institution as routine bookings** for investigation, who are well and not in need of regular vital sign recordings. Such patients can travel with their families in commercial or personal transport services without nursing or medical escort.

3. **Hospitalised Child - Ward Patient**

   Children who are hospitalised usually on a paediatric ward and require routine vital sign monitoring. These children require nursing observation in the inpatient setting and should receive the same level of care in transport. The nursing escort should be an experienced paediatric nurse, capable of recognising unexpected deterioration, and the patient should travel with equipment to deal with such an event. Transfer in the family vehicle is not appropriate. Commercial air transfer may be appropriate. The mode of transport should be assessed for each situation depending on time, availability of craft, geography and patient condition.

4. **Sick but stable non-ventilated patient**

These patients require frequent vital sign recordings, and have potential for deterioration in vital signs during transfer but are otherwise currently stable.

Monitoring must be at least at the level at the point of referral.

Personnel:

(a) Paediatric nurse.
(b) Paediatric medical practitioner experienced in the interventions required or potential during transfer.

Stable condition should be ensured prior to transport. Commercial flights may be appropriate if easily available and road or air ambulance helicopter or fixed wing may be used.

5. **Critically ill and/or ventilated patient**

These patients ideally require a combination of three or four skills during the transport process.

- Paediatric
- Intensive care
- Transport medicine including aviation medicine if by air.
- Subspecialty procedural skill where necessary.

Options for Transfer

a) One way transport utilising physicians and nursing staff from the referring institution and local transport services.

The major advantage is the speed of response and of arrival of the child at the receiving institution.

Disadvantages are:

1) Medical and nursing staff at referral institutions are not always immediately available, leading to delays and local manpower problems due to their absence.

2) They may have little training in treating critically ill children, or the rigors of transport medicine, and have a higher incidence of complications in patient care (4,5,7,8,10).

3) They may not have access to a full range of equipment or transport craft (1,6).

b)   Specialised paediatric critical care transport

Time to expertise can either be achieved by sending the patient to the expertise or alternatively by sending the expertise to the patient (1,8). The advantage of the latter is the better preparedness of an organised transport team to provide an enhanced level of care during the transport phase thereby reducing the risk inherent in moving the patient. The use of experienced transport personnel has been shown to reduce the number of adverse events by as much as tenfold (4,5,7,8,10).

Transporting personnel should include a doctor at senior registrar, fellow, or critical care specialist level and a senior nurse, both experienced in the care of critically ill children (1,3,5,).

Personnel with specific expertise may be included in the unusual circumstance where the patient requires an urgent sub-specialist procedure to stabilise for transfer, e.g neurosurgery, paediatric general surgery, cardiology.

Given the readiness of many transport systems, time to expertise may not be very different from one way transports.

The onus therefore is on organised systems to bring response times to a minimum.

c)   Personnel should include:

i)   A minimum of two people in addition to the vehicle operator, at least one of whom should be a nurse, doctor or paramedic capable of advanced airway management, IV therapy and experienced in caring for children.

ii)   They must be appropriately skilled for the job and reliably able to perform any procedures anticipated to occur.

GEOGRAPHICAL CONSIDERATIONS

New Zealand's geography parallels rural Australia, parts of the USA and Canada with large concentrations of population amongst scattered populations at very distant sites.

Observing systems in these other places suggests that New Zealand should move towards:

1.   Enhancing speed of available modes of transport.

2.   Better co-ordination of existing systems into an effective primary and secondary response network.

In addition, transporting services should be capable of performing advanced stabilisation prior to transport and be self-sufficient enough to be able to deal with delays in remote locations without additional support.

FUNDING CONSIDERATIONS

Cost of transfer should not be a factor in the decision which must be made on clinical grounds.

Mechanisms for funding should be equitable, take account of often huge financial burdens for geographically distant sites and preferably be held or administered centrally or to the transfer services themselves.

PROCESS OF TRANSFER

1.   Pre-transport communication and co-ordination

a)   Telephone referral following resuscitation of the patient, gathering of history, examination, vital signs and initial investigations.

b)   Acceptance of transfer. Discussion between referring and receiving senior medical staff, and agreement that transfer is feasible, beneficial and should proceed.

c)   Stabilisation advice and institution of any additional management by the referrer.

d)   Agreement regarding the required medical and/or nursing attendants during transport.

e)   Decision as to the appropriate mode and timing of transportation. Factors to consider include:

- Patient condition, age and size.
- Urgency of transfer.
- Medical interventions anticipated.
- Personnel and other resource availability.
- Time of day.
- Weather and/or traffic conditions.
- Geographical considerations
- Cost

f)   Decision regarding the required monitoring, equipment and medication.

2.   Initiation of Transport

a)   Transport / receiving service responsibilities:

Once agreement on the mode, personnel and timing is made, the receiving hospital and/or transport service has an obligation to:

i)   Be able to respond rapidly if required and at all times keep response times to a minimum with accessible personnel, equipment and vehicles or aircraft.

ii)   Check and provide all drugs and equipment prior to take off.

iii)   Provide notification of expected ETA and specific arrival requests eg requirement for urgent CT scan.

iv)   Continue to be available by phone for ongoing management advice.

v)   Notify number of family members who can accompany the child.

b)   Referrer responsibilities:

i)   Notify ongoing changes in patient condition which will affect treatment requirements.

ii)   Confirm family members accompanying the patient.

iii)   Preparation by the referrer of copies of medical records, referral letters, x-rays or patient specimens to accompany the patient.

3.   Transport Requirements

a)   Transport team responsibilities include:

i)   Adequate handover, both written and verbal, at both ends of the transfer.

ii)   Resuscitation and stabilisation of the patient. This may be lengthy(1) and include necessary investigations which are not available in transport, e.g. x-rays, blood gases, CT scan.

iii)   Discussion with the family, including description of the patient's condition, risks versus benefits, and of procedures which may be necessary in transport. Consent for transfer should be obtained.

b)   Monitoring and Equipment.

i)   Intravascular lines should be patent, secure and accessible.

ii)   Monitoring must be appropriate to the patient's condition and at least at the same level as in the referring unit.

iii)   Equipment must be:

-   recharged appropriately.
-   have good battery life.
-   appropriate dc conversion adaptors or machine outlets.
-   necessary power supply to warm an incubator at full power.

and enable monitoring of:

-   ECG / resps.
-   temperature   } minimum
-   pulse oximetry
-   BP non-invasive / invasive
-   pressure channels up to 2
-   ETCO2

iv)   Alarms should not be reliant solely on audible signals and should preferably be electronic.

v)   Equipment must provide a homeostatic environment ie must be able to:

-    adjust the temperature within the craft as well as an incubator for small babies
-    ventilate all age groups
-    humidify gases as required particularly for longer trips in small patients
-    provide IV fluids - pumps
-    suction.
-    check blood glucoses
-    deal with unexpected emergency
-    catheters, chest drains, endotracheal and naso-gastric tubes
-    fluids appropriate to the patients' age and condition
-    drugs to cope with all emergency scenarios

vi)   Gases and power must be sufficient to provide dc power for at least three pieces of equipment. Piped or cylinder O_2 should be calculated to be sufficient to last twice the anticipated distance of transfer(1).

vii)   Family - ideally at least one family member should be able to accompany a child.

viii)   A pre-departure checklist is ideal (5,7).

ix)   Recording - documentation of clinical data such as history, reason for transport, clinical progress during transfer, any interventions, drugs administered, fluids given etc is mandatory. Detailed demographic and operational information is also required.

x)   Communication - ability to communicate from the craft via radio-telephone or preferably cell phone for:

-    ongoing medical advice.
-    notification of ETA.
-    co-ordination of additional ambulance craft.

xi)   In the case of air transport, services should meet civil aviation requirements eg multi-engine, IRF type and have adequate door design for horizontal patient entry.

Transport should be hospital unit to hospital unit.   Airport or other handover is unacceptable, except in unusual circumstances.

4. Post-Transport

a) Adequate patient handover - both written and verbal.

b) Equipment   - return of transport gear
   - replenishment of supplies and small equipment
   - re-attachment to charging power supplies

c) Refurbishment of the transport craft.

d) In air transfers - post flight documentation.

e) The receiving unit must advise the referring unit on successful transport and regularly update them regarding patient progress (5).

E.R. Segedin
Chair, Transport Committee
Paediatric Society of New Zealand

June 2001

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MINIMUM STANDARDS FOR INTENSIVE CARE UNITS

This Document outlines the minimum standards relating to work practice/caseload, staffing and operational requirements, design, equipment and monitoring for Level I, II, III and Paediatric Intensive Care Units. The Document IC-13 (2010) – "Recommendations on Standards for High Dependency Units Seeking Accreditation for Training in Intensive Care Medicine" outlines similar minimum standards for High Dependency Units.

LEVELS OF INTENSIVE CARE UNITS

The level of intensive care available should support the delineated role of the particular hospital. The role of the ICU will vary, depending on staffing expertise, facilities and support services as well as the severity of illness and number of patients admitted.

1. **LEVEL III INTENSIVE CARE UNIT**

    A Level III ICU is a tertiary referral unit for intensive care patients and should be capable of providing comprehensive critical care including complex multi-system life support for an indefinite period. Level III units should have a demonstrated commitment to academic education and research. All patients admitted to the unit must be referred for management to the attending intensive care specialist.

A Level III unit should have:

1.1 **Work practice/caseload**

    1.1.1 At least six staffed and equipped beds to adequately discharge clinical, teaching and research commitments consistent with the functioning of an Intensive Care Unit in a tertiary referral centre.

    1.1.2 Sufficient clinical workload and case-mix of patients to maintain a high level of clinical expertise and to provide adequate clinical exposure and education of staff, including Intensive Care trainees if relevant. This should normally be more than 300 mechanically ventilated patients per annum.

1.2 **Staffing Requirements**

1.2.1 A medical director who is a Fellow of the College of Intensive Care Medicine. The medical director must have a clinical practice predominantly in Intensive Care Medicine.

1.2.2 Sufficient supporting specialist(s) so that consultant support is always available to the medical staff in the unit. For training units classified as C12 or C24 (refer Document IC-3 "Guidelines for Intensive Care Units seeking Accreditation for Training in Intensive Care Medicine") trainees must be exposed to at least two specialists who are Fellows of the College of Intensive Care Medicine. At least two specialists should have a minimum of 50% involvement in the unit. There should also be sufficient specialist staff to provide for reasonable working hours and leave of all types and to allow the duty specialist to be available exclusively to the unit at all times. The majority of attending specialists in the unit must be Fellows of the College of Intensive Care Medicine.

1.2.3 At least one of the specialists exclusively rostered to the unit at all times. During normal working hours this specialist must be predominantly present in the unit, and at all times be able to proceed immediately to it.

1.2.4 In addition to the attending specialist, at least one registered medical practitioner with an appropriate level of experience exclusively rostered and predominantly present in the unit at all times.

1.2.5 A minimum of 1:1 nursing for ventilated and other similarly critically ill patients, and nursing staff available to greater than 1:1 ratio for patients requiring complex management (e.g. ventricular assist device).

1.2.6 A nurse in charge of the unit with a post registration qualification in intensive care or in the clinical specialty of the unit.

1.2.7 The majority of nursing staff with a post registration qualification in intensive care or in the specialty of the unit.

1.2.8 All nursing staff in the unit responsible for direct patient care being registered nurses.

1.2.9 At least one nurse educator.

1.2.10 Support staff as appropriate, eg. biomedical engineer, clerical and scientific staff.

1.3 **Operational Requirements**

1.3.1 Defined management, admission, discharge and referral policies.

1.3.2 Demonstrable and documented formal audit and review of its activities and outcomes with staff who have dedicated time to collect and manage data.

1.3.3 A documented orientation program for new staff.

1.3.4 Educational programs for medical staff, and a formal nursing education program.

1.3.5 An active research program, preferably with staff who have dedicated time to collect and manage data.

1.3.6 Suitable infection control and isolation procedures and facilities.

1.3.7   24 hour access to pharmacy, pathology, operating theatres and tertiary level imaging services, and appropriate access to physiotherapy and other allied health services when necessary.

1.3.8   Appropriate clerical and secretarial support.

1.4   Design

1.4.1   A self-contained area, with easy access to the emergency department, operating theatres and organ imaging.

1.4.2   An appropriate design, providing a suitable environment with adequate space for patient care delivery, storage, staff accommodation (including office space), education and research.

1.5   Equipment and Monitoring

Equipment and monitoring of appropriate type and quantity suitable for the function of the unit and appropriate as judged by contemporary standards.

1.6   Suitability for training

Only Level III units may apply for accreditation as C24 training units, but may also apply for C6 or C12 accreditation (refer Document IC-3 "Guidelines for Intensive Care Units seeking Accreditation for Training in Intensive Care Medicine").

2.   LEVEL II INTENSIVE CARE UNIT

A Level II ICU should be capable of providing a high standard of general intensive care, including complex multi-system life support, which supports the hospital's delineated responsibilities.   It should be capable of providing mechanical ventilation, renal replacement therapy and invasive cardiovascular monitoring for a period of at least several days.   All patients admitted to the unit must be referred for management to the attending intensive care specialist.

A Level II unit should have:

2.1   Work practice/caseload

2.1.1   At least 4 staffed and equipped beds to adequately discharge clinical and teaching functions.

2.1.2   Sufficient clinical workload for maintaining clinical expertise and to provide adequate clinical exposure and education of intensive care staff, including trainees if relevant. This should normally be more than 200 mechanically ventilated patients per annum.

2.2   Staffing requirements

2.2.1   A medical director who is a Fellow of the College of Intensive Care Medicine.   The medical director must have a clinical practice predominantly in intensive care medicine.

2.2.2 At least one other specialist who is a Fellow of the College of Intensive Care Medicine[1].

2.2.3 Sufficient specialist staff to provide reasonable working hours and leave of all types and to allow the duty specialist to be rostered and available exclusively to the unit.

2.2.4 In addition to the attending specialist, at least one registered medical practitioner with an appropriate level of experience exclusively rostered and predominantly present in the unit at all times.

2.2.5 A nursing staff: patient ratio of 1:1 for all critically ill patients.

2.2.6 A nurse in charge of the unit with a post registration qualification in intensive care or in the clinical specialty of the unit.

2.2.7 The majority of nursing staff with a post registration qualification in intensive care or in the specialty of the unit.

2.2.8 All nursing staff in the unit responsible for direct patient care being registered nurses.

2.2.9 Access to a nurse educator.

2.2.10 Support staff as appropriate, eg. biomedical engineer, clerical and scientific staff.

2.3 **Operational Requirements**

2.3.1 Defined management, admission, discharge and referral policies.

2.3.2 Demonstrable and documented formal audit and review of its activities and outcomes, with staff who have dedicated time to collect and manage data.

2.3.3 A documented orientation program for new staff.

2.3.4 Educational programs for medical staff, and a formal nursing education program.

2.3.5 Suitable infection control and isolation procedures and facilities.

2.3.6 24 hour access to pharmacy, pathology, operating theatres and imaging services commensurate with the designated role of the hospital, and appropriate access to physiotherapy and other allied health services when necessary.

2.3.7 An active research program is desirable.

2.4 **Design**

2.4.1 A self-contained area, with easy access to the emergency department, operating theatres and organ imaging.

2.4.2 Appropriate design, providing a suitable environment with adequate space for patient care delivery, storage, staff accommodation (including office space), education and research.

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[1] The College of Intensive Care Medicine acknowledges that recruitment of Fellows of the College to rural units may be difficult and would support the designation Level II for a rural ICU if this were the only deficiency and if genuine attempts had been made at recruitment of suitable personnel.

2.5 **Equipment and Monitoring**

Equipment and monitoring of appropriate type and quantity suitable for the function of the unit and appropriate as judged by contemporary standards.

2.6 **Suitability for training**

Level II units may apply for maximum accreditation as C12 training units, but may also apply for C6 accreditation (refer Document IC-3 "Guidelines for Intensive Care Units seeking Accreditation for Training in Intensive Care Medicine").

3. **LEVEL I INTENSIVE CARE UNIT**

A Level I ICU should be capable of providing immediate resuscitation and short term cardio-respiratory support for critically ill patients. It will also have a major role in monitoring and prevention of complications in "at risk" medical and surgical patients. It must be capable of providing mechanical ventilation and simple invasive cardiovascular monitoring for a period of at least several hours. Provision of such care for more than 24 hours is allowed for patients with essentially single system failure but only within the context of ongoing discussion with a Level II or Level III unit with which the host unit has an established referral relationship. Such a relationship should include mutual transfer and back transfer policies and an established, joint review process. All patients admitted to a Level I unit must be referred to the Medical Director of the unit or the specialist taking responsibility for the unit at the time of admission.

The patients most likely to benefit from Level I care include:

a) Patients with uncomplicated myocardial ischaemia.
b) Post-surgical patients requiring special observations and care.
c) Unstable medical patients requiring special observations and care beyond the scope of a conventional ward, and
d) Patients requiring short term mechanical ventilation.

3.1 **Work practice/caseload**

The number of ICU beds and number of patients' admissions should be sufficient to maintain clinical skills by both medical and nursing staff.

A Level I unit should have:

3.2 **Staffing Requirements**

3.2.1 A medical director who is experienced in intensive care medicine.

3.2.2 Consultant support, always available from a specialist with experience in intensive care medicine.

3.2.3 In addition to the attending specialist, at least one registered medical practitioner with an appropriate level of experience, rostered for the intensive care unit at all times.

3.2.4 A nursing staff: patient ratio of 1:1 for all critically ill patients.

3.2.5 A nurse in charge of the unit with a post registration qualification in intensive care or in the clinical specialty of the unit.

3.2.6 The majority of nursing staff with a post registration qualification in intensive care or in the specialty of the unit.

3.2.7 All nursing staff in the unit responsible for direct patient care being registered nurses.

3.2.8 Support staff as appropriate, eg. biomedical engineer, clerical and scientific staff.

3.2.9 A minimum of two registered nurses present in the unit at all times when there is a patient admitted to the unit.

3.3   **Operational Requirements**

3.3.1 Defined management, admission, discharge and referral policies.

3.3.2 Demonstrable and documented formal audit and review of its activities and outcomes.

3.3.3 A documented orientation program for new staff.

3.3.4 Educational programs for medical staff, and a formal nursing education program.

3.3.5 Suitable infection control and isolation procedures and facilities.

3.3.6 24 hour access to pharmacy, pathology, operating theatres and imaging services commensurate with the designated role of the hospital, and appropriate access to physiotherapy and other allied health services when necessary.

3.3.7 An active research program is desirable.

3.4   **Design**

3.4.1 A self-contained area, with easy access to the emergency department, operating theatres and organ imaging.

3.4.2 Appropriate design, providing a suitable environment with adequate space for patient care delivery, storage, staff accommodation (including office space), education and research.

3.5   **Equipment and Monitoring**

The type and quantity of equipment and monitoring suitable for the function of the unit and appropriate as judged by contemporary standards.

3.6   **Suitability for training**

Level I units are ineligible to apply for accreditation for training in Intensive Care Medicine.

4.   **PAEDIATRIC INTENSIVE CARE UNIT**

A tertiary referral Paediatric Intensive Care Unit (PICU) should be capable of providing comprehensive critical care including complex multi-system life support for an indefinite

period to children less than 16 years. These units should have a commitment to academic education and research. All patients admitted to the unit must be referred for management to the attending intensive care specialist.

A PICU should have:

4.1 **Work practice/caseload**

    4.1.1 Sufficient staffed and equipped beds (usually a minimum of six beds) to provide for its clinical and teaching functions.

    4.1.2 Sufficient clinical workload to maintain clinical expertise (usually a minimum of 300 patient admissions per annum).

4.2 **Staffing Requirements**

    4.2.1 A medical director who is a Fellow of the College of Intensive Care Medicine. The medical director should have a clinical practice predominantly in paediatric intensive care medicine.

    4.2.2 Sufficient supporting specialist(s) so that consultant support is always available to the medical staff in the unit. For training units classified as C12 or C24 (refer Document IC-3 "Guidelines for Intensive Care Units seeking Accreditation for Training in Intensive Care Medicine") trainees must be exposed to at least two specialists who are Fellows of the College of Intensive Care Medicine. At least two specialists should have a minimum of 50% involvement in the unit. There should also be sufficient specialist staff to provide for reasonable working hours and leave of all types and to allow the duty specialist to be available exclusively to the unit at all times. The majority of attending specialists in the unit should be Fellows of the College of Intensive Care Medicine.

    4.2.3 At least one of the specialists exclusively rostered to the unit at all times. During normal working hours this specialist must be predominantly present in the unit, and at all times be able to proceed immediately to it.

    4.2.4 In addition to the attending specialist, at least one registered medical practitioner with an appropriate level of experience exclusively rostered and predominantly present in the unit at all times.

    4.2.5 A minimum of 1:1 nursing for ventilated and other similarly critically ill patients, and nursing staff available to greater than 1:1 ratio for patients requiring complex management (e.g. ventricular assist device).

    4.2.6 A nurse in charge of the unit with a post registration qualification in intensive care or in the clinical specialty of the unit.

    4.2.7 The majority of nursing staff with a post registration qualification in intensive care or in the specialty of the unit.

    4.2.8 All nursing staff in the unit responsible for direct patient care being registered nurses.

    4.2.9 At least one nurse educator.

    4.2.10 Support staff as appropriate, eg biomedical engineer, clerical and scientific staff.

4.3 **Operational Requirements**

4.3.1 Defined management, admission, discharge and referral policies.

4.3.2 Demonstrable and documented formal audit and review of its activities and outcomes with staff who have dedicated time to collect and manage data.

4.3.3 A documented orientation program for new staff.

4.3.4 Educational programs for medical staff, and a formal nursing education program.

4.3.5 An active research program, preferably with staff who have dedicated time to collect and manage data.

4.3.6 Suitable infection control and isolation procedures and facilities.

4.3.7 24 hour access to pharmacy, pathology, operating theatres and tertiary level imaging services, and appropriate access to physiotherapy and other allied health services when necessary.

4.4 **Design**

4.4.1 A self-contained area, with easy access to the emergency department, operating theatres and organ imaging.

4.4.2 Appropriate design, providing a suitable environment with adequate space for patient care delivery, storage, staff accommodation (including office space), education and research.

4.5 **Equipment and Monitoring**

Equipment and monitoring of appropriate type and quantity suitable for the function of the unit and appropriate as judged by contemporary standards.

4.6 **Suitability for training**

Paediatric ICU's may apply for accreditation of training as C6, C12 or C24 units as detailed in Document IC-3 "Guidelines for Intensive Care Units seeking Accreditation for Training in Intensive Care Medicine".

GENERIC REQUIREMENTS FOR INTENSIVE CARE UNITS

An Intensive Care Unit (ICU) is a specially staffed, and equipped, separate and self-contained section of a hospital for the management of patients with life-threatening or potentially life-threatening, and reversible or potentially reversible organ failure.

An ICU provides resources for the support of patients and their families, and utilises the specialised skills of medical, nursing and other staff experienced in the management of critically ill patients. These skills and resources, necessary to care for the critically ill, are most efficiently concentrated in one area of the hospital. This does not preclude the division of one ICU into a higher level (eg for ventilated patients) and lower or "step-down" level (eg for post-operative patients), nor does it preclude the siting of specific high dependency areas elsewhere in the hospital (eg neurosurgical, post-operative cardiothoracic area). Neonatal and Paediatric

Intensive Care Units and Coronary Care Units should preferably be separate from general ICU's. However, coronary care patients and children are effectively managed in general ICU's, where necessary.

Within each unit, policies should be available which detail the admission and discharge criteria of patients. There should also be protocols for retrieving patients, and for transferring patients to other intensive care units for more comprehensive patient care when necessary.

5. STAFFING

The concentration of staff and equipment to care for critically ill patients in one area of the hospital encourages efficient use of expertise and limited resources.

5.1 Medical Staff

The medical director of Level II and III units and paediatric units and the majority of all senior medical staff appointed to Level III units and paediatric units, should be Fellows of the College of Intensive Care Medicine. Sufficient specialist staff with experience in intensive care to provide for administration, teaching, research, reasonable working hours and leave of all types are necessary. Except for Level I units, there must be at least one specialist exclusively rostered to the unit at all times together with 24 hour full-time junior medical staff with an appropriate level of experience rostered exclusively at all times. In Level III units and Paediatric units there must be access to a broad range of specialty consultants.

5.2 Nursing Staff

The nursing staff: patient ratio and the total number of nursing staff required by each unit depends on many variables such as the total number of patients, severity of illness of patients, the method of rostering staff on 8 or 12 hour shifts, as well as individual policies for support and monitoring in each unit. All nurses involved in direct patient care should be registered nurses and the nurse in charge and the majority of nursing staff in each unit should have a post registration qualification in intensive care or in the specialties of the unit. Level I & II units should be capable of providing a nursing staff patient ratio of 1:1 for all critically ill patients. Level III units and Paediatric units should be capable of providing nursing care to greater than 1:1 ratio for critically ill or unstable patients.

An artificially ventilated patient needs at least one nurse at the bedside at all times. A ventilated patient with more complex support such as renal replacement therapy and inotropic support may need two nurses per patient for at least some of the shift. Others such as post-operative patients admitted for overnight monitoring and treatment with a continuous epidural and supplemental oxygen, may require only one nurse per 2-3 patients. Allowances must be made for meal breaks, handover times, holidays, sickness, study leave, etc.

5.3 Other Staff

Depending on the needs of the unit, physiotherapists, radiographers, dieticians, technicians, including biomedical engineering and scientific officers, cleaning staff, social workers, occupational therapists, interpreters, pastoral, secretarial and clerical staff are all required. Secretarial services should be available to support educational and administrative activities. These should be separate from ward clerk duties in the ICU.

5.4 Educational

The unit should have a documented educational program for medical, nursing and other staff. Level III units and Paediatric units should have a nurse educator and formal nursing educational program. Level II units should have access to a nurse educator.

6.   OPERATIONAL

All units should have defined policies for admission, management, discharge and referral of patients. All units should be under the direction of a specialist in intensive care medicine. This person should institute agreed policies, develop a team approach for management and be responsible to the hospital administration through appropriate channels. Clinical management of the patient must be achieved within the framework of agreed policies (eg. procedural and infection control, including defined antibiotic policies). All units should have documented and demonstrable procedures for formal audit, peer review and quality assurance. Services required on a 24 hour basis include imaging, laboratory and other diagnostic facilities. Except for Level I units, all patients admitted must be referred for management to the attending intensive care specialist. Level III units and paediatric units must have an active research program. In Level II units, an active research program should be encouraged.

7.   STRUCTURE OF AN ICU

7.1   Siting

The ICU should be a separate unit within the hospital with access to the emergency department, operating theatres and organ imaging on campus.

7.2   Design

A high standard of intensive care medicine is influenced by good design and adequate space. Whenever renovations or new structures are being planned there are certain features which should be considered.

7.2.1 *Patient Area* – in adult intensive care units at least 20m^2 floor area is required for each bedspace in an open area exclusive of service areas and circulation space as indicated below. Paediatric units may utilise less than 20m^2 when utilising cots rather than beds. At least one wash basin for every two beds is recommended and one for each bedspace is preferred. At least one single room should be available for every six open space beds. Each single room needs to have its own wash basin. There must be an adequate number of service outlets depending on the purpose of the unit. A Level III unit will require at least three oxygen, two air and three suction outlets, and at least 16 power points for each bedspace. The electrical wiring and protection of patient treatment areas must be Cardiac Protected Status AS3003. Adequate and appropriate lighting for clinical observation must be available. Service outlets and lighting must comply with standards prescribed by the appropriate authority. For the psychological well-being of patients and staff, windows and bed access to the exterior are desirable features. Design of the unit should take into account the need for patient privacy.

7.2.2 *Working Area* – the working area must include adequate space for staff to work in comfort while maintaining visual contact with the patient. Adequate space must be allowed for patient monitoring, resuscitation equipment, and medical storage areas (including a refrigerator). The unit needs space for a mobile x-ray machine, and associated equipment. The x-ray viewing facilities must enable simultaneous viewing of multiple x-rays. There should be adequate room for telephones and other

communication systems, computers and data collecting, also for the storage of stationery. Adequate space for a receptionist and/or ward clerk must be available.

7.2.3 *Environment* – the unit should have appropriate air conditioning which allows control of temperature, humidity and air change.

7.2.4 *Isolation area* – the unit must be capable of isolation procedures.

7.2.5 *Equipment storage area* – eg. for monitors, ventilators, infusion pumps and syringes, dialysis equipment, disposables, fluids, drip stands, trolleys, blood warmers, suction apparatus, linen, large items of special equipment.

7.2.6 *Dirty utility* – area for cleaning appliances, urine testing, emptying and cleaning bed pans and urine bottles. Unit design should provide appropriate movement pathways for contaminated equipment.

7.2.7 *Staff Facilities* – should be sited close to the patient area and have adequate communication with it.

7.2.8 *Seminar Room* – should be situated close to the patient area with adequate communication and be equipped with seating, audiovisual aids, wall boards and other teaching aids.

7.2.9 *Nursing Offices* – separate offices must be provided at least for the Nurse in Charge and Nurse Educator.

7.2.10 *Medical Offices* – each senior doctor should have adequate office space. There should be adequate office space for junior medical staff to perform educational, research or clerical work during quiet clinical periods.

7.2.11 *Relatives' area* – a separate waiting area must be available (with drinks dispenser, radio, television and comfortable seating desirable). A separate interview room and a separate area for distressed relatives should be available and overnight rooms for relatives should also be considered.

7.2.12 *Secretarial area* – a separate area should be available for departmental secretarial assistance. Records storage has to be accommodated.

7.2.13 *Computing facilities* – a separate area should be designated for computerised patient data entry and analysis. Confidentiality should be built into any system.

7.2.14 *Cleaners' area* – for storage of equipment and materials.

7.2.15 *Workshop and Laboratory* – should be considered for any unit which does not rely on centralised services.

7.2.16 *Library facilities* – an appropriate range of bench manuals, textbooks, journals and access to electronic medical information should be available 24 hours a day within the unit complex.

8. EQUIPMENT

8.1 The type and quantity of equipment will vary with the type, size and function of the unit and must be appropriate to the workload of the unit, judged by contemporary standards.

8.2   There must be a regular system in force for checking the safety of equipment.

8.3   Basic equipment should include:

- ventilators
- hand ventilating assemblies
- suction apparatus
- airway access equipment, including bronchoscopic equipment
- vascular access equipment
- monitoring equipment, both non-invasive and invasive
- defibrillation and pacing facilities
- equipment to control patient's temperature
- chest drainage equipment
- infusion and specialised pumps
- portable transport equipment
- specialised beds

Other equipment (eg. renal replacement therapy and intra-aortic balloon counterpulsation etc.) for specialised diagnostic or therapeutic procedures should be available when clinically indicated and in order to support the delineated role of the ICU.

Protocols and in-service training for medical and nursing staff need to be available for the use of all equipment, including steps to be taken in the event of malfunction.

9   MONITORING

Adequate monitoring is a core capability of all Intensive Care Units.

The described monitoring methods below are not meant to replace vigilance by medical and nursing staff in the unit and may fail to detect unfavourable clinical developments. Furthermore, it is understood that the use of monitoring does not guarantee any specific patient outcome.

The health care facility is responsible for provision of equipment for intensive care and monitoring on the advice of one or more designated intensive care specialists, and for effective maintenance of this equipment.

9.1   Personnel

Clinical monitoring by a vigilant nurse is the basis of intensive patient care. This should be supplemented by appropriate devices to assist the nurse.

9.2   Patient Monitoring

9.2.1   *Circulation*

The circulation must be monitored at frequent and clinically appropriate intervals by detection of the arterial pulse, ECG display and measurement of the arterial blood pressure.

9.2.2   *Respiration*

Respiratory function should be assessed at frequent and clinically appropriate intervals by observation, supported by capnography and blood gas analysis.

9.2.3 *Oxygenation*

The patient's oxygenation should be assessed at frequent and clinically appropriate intervals by observation, pulse oximetry and blood gas analysis as appropriate.

9.3 **Equipment (including portable equipment used for patient transports)**

9.3.1 *Piped gas supply failure alarm* - There must be piped gas supply failure alarms.

9.3.2 *Oxygen supply failure alarm* - An automatically activated device to monitor oxygen supply pressure and to warn of low pressure must be fitted to ventilators.

9.3.3 *Oxygen analyser* - An oxygen analyser must be available to measure the oxygen concentration delivered by ventilators or breathing systems.

9.3.4 *Alarms for Breathing System Disconnection or Ventilator Failure* - When an automatic ventilator is in use, a device capable of warning promptly of a breathing system disconnection or ventilator failure must be in continual operation.

9.3.5 *Ventilator volumes and pressures* - When a ventilator is in use, ventilatory volumes should be measured although it is accepted that this is not always possible with some ventilators used for paediatric and neonatal patients. Airway and respiratory circuit pressure must be monitored continuously and prompt warning given of excessive pressures.

9.3.6 *Humidifier temperature* - When a heated humidifier is in use monitoring of the inspired temperature must be available which alarms at high temperature.

9.3.7 *Electrocardiograph* - Equipment to monitor and continually display the electrocardiograph must be available for every patient.

9.3.8 *Pulse Oximeter* - A pulse oximeter must be available for every patient in the Intensive Care Unit.

9.3.9 *End tidal CO_2 monitor* - Capnography must be available at each bed in the Intensive Care Unit and must be used to confirm tracheal placement of the endotracheal or tracheostomy tube immediately after insertion.

Continuous end tidal CO_2 monitoring should be used in all patients treated with neuromuscular blocking agents and during patient transport

9.3.10 *Air embolism* - When a patient is treated by renal replacement therapy, plasmapheresis or circulatory perfusion, monitoring for air embolism must be in use.

9.3.11 *Other Equipment* - When clinically indicated, equipment must be available to measure other physiological variables such as intra-arterial and pulmonary artery pressures, cardiac output, inspiratory pressure and air flow, intracranial pressure, temperature and neuromuscular transmission.

These guidelines should be interpreted in conjunction with the following Documents of the College of Intensive Care Medicine:

IC-2   "Intensive Care Specialist Practice in Hospitals Accredited for Training in Intensive Care Medicine"
IC-3   "Guidelines for Intensive Care Units seeking Accreditation for Training in Intensive Care Medicine"
IC-4   "The Supervision of Vocational Trainees in Intensive Care Medicine"
T-10   "The Role of Supervisors of Training in Intensive Care Medicine"
IC-7   "Administrative Services to Intensive Care Units"
IC-13 "Recommendations on Standards for High Dependency Units Seeking Accreditation for Training in Intensive Care Medicine"

Promulgated by FICANZCA: 1994
Revised: 1997, 2003(JFICM)
Republished by CICM: 2010

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**INTENSIVE CARE SERVICES FOR CHILDREN IN NEW ZEALAND
TERTIARY PAEDIATRIC SERVICES REVIEW - MAY 1998**

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This committee met by a series of teleconferences over several months.

EXECUTIVE SUMMARY:

1.   There should be a national paediatric intensive care service for New Zealand based around a single Paediatric Intensive Care Unit at the Tertiary Children's Hospital (Starship).

2.   This service would need to:
   i)   cater for about 1400 admissions per year and provide 15 to 16 intensive care beds.
   ii)   liaise closely with paediatricians, intensivists, anaesthetists and neonatologists in other centres regarding patient management.
   iii)   provide a national paediatric transport service.
   iv)   provide the full range of paediatric subspecialty services.
   v)   provide accommodation and support for patients' parents.
   vi)   be staffed by medical and nursing staff with recent training and ongoing experience in paediatric intensive care.

3.   Consensus regarding transfer guidelines was not reached. The majority of participants agreed that all paediatric patients anticipated to require intubation for more than 24 hours should be discussed with the Starship with a view to early transfer. Waikato Hospital did not support this view. Wellington and Hastings Hospitals had reservations for some patients.

4.   For a national service to work it is imperative that regional centres be supported to maintain a high standard of acute paediatric care, including:
   i)   resuscitation and stabilisation.
   ii)   short term ventilation (less than 24 hours).
   iii)   high dependency care of children not requiring transfer.

5.   There is a considerable amount of overseas literature to support the above recommendations.

6.   Funding concerns should not prevent transfer on appropriate clinical grounds and to this effect consideration should be given to national funding of paediatric intensive care services.

7.   There should be a national database of all children requiring intensive care to allow for accurate audit and ongoing quality improvement.

8.   There should be a co-ordinated, three tier transport system capable of managing critically ill children. This should be separately and centrally funded.

SECTION SUMMARY:

Background

1.   Paediatric Intensive Care in New Zealand is a new discipline for this country and is evolving within a framework of children cared for in general units.

Principle Conditions

1.   The discipline incorporates all groups of paediatric conditions and requires knowledge, practical skills, specific training and ongoing experience with this age group.

Statistics and Bed Recruitment

1.   Based on New Zealand population (<15 years), current performance and "best practice" international guidelines for maximal efficiency, future annual provision should be made for approximately 1400 PICU admissions and 15-16 intensive care beds.

2.   New Zealand's ICU admission rate for children appears consistent with international benchmarks but efficiency measures (bed days used per 1000 children and bed provision) are not optimal.

      While one unit's admission rate meets the second highest requirement, no unit has eight or more functional beds and no unit meets the recommendations for a maximally efficient service. These will only be met by a single combined children's cardiac and general unit.

Format of Service

1.   Optimal delivery of care requires an integrated, co-operative national system with well supported local emergency care, open communication, clear guidelines for referral, educational exchange and efficient transfer mechanisms.

2.   Workload measures of number and efficiency should be followed and benchmarked internationally.

3.   Patient load is of predominantly young patients with two-thirds of patients in the pre-school age group. Socio-economic conditions appear to heavily influence use.

4.   Adolescent use of intensive care is unknown. Adolescent patients with chronic paediatric disease should be considered for the paediatric system.

5.   Care for critically ill children is already being purchased nationally. Unmet need is within the system which handles them viz national co-ordination, optimal access, education and training, data collection and research.

6.   Paediatric specific equipment is requirement in both the resuscitation and stabilisation phase locally and for ongoing care in PICU.

7.   Intensive care to children should be delivered in a child and family centred, culturally appropriate manner.

Changes Over the Next Five Years

1. Future service changes related to changing position distribution and socio-economic changes are unknowable.

2. The planned move of cardiac children to combine with general PICU children should occur within the next five years.

3. Ongoing refinement of the national service should ensure that only children who need to transfer do so.

Workforce

1. Medical workforce number is sufficient for future requirement apart from a potential 1.0 - 2.0 FTE increase in paediatric intensivists. Local needs can be met by improved postgraduate training and CME of general intensivists, paediatricians and other staff.

2. A minimum of 5.2 FTE nurses per bed is required. If additional skilled staff are not readily available to cover peak activity this should be increased to cover 95% of patient load. Current PICU nursing cover is insufficient for unit and transport requirements. Some efficiency may be achieved by the amalgamation with cardiac nurses but a moderate increase in nursing FTE's may be required.

3. The level of post-graduate certification in paediatric intensive care nursing is suboptimal in both general units and in the PICU. The number with a postgraduate certificate in the PICU needs to improve from 50% to 70% and general units require additional trained staff. In addition to enhancing exposure to the PICU course in Auckland, general ICU courses should contain a paediatric module.

4. Paramedical staff require specific paediatric training and experience, and are an integral part of a PICU service.

Interactions and Dependencies on Other Services

1. Close links are required between intensive care services for children, neonatal and adult intensive care, transport services, and paediatric speciality services. Throughout the country the intensive care service involves general paediatricians, general intensivists and some anaesthesia staff.

Evidence for Specific Paediatric Service Position

1. The available literature is strongly supportive of transfer of all children and particularly the most seriously ill to PICU's. There is evidence from three international studies that this results in reduced mortality and improved efficiency.

Configuration of Service

1. The consensus of the group favoured a single tertiary PICU and a co-ordinated national system with general ICU's and local intensivists and/or paediatricians. Consensus on the

   timing of referral and early discussion of the sickest patients was reached by all but three regions.

2. The Committee discussed at length the literature recommendation that all children intubated for more than 24 hours (B2, A5, A10) and particularly the sickest children (B1, B4) should transfer to a tertiary paediatric family. There is no New Zealand data to support or refute this.

   There was majority agreement for early discussion of the most seriously ill children. One region did not accept this, and two others expressed reservations for some patient groups.

3. Local hospitals must retain staff training and equipment to manage early resuscitation and short term care of critically ill paediatric patients, and must evolve a policy for managing children needing close supervision.

Data Collection and Outcome Scoring

1. Data collection is required for both quality assurance - including severity adjusted mortality and mortality review, and to examine and trend service information. Current data collection is patchy and uncoordinated.

Transport

1. A national, co-ordinated system of emergency transport is required. While elements of this system exist, there is no national co-ordination and little emphasis on specific paediatric requirements. Co-ordination with neonatal transports is important for young infants and currently non-existent. A three tiered medical retrieval system is suggested.

Funding

1. A national PICU resource must be funded to be able to accept all referrals, provide internationally acceptable care and staff tertiary retrievals.

   Funding must also maintain peripheral centres to support primary retrieval, resuscitation, early management and high dependency care. This requires reliable equipment to resuscitate and stabilise patients, regular CME for staff and sufficient staff with the right skills to provide 24 hour cover.

   A co-ordinated transport system requires non CHE based central funding to cater for the three types of transport. This fund needs to be separate from PICU funding.

   Current DRG derived funding has been shown to underestimate both ICU costs and paediatric costs and so is particularly bad with the combination of paediatric ICU. The THA must be informed in discussions of case-weighted funding for PICU patients.

   Costs of developing the service over the next five to ten years include and additional 1-2 FTE paediatric intensivists and provision for a moderate increase in nursing number (particularly to cover transport). Non-personnel costs include training of both nursing and medical staff.

BACKGROUND:

Subspecialty paediatric care has been slow to evolve a national focus in New Zealand. The absence of a national children's hospital has meant that over the last few decades specialty paediatric services, including intensive care, have not developed within a paediatric structure as they have done in most comparable countries, (e.g. Australia). Children by default have been absorbed locally into services designed primarily for adults.

The Paediatric Intensive Care Unit (PICU) at the Starship Hospital in Auckland opened in December 1991 into a well established system where children were cared for in local general intensive care units. This facility has created a new focus for examining how best to handle critically ill children in New Zealand. In comparison, PICU's in many other countries have evolved over the last two or three decades within the children's health system, and in parallel with their adult counterparts.

Within New Zealand, paediatric intensive care has been increasingly discussed over the last two years. At the end of 1996 the president of the Paediatric Society of New Zealand (PSNZ) requested that Dr Segedin as head of the PICU at the Starship write a position paper on the provision of intensive care for children in New Zealand. The briefing paper from this discussion was circulated firstly to the requesting body - the Executive Committee of the PSNZ, then to paediatricians and intensivists throughout the country,

In May of 1997, the Australian and New Zealand Intensive Care Society (ANZICS) New Zealand branch met in Christchurch to discuss the document and the provision of intensive care for children in New Zealand. No consensus could be reached regarding either the applicability of international practice to New Zealand conditions, or the best way to provide for critically ill children within New Zealand. It was resolved that current practice in New Zealand should be subjected to a data collection process, whereas severity of illness, outcome scoring and efficiency measures would be examined in a similar fashion to international studies. Paediatricians (other than paediatric intensivists) were not involved in this discussion. The realities of carrying out a formal survey of severity of illness to outcome in New Zealand are currently being explored.

Independently, the Southern Regional Health Authority (SRHA) considered the development of a regional PICU for the South Island and after examining various aspects of this provision elected instead to transfer their sickest patients to the PICU in Auckland.

Paediatric intensive care in New Zealand is a new discipline for this country and is evolving within a framework of children cared for in general units.

PAEDIATRIC INTENSIVE CARE SERVICE EVALUATION

1.   **PRINCIPLE CONDITIONS**

The discipline encompasses a wide range of patients, age and physiology. Clinical conditions include the entire spectrum of all childhood disease. Principal clinical load is therefore best described by:

Severe illness requiring (or at risk of requiring) support of vital functions including:
−   intubation and airway management
−   ventilation for respiratory failure or to facilitate other therapy
−   cardiac function support including the use of inotropes
−   renal support and/or replacement therapy
−   management of cerebral dysfunction
      Common conditions include:
−   airway disease - croup, subglottic stenosis

- respiratory illness - pneumonia, bronchiolitis, asthma
- central nervous system conditions including infections, seizures, surgical conditions and injury
- multiple trauma - head, chest and./or abdominal injuries
- septicaemia
- post surgical procedures - major blood loss, cardiac or thoracic surgery, neonatal surgery (some also in NICU's), ENT surgery, other sub-specialty surgery

Disease processes and management techniques in children are different from those encountered in both neonatals and adults and therefore different skills and training are required.

The discipline incorporates all groups of paediatric conditions and requires knowledge, practical skills, specific training and ongoing experience with this age group.

2. **STATISTICS AND BED REQUIREMENTS**

   a) Annual New Zealand Data (1996-1997) made available to the committee.

<p align="center">Table 1</p>

	Total	Ventilated	> 24 hours	Deaths
Waikato	254	44	18	
PICU	667	256	101 *	23
ICR - GLH	330	300 **	150 **	
Hastings	59	25	16 #	2
Christchurch	62	29	25	3
Taranaki	24	3	2	0

*   Estimate based on review of all patients. Does not include patients with postop codes or seizures unless known to be complicated, or nasopharyngeal CPAP.
**   Estimate based on usual practice.
\#   Exceptionally busy period March 96 - March 97.

   b) Incidence

      i) UK (1991) (A4)   1.6 admissions (7.2 ICU days) per 1,000 (boys) per year and 1.1 admissions (4.95 ICU days) per 1,000 (girls) per year (for days multiply by length of stay - in UK approximately 4.5 days).

      ii) USA (1991) (B1)   1.2 admissions per 1,000 children per year (length of stay unknown).

      iii) Victoria, Australia (1996) (personal communication)   2.53 child ICU days per 1,000 children < 16 years per year. Mean length of stay = 2.14 days equates 1.18 admissions per 1,000 children per year.

      iv) New Zealand - North Health general ICU approximately 1.28 admissions per year and 4.07 bed days per 1,000 children. Figures from the rest of the country are not complete enough to enable calculations.

   * Per 1,000 children per year.

<p align="center">Table 2</p>

	Admissions	Bed Days
U.K.	1.6 (boys)	7.2

	1.1 (girls)	4.95
U.S.A.	1.2	?
Victoria	1.18	2.53
North Health	≈ 1.28	4.07

The figure of around 1.2 admissions per 1000 children per year is remarkably consistent across widely different systems. Efficiency comes from how these admissions are handled. Current North Health figures are better than the UK but not as efficient as the centralised system in Victoria.

At the rate of 1.28 admissions per 1000 children, New Zealand should expect 1435 admissions per year. At 1.2 admissions per 1000 children, 1345.

c) Prevalence

i) New Zealand. A prevalence survey of children in intensive care units in New Zealand was carried out as part of this review. There were 22 children in ICU's on the morning of 17 November 1997, nine of whom were not ventilated. A range of minimum and maximum children at any one time was also elicited (table 2). The prevalence of 22 children = 24.6 beds occupied per million children (<15 years) per days, with a little more than half ventilated.

ii) Northern UK (E3). A prevalence of 20.7 beds per million children per day.

iii) USA - Virginia (1988) (E1). 13.9 beds occupied per million children < 18 years per day for ventilated patients. Including non-ventilated ICU patients, 27.6 per million children < 18 years.

According to these figures New Zealand requires approximately 23-27 beds for PICU patients of which about 50% are ventilated. Outside Auckland patients non-ventilated may be appropriately managed in their local hospital.

d) Bed Provision

Bed provision depends on efficiency of a system - the role of the PICU in high dependency care, length of stay in the PICU and the number and size of the units involved.

Systems in the UK and USA are characterised by many small units and longer LOS (approximately double) than the more regionalised systems of Australia (A10).

Bigger units in regional centres have more experience, clinical confidence with children, more complete 24 hour care systems and better HDU backup for care in a less expensive ward environment and therefore are likely to function more effectively (A10). Maximal efficiency aim is for 80% occupancy and mean length of stay (LOS) of 2.5-3.0 days (A10).

i) UK (B2) 1 bed per 26,000 children required to cover 95% of patient load at peak time

ii) USA (B4) 1 bed per 28-32,000 children

iii) UK (A5) 1 bed per 40,000 children < 16

iv) UK (A4) 1 bed per 48,000 children LOS 4.5 days

v) Australia (A10) 1 fully staffed bed/70,000 children

vi) Victoria (A10) 1/100-115,000 children, 80% occupancy, 60% intubation rate including cardiac patients.

vii) Current North Health children (1997)   1/78,000 80% occupancy 45% intubated, excluding cardiac, plastics.

viii) GLH Cardiac PICU approximately 1/205,000 children.

Current North Health provision compares acceptably and is consistent with general Australian figures. If those rates are applied across the nation, New Zealand would require the five to six cardiac plus 14 general beds. An efficiency gain will occur with the amalgamation of cardiac and general children of approximately 22% overall (actual analysis of combined PICU/GLH data) bringing the total PICU bed requirement to 15-16 when this move is realised.

The difference between these figures and the New Zealand prevalence (b) can be explained by appropriate provision of local high dependency care and short term ventilation.

e) Size of Unit and Number of Patients. Recommendations are related to cost efficiencies, ability to support 24 hour systems, ongoing clinical experience and its relationship to maintenance of skills.

i) British Paediatric Association (A4) Minimum of 4-6 beds - ideally eight or more.

ii) Paediatric Intensive Care Society (UK) (A5) Minimum of four beds and 150 patients per year.

iii) California (A7) Minimum of eight beds and 350 admissions per year.

iv) Australia (A10) Recommend 10-16 staffed beds and 1,000-1,500 patients per year with a minimum of 600 ventilated patients per year.

v) New Zealand PICU Starship 9 Physical, 5 staffed beds, peak 10. Green Lane approximately 5 beds, peak 9. Waikato 3 beds annexed to adult unit. Other units - beds within general unit.

Based on New Zealand population (< 15 years) current performance and "best practice" international guidelines for maximal efficiency, future annual provision should be made for approximately 1400 ICU admissions and 15-16 intensive care beds.

New Zealand's ICU admission rate for children appears consistent with international benchmarks but efficiency measures (bed days used per 1000 children and bed provision) are not optimal.

While one unit's admission rate meets the second highest requirement no unit has eight or more functional beds and no unit meets the recommendations for a maximally efficient service. These will only be met by a single combined cardiac and general unit.

3. **FORMAT OF SERVICE**

A Paediatric Intensive Care Service for New Zealand requires (figure 1):

a) General:

− An integrated, co-operative national service with internationally recognised standards of care.

− Local emergency care and clear local care policies for management of critically ill children depending on local skill, existence of a general ICU, high dependency areas etc.

- Equitable access to the system for all New Zealand children accepting geographic limitations.
- Open communication.
- Clear guidelines for discussion and/or transfer.
- Transport mechanisms for both primary and secondary transfer.
- An education process for both trainees and CME of medical and nursing personnel.

- Quality assurance and data collection system, including outcome analysis and efficiency measures.

b)   Major Workload

   i)   Workload measures

A unit's workload is measured by:
-       total patient admissions
-       length of stay
-       bed days used
-       occupancy of funded beds
-       a measure of dependency of the patient e.g.
         intubated versus not (1:1 versus 1:2 staffing)
         TISS scoring
These statistics should be benchmarked locally and internationally.

   ii)   Specific patterns of use of paediatric intensive care.

   ii-   a) Age

In general for New Zealand the paediatric age group includes birth to 15th birthday, although this will extend to 18 years if the patient is at school or debilitated by chronic paediatric illness (A9). A service must be able to be flexible in orientation from small new-born (> 2kg) to adolescent patients. Some young adolescents with "adult" diseases are easily and well handled within a

general ICU. Conversely, small neonates require the very specific expertise of a neonatal unit.

The majority of patients are young with two-thirds or more less than five years of age, 60% < two years, 33% < six months and 10% or more, still in the neonatal period. This latter depends on admission policies of local neonatal units for neonates with infectious, cardiac or surgical conditions.

   ii-   b) Gender

Boys represent approximately 60% of all admissions, particularly trauma cases.

   ii-   c) Socio-economic and Racial Factors

Many illnesses requiring PICU care have strong social influences and are more prevalent in lower socio-economic environments, including pedestrian injury, meningococcal septicaemia, viral respiratory disease in infants. The pattern of illness in an ICU reflects the community which it serves. Racial groups common in lower social groupings are over-represented.

   ii-   d) Disease Categories

Respiratory and airway disease, particularly in young infants, is the biggest group of conditions requiring intensive care. Other major groups are those with central nervous system problems and elective operative procedures, followed by trauma, sepsis and a large group of less common medical conditions, including diabetic ketoacidosis, renal transplants, acute gastro-enteritis and cardiac conditions.

c)   Adolescent Care

Internationally, adolescent patients up to the age of even 21, but particularly those who are still at school are commonly cared for in the paediatric system. This discussion has not been had in New Zealand and numbers are unknown. It would seem sensible for adolescents with chronic paediatric conditions to be handled in a paediatric ICU although physiologically they are probably well cared for in general intensive care unit.

Adolescent transition for repeat users of intensive care occurs at the time of hand-over from the primary paediatric service to it's adults counterpart. At this point such patients will be transferred to adult intensive care services where this is relevant.

d)   Unmet Need

There are no critically ill children who do not currently present to the overall system, except those who die prior to hospital admission.

Local presentation of seriously ill children is not effected by national service configuration. The subsequent handling of these children, however, has significant deficiencies:
- a suboptimally integrated national service.
- limited access to specialised paediatric facilities.

- insufficient paediatric education and training of nurses and medical staff handling children.
- incomplete data collection and outcome analysis.
- little research.

e)   Length of Service

With only very few exceptions, PICU care is an acute service required for an acute illness or acute exacerbation of long term illness. Few patients stay longer than two weeks. Chronic, lifelong care e.g. home ventilation is not common in New Zealand and tends to be managed by general adult units locally where there are no transition issues.

f)   Equipment

The provision of intensive care to children across all sizes and ages requires a wide range of specialised equipment. Large capital items are required for safe delivery of fluids, ventilation and temperature control. Methods of delivery differ across the paediatric age range and in comparison to both adult and neonatal intensive care practice.

Major cost items include:

- Ventilators - capable of full age range and different modes.
- Monitors with software and alarms appropriate across all age ranges.
- Overhead warmers - prevent temperature decrease and allow both access for care and easy observation of infants and small children.
- Infusion pumps for reliable delivery of small volumes of fluid.

- Disposables - full range size of items required for therapy and monitoring, e.g. endotracheal tubes, urine collection devices etc.

g)   Needs of Children and Families

    i)   Cultural Requirements

    A service must:
    -       be in accord with The Treaty of Waitangi.
    -       provide culturally appropriate support for family of Maori and Pacific Island origin and increasingly Asian and other immigrant cultural groups, as well as Caucasian New Zealanders.
    -       have ready access to interpreter services.

    ii)   Family

    The service requires:
    -       Child and family orientation and open communication.
    -       Culturally appropriate support mechanisms for stress of dislocation, financial burdens and grief.
    -       Accommodation for families as well as caregivers.

    No child (and therefore their family) should be dislocated for longer than necessary.

    iii)   Children - the intensive care environment can be particularly terrifying for a conscious child, regardless of how close to home. Accordingly:

-       Children should not be housed, other than temporarily, with adults. Where this is necessary on repeated basis a special area should be created.
-       Open visiting is required for family members, particularly parents and other immediate caregivers.

-       Family should be part of the care team - informed and involved wherever possible and able to interact with the child as much as is feasible.

Optimal delivery of care requires an integrated, co-operative national system with well supported local emergency care, open communication, clear guidelines for referral, educational exchange, and efficient transfer mechanisms.

Workload measures of number and efficiency should be followed and benchmarked internationally.

Patient load is of predominantly young patients with two-thirds of patients in the pre-school age group. Socio-economic conditions appear to heavily influence use.

Adolescent use of intensive care is unknown. Adolescent patients with chronic paediatric disease should be considered for the paediatric system.

Care for critically ill children is already being purchased nationally. Unmet need is within the system which handles them viz national co-ordination, optimal access, education and training, data collection and research.

Paediatric specific equipment is required in both the resuscitation and stabilisation phase locally and for ongoing care in a PICU.

Intensive care to children should be delivered in a child and family centred, culturally appropriate manner.

4. LIKELY CHANGES OVER THE NEXT FIVE YEARS

a)   Service Use
Several separate processes may influence patterns of illness and requirement for intensive care.

i)   Census implications.
-     A decreasing proportion of the biggest patient group (0-5 years) is anticipated, more so in the south. The resulting effect on overall use is unknown. Pattern of illness may change rather than overall need, with a higher incidence of illnesses of 5-10 year olds, e.g. trauma.
-     Age group may be less important than socio-economic status.
-     Migration and immigration patterns will influence distribution of service within New Zealand.
ii)   Changes in subspecialty referral patterns will influence distribution of patients, e.g. burns and other specialty surgical services.
iii)   Effects of prevention activities e.g. SIDS, trauma, burns.

iv)   Technology Developments e.g. telemedicine. Intensive care, however, is a hands on discipline.
v)   Provision of other high technology therapy including ECMO and oscillation which will act as foci for referral.

b)   Service Department

i)   The infrastructure already exists to delivery the majority of service needs for both immediate and ongoing care.
ii)   Refinements in the national co-ordination of this system should see more efficient handling of patients over the next five to ten years.
iii)   The proposed move of cardiac children from Green Lane to the Starship is likely to occur within three to five years. One combined PICU will handle both groups of children.

Future service changes related to changing population distribution and socio-economic changes are unknowable.

The planned move of cardiac children to combine with general PICU children should occur within the next five years.

Ongoing refinement of the national service should ensure that only children who need to transfer do so.

5. WORKFORCE

Intensive care service is predominantly delivered by junior and senior medical staff and nurses who are required 24 hours a day in-house and with dedicated availability to the intensive care unit.

A) MEDICAL

a) Workforce recommendations/definitions.

Based on available literature, a PICU requires:

i) A full time medical director qualified in PIC with full administrative responsibility (A5, A6) supported by a nominated deputy.

ii) Paediatric intensivists, as defined by examinations in paediatric intensive care or minimum training/experience.

In the USA Critical Care Board examinations follow a two to three year PICU fellowship and can be sat in paediatrics, internal medicine, anaesthesia or surgery.

In Australasia the College of Anaesthetists - Faculty of Intensive Care awards a fellowship in paediatric intensive care following either part I FICANZA or FRACP examination and requires a minimum of two years ICU with 18 months in an approved PICU plus 12 months of anaesthesia of which six months is paediatric plus six months of paediatric medicine. The subsequent examination is a paediatric one. Some training can be

done in New Zealand but it is recommended that trainees have a minimum of one to two years overseas. Physician trainees can also train with an FRACP alone provided that time requirements are met. Anaesthesia time is strongly recommended.

Full time dedication to intensive care is recommended (A10). Number of senior staff is dictated by the number of units. Each unit requires at least 4 people to run a roster and more than 4 for an acceptable lifestyle.

iii) Outside a paediatric unit, immediate care is the responsibility of general intensivists, anaesthetists and/or general paediatricians. Requirement for PICU training of this group is recommended to be at least 6-12 months if involved with resuscitation and stabilisation of children and/or caring for children in a PICU setting (A10).

iv) Junior medical staff should be available in-house 24 hours and be dedicated to the needs of the PICU. They should be of sufficient experience and seniority to be able to reliably intubate children (A4 - A10). Junior staff should stay 6-12 months (A10) and be heavily supervised at times of changeover (B5). They should ideally come to the unit with airway or paediatric skills and preferably both. Units with two registrars on at all times have improved cover at hand-over times and much greater capacity to do paediatric transports (A10).

b) Current Workforce in New Zealand

Current senior medical PICU workforce consists of:

i) Four trained paediatric intensivists covering 1½ units, two are from an anaesthesia background and two from a paediatric background. The balance of both skills is considered valuable both locally and internationally (A10). Only two are in full time PICU practice, the others

have 25% and 50% time in anaesthesia. Amalgamation of cardiac and general children in Auckland will maximise ICU time and improve efficiency of cover. Full time dedication to paediatric intensive care is probably a desirable end point for the majority (A10).

ii)   General intensivists around the country. In several parts of the country, at least part of the ICU/anaesthesia establishment has had recent PICU experience of 6-12 months duration. (Hastings, Waikato, Christchurch, Dunedin). This is considered desirable and general units should be encouraged to progress in this direction. Such training does not create paediatric intensivists but gives sufficient exposure to children enhance short term PICU care and resuscitation skills.

iii)   Paediatric anaesthetists. Several centres have skilled paediatric anaesthetists who are experienced at stabilisation of unstable children, line placement etc. Wherever possible, in centres with no PICU, they should be involved with critically ill children outside of operating rooms. Several have 6-24 months of paediatric intensive care training.

iv)   Paediatricians, particularly in small centres, have some training in intensive care (Invercargill, Rotorua, Hastings, New Plymouth). It is desirable that all general paediatricians who are working in small centres, particularly areas without solid ICU backup should have this training.

v)   Junior staff are very important for a successful service (B5). Most units in New Zealand have full registrar cover, few, however, have paediatric training. Specialist driven decision-making and close direction of junior staff are essential.

c)   Postgraduate Training

There are currently two New Zealand RACP trainees in intensive care and an additional ANZCA paediatric anaesthetist/intensivist trainee. There is a possible 1-2 position opening in the next five years.

Those who require training in paediatric intensive care include:

i)   Paediatric intensivists (18-24 months minimum) - see above.
ii)   General intensivists (6-12 months)
iii)   Paediatricians, including those going to work in small centres or related disciplines e.g. cardiology or neonatology (6 months).
iv)   ED physicians, both paediatric and general (3-6 months).
v)   Paediatric anaesthetists (3-6 months).
vi)   Some general anaesthetists, particularly those destined for small centres (3-6 months).
vii)   Paediatric surgeons (6 months).

Recommendations do not necessarily reflect individual college requirements.

Inclusion of emergency care principles in paediatric diploma courses and fellowship exams is important.

d)   CME

i) Paediatric intensivists must go off shore annually to keep current - one local plus one international meeting.

ii) General intensivists caring for children should attend paediatric meetings e.g. the one day paediatric meeting at ANZICS.

iii) PALS certification will be available for both intensivists paediatricians and trainees and rural practitioners in the near future. EMST courses have a paediatric trauma section.

iv) PICU at Starship needs to improve outreach education with protocol guidelines, day meetings and formation of a special interest group.

e) Undergraduate Medical Training

Training in intensive care principles is currently poorly addressed, other than requirement for basic CPR certification at graduation more emphasis on neonates and children is required. A curriculum should incorporate intensive care teaching in child health, including aspects of prevention, medical, surgical and subspecialty conditions, as well as applied physiology and resuscitation principles.

Medical workforce number is sufficient for future requirement apart from a potential 1 - 2 FTE increase in paediatric intensivists. Local needs can be met by improved postgraduate training and CME of local general intensivists, paediatricians and other staff.

B **NURSING**

(A3-7, A10, A12)

Nursing of critically ill children requires specific training with this group of patients. It is not sufficient to have adult intensive care training or general paediatric training alone, except for the use of experienced paediatric nurses for HDU care and up to 30% of staff in a paediatric unit who are supported by experienced PCIU nurses (A3, A12, A4). All ICU courses require a unit of paediatric care.

a) Workforce recommendations

i) To meet international recommendations for units looking after children, PICU's should have:

- A charge nurse with experience in and a qualification in paediatric intensive care.
- A nurse educator with qualification in paediatric intensive care.
- The majority (at least 70%) of nursing staff looking after intubated children should have or be working towards a post registration qualification in intensive care preferably in paediatric intensive care - or the general specialty of the unit, e.g. cardiac ICU. Within such units with paediatric experience should preferentially care for the children.

All units looking after children should have at least one nurse with a post registration qualification in paediatric intensive care on duty in the unit at all times.

ii) Staffing Levels

The recommendation of 6.4 FTE's per funded bed (A4) is uncommon in New Zealand where it is more common to staff at approximately 5.2 FTE's per bed covering about 80% of shifts and requiring additional staff every 5th shift. Such a staffing level requires ready availability of skilled additional staff. If these are not available staffing levels should be higher.

Nursing rations should be no less that one nurse per intubated patient, one nurse to every two HDU patients and allow for two or more nurses to care for extra needs of some patients, shift co-ordinators, runners and transports.

b)   Current Workforce

i)   PICU at Starship is staffed for only five beds with 28.3 FTE nurses including an allocation towards the in-house nursing pool. This is insufficient and needs to be increased to cover 6-7 beds in the near future. The combination of these nurses with cardiac nurses will improve efficiencies but a modest increase in nursing establishment is likely to be required. This is particularly important in obtaining skilled PICU transport nurses. Only 50% have or are working towards a certificate in intensive care nursing course in September 1997.

ii)   General units and the cardiac unit at Green Lane Hospital. The numbers of paediatric qualified and/or experienced nurses in these units is not documented.

c)   Training

PICU at Starship and it's nursing course need to extend it's education role for both short term attachments and future involvement in the year long course.

A minimum of 5.2 FTE nurses per bed is required. If additional skills are not readily available to cover peak activity this should be increased to cover 95% of patient load. Current PICU nursing cover is insufficient for unit and transport requirements. Some efficiency may be achieved by the amalgamation with cardiac nurses but a moderate increase in nursing FTE's may be required.

The level of postgraduate certification in paediatric intensive care nursing is suboptimal in both general units and in the PICU. The number with a postgraduate certificate in the PICU needs to improve from 50% to 70% and general units require additional trained staff. In addition to enhancing exposure to the PICU course in Auckland, general ICU courses should contain a paediatric module.

C   OTHER SERVICES

a)   Subspecialty medical staff (A1, A5-9)

A paediatric intensive care unit requires extensive support from specialised laboratory, pathology, radiology and the full range of paediatric subspecialties to support it's tertiary role.

b)   Family support professionals (A1, A4-9)

The special requirements of stressed and often dislocated families require facilities and personnel for:

    i)   accommodation

    ii)   open visiting of their child, clear and regular explanations and, where possible, involvement in their care.

    iii)   facilities adjacent to the unit for rest away from the bedside meetings with staff, refreshments.

    iv)   personnel available who are able to provide for the emotional and psychological needs of both the child and family who are not formally involved in the medical management of the patient. This includes clergy, social workers, cultural supporters, psychiatrists.

c)   Other staff

Physiotherapists, laboratory and radiology staff with knowledge of critically ill children are required on a 24 hour basis.

Respiratory therapists required in the North American setting are not part of the Australasian workforce - their role being divided between medical and nursing staff.

Paramedical staff require specific paediatric training and experience, and are an integral part of a PICU service.

6. INTERACTIONS AND DEPENDENCIES ON OTHER SERVICES

a)   Adult intensive care and anaesthetists
- stabilisation of children, early care.
- procedural skills

b)   Neonatal intensive care
- new-born babies with cardiac or surgical conditions
- small infants with other illnesses housed in NICU e.g. bronchiolitis

c)   Transport services
- air and ground craft take paediatric experience to the patient, both PICU and on occasions subspecialty skills e.g. neurosurgical.
- neonatal and adult ICU transport services.
- primary retrieval vs interhospital transfer

d)   Paediatric anaesthesia

e)   Specialty paediatric care
Requirements for function of a PICU include a full range of medical and surgical disciplines of practitioners trained and experienced in paediatric aspects of the specialty. Especially important are ENT surgeons, general surgeons, respiratory physicians, cardiologists.

Close links are required between intensive care services for children, neonatal and adult intensive care, transport services and paediatric speciality services. Throughout the country the intensive care service involves general paediatricians, general intensivists and some anaesthesia staff.

7 EVIDENCE FOR SPECIFIC PAEDIATRIC SERVICE PROVISON

a)   International guidelines (A1 - 9) are based on existing practice and professional opinion as to best practice for children. Australia and the USA in particular have always had well developed paediatric systems and the issues currently being addressed by the tertiary review within New Zealand simply do not exist to be studied in these countries. Our current system of children in an adult subspecialty framework is most similar to the UK. All available guidelines support transfer of children, particularly the most seriously ill, to a PICU.

b)   Scientific evidence is, therefore, small and only recently available. The four comparative studies all support better outcome for the most seriously ill children in specialised tertiary paediatric facilities. Reasons are not explored but size of service, experience at handling many uncommon conditions and overall system support within the larger institutions as well as paediatric dedication are all likely to be important. The trauma study, however, favours "paediatric" versus "size and system". In addition to improved mortality, the literature suggests that highly regionalised systems handle patients more efficiently with a much reduced length of stay, bed requirement per population of children and overall infrastructure cost (B2, A10). The cost of transport is not included in these calculations.

The available literature supporting children in adult facilities is not comparative or severity of illness adjusted. Unadjusted mortality statistics are, in fact, high.

c)   Related Disciplines

This evidence is consistent with similar high technology disciplines such as neonatology and oncology.

The available literature is strongly supportive of transfer of all children particularly the most seriously ill to PICU's. There is evidence from three international studies that this results in reduced mortality and improved efficiency.

8   **CONFIGURATION OF SERVICE**

a)   Size of service

Approximately 1400 paediatric patients per year will present for intensive care.

Opinion regarding the patient number required to maintain skills ranges from a minimum of 150 total patients per year to 600 intubated patients with 1000-1500 total patients in a regionalised model. Given that this latter recommendation comes from the service which has the best mortality and cost efficient statistics, it is worth aspiring to. The current changes proposed for Auckland Healthcare will just achieve this recommendation with an estimated 970 total patients, 620 of whom are intubated.

The literature requires a minimum of four beds. Economically eight or more is though best with 12-16 maximally efficient (A10). New Zealand PICU experience is that four to eight beds is insufficient to achieve a critical mass for either cost efficiencies, to support the required specialised staffing infra-structure, or maximise clinical experience and expertise in both medical and nursing staff. There is insufficient critical mass of clinical staff to support the required research.

There is opinion that it is the number of children, not total adult and children experience that matters (A10) and this is examined in the outcome studies (B1-4).

b)   Options for Service Delivery

The committee has discussed three options for service delivery:

i)   status quo with children placed in local adult units and variable referral practices.
ii)   regionalised PICU's in all four regions.
iii)   single PICU and co-ordinated nation-wide service.

The conclusion of the committee was that the status quo was changing. Policies were different for different regions but were evolving to a single PICU national service model. The southern RHA decision to not evolve a regional PICU for reasons of insufficient critical mass and cost inefficiencies led to the most favoured recommendation for option iii).

This model requires a central PICU taking the sickest patients, good local care of children requiring close monitoring as well as resuscitation and a period of ventilation, and agreed discussion/transfer guidelines. Different regions have different levels of comfort in handling children and therefore thresholds for referral. Bigger centres with established general units voiced a need to support local paediatric practice e.g. paediatric surgery. There was no general dispute with this as few patients in this category should require intensive care for longer than 24 hours.

c)   Guidelines for Referral

All agreed
Infants and children who require intensive care and also have/ are:

i)   Referred for ECMO (currently GLH).
ii)   Congenital heart disease (currently GLH).
iii)   Neurosurgical intervention.
iv)   Suspected metabolic disease - diagnosis, management including CVVH.
v)   Hepatic failure.
vi)   Renal failure requiring dialysis and/or CVVH if less than 12kg.
vii)   Requirement for other subspecialty paediatric expertise e.g. ENT, pulmonary.

The committee discussed at length the literature recommendation that all children intubated for more than 24 hours (B2, A5, A10) and particularly the sickest children (B1, B4) should transfer to a tertiary paediatric facility. There is no New Zealand data to support or refute this.

There was majority agreement for early discussion of the most seriously ill children. One region did not accept this, and two others expressed reservations for some patient groups.

The purpose of early discussion was to:

i)   agree on management which may avert ventilation, or abbreviate its course.
ii)   avoid transfer if possible in appropriate patients.
iii)   agree on early resuscitative management of those who do not require early transfer.

Timing of transfer in part depends on proximity to the PICU at Starship Hospital. It is, for example, illogical for children to be managed at the new level II ICU at North Shore Hospital for any length of time whereas a retrieval from the deep south should not be for trivial reasons or illness that is likely to be shorter than the transfer time. This places significant onus for short term management on geographically distant centres.

d)   Other requirements of a nation-wide system (fig 1):

-       adequate facilities for local centre care of HDU/short term ICU children and emergency care.
-       open communication and clear accountability both locally and between centres.
-       protocols and outreach education from the central PICU.
-       easy access for all party communication.
-       well funded transport system.
-       improved levels of paediatric ICU training (particularly emergency care) in smaller areas.

e)   Obligations Of A Central PICU

i)   to achieve an internationally comparable service with maximal clinical skill and efficient patient handling, benchmarked inter-nationally.
ii)   always have beds available for patients who require transfer from other centres - this requires good peak physical capacity and flexible nursing.
iii)   outreach - both clinical and educational.
iv)   be available and approachable for referrals.
v)   run an efficient transport service.
vi)   work co-operatively.
vii)   work to advocate/establish a quality paediatric sub-specialty backup in all disciplines "a paediatric package".
viii)   undertake research into clinical issues relevant locally and internationally.

The consensus of the group favoured a single tertiary PICU and a co-ordinated national system with general ICU's and local intensivists and/or paediatricians. Consensus on the timing of referral and early discussion of the sickest patients was reached by all but three regions.

The committee discussed at length the literature recommendation that all children intubated for more than 24 hours (B2, A5, A10) and particularly the sickest children (B1, B4) should transfer to a tertiary paediatric facility. There is no New Zealand data to support or refute this.

There was majority agreement for early discussion of the most seriously ill children. One region did not accept this, and two others expressed reservations for some patient groups.

Local hospitals must retain staff training and equipment to manage early resuscitation and short term care of critically ill paediatric patients, and must evolve a policy for managing children needing close observation.

8   DATA COLLECTION AND OUTCOME SCORING

a)   Quality Measures

Effectiveness and efficiency of intensive care for children is best measured by:

*   length of stay in intensive care.
*   length of ventilation.
*   mortality adjusted for severity of illness.

These are not universally collected on children in New Zealand ICU's.

i)   Mortality adjusted for severity of illness (F1 - 2)

Severity of illness at first contact (PIM score) (F1) and worst physiology in 24 hours (F2) (PRISM, PRISM III scores) are used in parts of New Zealand. PRISM is widely used but sub-optimal in that poor early care can worsen physiology in the first 24 hours and therefore the score, making death a more predicted outcome. These scores also ignore ICU input into stabilisation prior to ICU admission.

The PIM score is applied at the first contact with a unit taking into account severity of illness at the initiation of therapy whether that is in the unit, emergency department or during a retrieval. It is validated in Australia which more closely mirrors New Zealand practice than the USA based PRISM score.

Two units currently collect data from both scores as part of an Australasian database.

ii)   Mortality Review

There is as yet no national mortality review process for children in New Zealand. Intensive care, representation on any future committee is essential.

b)   Current Service Information

Data collection is required to examine details of current provision, staff training, patient number and trends in service pattern. Appendix 1.

c)   Feedback for prevention activities

Data collection is required for both quality assurance - including severity adjusted mortality and mortality review, and to examine and trend service information. Current data collection is patchy and uncoordinated.

9   TRANSPORT

A national, co-ordinated system of emergency transport is required. While elements of this system exist, there is no national co-ordination and little emphasis on specific paediatric requirements. Co-ordination with neonatal transports is important for young infants and currently non-existent. A three tiered medical retrieval system is suggested.

1. Primary retrieval either from a scene or small hospital. This is likely to be staffed by paramedics, anaesthetists, paediatricians or in some rural areas, general practitioners. All require access to PALS and EMST training.

2. Secondary retrieval from district base hospital to regional centre is often required and should be ideally staffed from the regional centre with experienced anaesthesia/intensive care personnel with paediatric training. Small infants may be transferred by local neonatal staff.

3. Tertiary transfer to a national paediatric unit may occur either as step two or three depending on proximity to the PICU, the condition of the patient, and the likely course of the illness. Evidence strongly supports paediatric intensive care transport teams based in PICU's to these retrievals. Support of families dislocated under these circumstances requires special attention. Accommodation, family support and urgent financial assistance must all be available at short notice. Current CHE based funding is a major impediment to transfer for distant centres.

10   FUNDING

A national PICU resource must be funded to be able to accept all referrals, provide internationally acceptable care and staff tertiary retrievals.

Funding must also maintain peripheral centres to support primary retrieval, resuscitation, early management and high dependency care. This requires reliable equipment to resuscitate and stabilise patients, regular CME for staff and sufficient staff with the right skills to provide 24 hour cover.

A co-ordinated transport system requires non CHE based central funding to cater for the three types of transport. This fund needs to be separate from PICU funding.

Current DRG derived funding has been shown to underestimate both ICU costs and paediatric costs and so is particularly bad with the combination of paediatric ICU. The THA must be informed in discussions of case-weighted funding for PICU patients.

Costs of developing the service over the next five to ten years include and additional 1-2 FTE paediatric intensivists and provision for a moderate increase in nursing number (particularly to cover transport). Non-personnel costs include training of both nursing and medical staff.

Table 3

Paediatric Use of Intensive Care in New Zealand
17 November 1997

Place	Number of Children	Not Ventilated	Short (<24hrs) Ventilation	Ventilation >24hrs	Range	Comment
Whangarei	1	0	1	0	0-2	
Starship	7	1	1	5	1-10	
Green Lane ICR	1	0	0	1	0-9	
Middlemore	0	0	0	0	0-3	Burns, plastics
Waikato	4	2	0	2	0-4	< 14 years
Tauranga	0	0	0	0	0-2	
Rotorua	1	1	0	0	0-2	
Whakatane	0	0	0	0	0-2	include prems
Gisborne	0	0	0	0	0-2	
Taranaki	0	0	0	0	0-2	
Hastings	0	0	0	0	0-4	
Wanganui	0	0	0	0	0-2	
Palmerston North	2	1	1	0	0-2	
Wellington	0	0	0	0	0-2	
Hutt	2	1	0	1	0-3	Plastics
Blenheim	0	0	0	0	0-2	Transfer out
Nelson	0	0	0	0	0-2	
Christchurch	0	0	0	0	0-4	
Ashburton	3	3	0	0	0-3	HDU
Timaru	0	0	0	0	0-1	Keep > one week
Dunedin	1	0	0	1	0-4	Transferring
Invercargill	0	0	0	0	0-1	

APPENDIX

DATA THAT NEEDS TO BE COLLECTED

1   Patient Data
         Annual number < 15 years
         Diagnosis
         Age

2   Intubation rate and number.
                 Length of ventilation.

3   Senior medical staff provided intensive care to children
                 Paediatric or intensive car background
                 Total number of people
                 Number with > six months PICU training and when that was received
                 Involvement of paediatricians in ICU care

4   Junior Staff
                 Who makes decisions at the bedside
                 Paediatric   )
                 Paediatric Anaesthetic   ) training
                 Intensive care   )

5   Nursing Staff
                 Number with PICU certificate
                 Number with ICU certificate
                 Number with > one year PICU and no certificate
                 Percentage of paediatric trained nurses to total nursing FTEs

6   Physical facility

         (a)   Within intensive care
                 Where are children nursed
                 -       special area
                 -       side room
                 -       open floor

         (b)   Local policy for placement of high dependency paediatric patients.

7   Severity of illness/outcome data collected.

AUSTRALIAN AND NEW ZEALAND COLLEGE OF ANAESTHETISTS
ABN 82 055 042 852

RECOMMENDATIONS ON MINIMUM FACILITIES FOR SAFE ADMINISTRATION OF ANAESTHESIA IN OPERATING SUITES AND OTHER ANAESTHETISING LOCATIONS

1.   PRINCIPLES OF ANAESTHESIA CARE

1.1   The provision of safe anaesthesia in hospitals requires appropriate staff, facilities and equipment. These are specified in this Document.

1.2   Anaesthesia should be administered only by medical practitioners with appropriate training in anaesthesia or by trainees supervised according to College Professional Documents

- TE3 *Policy on Supervision of Clinical Experience for Vocational Trainees in Anaesthesia*,
- PS1 *Recommendations on Essential Training for Rural General Practitioners in Australia Proposing to Administer Anaesthesia* and
- PS2 *Statement on Credentialling in Anaesthesia*.

1.3   Every patient presenting for anaesthesia should have a pre-anaesthetic consultation by a medical practitioner who has appropriate training in anaesthesia. See College Professional Document PS7 *Recommendations on The Pre-Anaesthesia Consultation*.

1.4   Appropriate monitoring of physiological and other variables must occur during anaesthesia. See College Professional Document PS18 *Recommendations on Monitoring During Anaesthesia*.

2. STAFFING

2.1   In addition to the nursing or other professional staff required by those carrying out the operative procedure, there must be:

2.1.1   An assistant for the anaesthetist. See College Professional Document PS8 *Guidelines on The Assistant for the Anaesthetist*.

2.1.2   Adequate assistance for positioning the patient.

2.1.3   Adequate technical assistance to ensure proper functioning and servicing of all equipment used.

3. AREAS IN WHICH ANAESTHESIA IS ADMINISTERED

3.1 Anaesthesia Equipment

3.1.1   Essential requirements are listed below. Where a range of equipment is recommended, the facility is expected to provide the type most suitable for its needs.

3.1.2   Each facility must designate:

3.1.2.1   One or more specialist anaesthetists to advise on the choice and maintenance of anaesthesia equipment.

3.1.2.2   One or more of its nursing or technical staff to be responsible for the organisation of cleaning, maintenance and servicing of anaesthesia equipment.

3.1.3   In each anaesthetising location where inhalational general anaesthesia is to be performed, there must be an anaesthesia delivery system which is capable of delivering an accurately measured flow of oxygen (and medical air where this is clinically indicated). Essential equipment includes:

3.1.3.1   Calibrated vaporisers or other systems designed for the accurate delivery of inhalational anaesthetic agents when required.

3.1.3.2   Infusion devices designed for controlled delivery of intravenous anaesthetic agents when required.

3.1.3.3   A range of suitable breathing systems with appropriate measures to ensure the sterility of breathing gases supplied to each patient. See College Professional Document PS28 *Guidelines on Infection Control in Anaesthesia*.

3.1.3.4   Breathing systems suitable for paediatric use when necessary.

3.1.4   Each anaesthesia machine must comply with minimum safety requirements as specified in College Professional Document T3 *Minimum Safety Requirements for Anaesthesia Machines for Clinical Practice*.

3.1.5   A separate means of inflating the lungs with oxygen must be provided in each anaesthetising location. This apparatus should comply with the current relevant national Standards. The size of the device and its attachments must be appropriate for patients being anaesthetised at that location. Its oxygen supply must be independent of the anaesthesia delivery system.

3.1.6   Suction apparatus must be available for the exclusive use of the anaesthetist at all times together with appropriate hand pieces and endotracheal suction catheters. This apparatus should comply with the current relevant national Standards. Provision must be made for an alternative suction system in the event of primary suction failure.

3.1.7   In every anaesthetising location there must be:

3.1.7.1   Appropriate protection for the anaesthesia team against biological contaminants. This must include gowns, disposable gloves, masks and eye shields.

3.1.7.2   A stethoscope

3.1.7.3   A sphygmomanometer

3.1.7.4   Monitoring equipment complying with College Professional Document PS18 *Recommendations on Monitoring During Anaesthesia*. Where volatile agents are not available, agent monitoring is not required.

                 The particular requirements of magnetic resonance imaging facilities can be met with appropriate equipment designed for the environment.

3.1.7.5   An appropriate range of face masks.

3.1.7.6   An appropriate range of oropharyngeal, nasopharyngeal, laryngeal mask and other artificial airways.

3.1.7.7   Two laryngoscopes with a range of suitable blades.

3.1.7.8   An appropriate range of endotracheal tubes and connectors.

3.1.7.9   A range of endotracheal tube introducers and bougies.

3.1.7.10   Endotracheal cuff inflating syringe.

3.1.7.11   Magill's forceps and throat packs.

3.1.7.12   A suitable range of adhesive and other tapes.

3.1.7.13   Scissors.

3.1.7.14   Sterile lubricant suitable for use with airway devices.

3.1.7.15   Tourniquets for use during IV insertion.

3.1.7.16   Intravenous infusion equipment with an appropriate range of cannulae and solutions.

3.1.7.17   Means for the safe disposal of items contaminated with biological fluids, "sharps" and waste glass.

3.1.7.18   Equipment for scavenging of anaesthetic gases and vapours where these are in use with interface equipment which prevents over-pressurisation of the anaesthesia breathing circuit.

3.1.8   In every anaesthetising location there must be readily available:

3.1.8.1   Equipment for managing difficult intubations in all locations where endotracheal intubation is electively performed.

3.1.8.2   Equipment for automatic ventilation of the lungs incorporating alarms as specified in College Professional Document PS18 *Recommendations on Monitoring During Anaesthesia*, when appropriate.

3.1.8.3   Equipment as required for the direct measurement of arterial and venous pressures when appropriate having regard to the procedures being undertaken.

3.1.8.4   Equipment for the rapid infusion of fluids.

3.1.8.5   A cardiac defibrillator with capacity for synchronised cardioversion.

3.1.8.6   Interpleural drainage sets including appropriate underwater seal drainage equipment or one way valves.

3.1.8.7   When appropriate, equipment to warm and/or humidify respiratory gases during anaesthesia. A decision as to the use of active or passive devices will require consideration of the procedures being undertaken.

3.1.8.8   Equipment to cool patients in the event of inappropriate increases in body temperature.

3.1.8.9   Equipment required for sub-arachnoid, epidural or regional nerve blocks, when appropriate.

3.1.8.10   When appropriate, having regard to the procedures being undertaken, equipment to minimise patient heat loss including insulating sheets, forced air warming devices, mattress warmers and intravenous fluid warmers.

3.1.8.11   Equipment to ensure safe positioning for patients during procedures.

3.1.9   Other requirements for safe anaesthesia include:

3.1.9.1   Appropriate lighting for the clinical observation of patients which complies with the current relevant national Standards.

3.1.9.2   Emergency lighting and electric power complying with the current relevant national Standards.

3.1.9.3   Telephone/Intercom to communicate with persons outside the anaesthetising location including an "anaesthesia emergency" call system.

3.1.9.4   Refrigeration facilities for the storage of fluids, drugs and biological products.

3.1.9.5   The means to maintain room temperature in the anaesthetising location within the range of 18 - 28°C.

3.1.9.6   Patient transfer trolleys/beds as specified in College Professional Document PS4 *Recommendations for the Post-Anaesthesia Recovery Room*.

3.1.9.7   Devices such as rollers or patient slides to assist with transfer of patients in a manner safe for patients and staff.

3.1.9.8   A minimum of three people to assist with transfer of the patient when required, with the anaesthetist having prime responsibility for the patient's airway, head and neck.

3.2 Drugs

3.2.1   In addition to the drugs and agents commonly used in anaesthesia, drugs necessary for the management of the following conditions (which may complicate or co-exist with anaesthesia) must also be available. Such conditions include:

- Adrenal dysfunction
- Anaphylaxis
- Bronchospasm
- Cardiac arrest

- Cardiac arrhythmias
- Coagulopathies
- Hypoglycaemia
- Hypotension
- Hyperglycaemia
- Hypertension
- Pulmonary oedema
- Raised intracranial pressure
- Respiratory depression
- Uterine atony (where relevant)

3.2.2 In making an appropriate selection of drugs and administration equipment for the management of these conditions, advice should be sought as in 3.1.2.1.

3.2.3 Appropriate mechanisms must exist for the regular replacement of all drugs and drug administration equipment after use or when their expiry date has been reached.

3.2.4 An initial supply of dantrolene sufficient for commencing the treatment of a suspected case of malignant hyperpyrexia should be readily accessible to all anaesthetising locations within the institution. The minimum supply is twenty-four 20mg ampoules of dantrolene. Additional doses must be readily available on request. Large hospitals and isolated hospitals should have thirty-six 20mg ampoules of dantrolene readily available; this is sufficient to treat a 70 kg adult with up to 10 mg/kg.

3.3 Routines for Checking, Cleaning and Servicing Equipment

3.3.1 Regular sterilising, cleaning and housekeeping routines for the care of equipment should be established.

3.3.2 Documented servicing of the anaesthesia delivery system and medical gas equipment by an appropriate organisation must be carried out at intervals recommended by the manufacturer. In the absence of a manufacturer's recommendation on servicing intervals, servicing must be carried out twice a year. After any maintenance or modification to the gas distribution system, tests of gas flow, pressure and identification must be carried out and documented according to current national standards prior to use.

3.3.3 A copy of the College Professional Document PS31 *Recommendations on Protocol for Checking the* Anaesthesia *Machine* or a similar document should be available on each anaesthesia delivery system.

3.4 Recovery Area

3.4.1 Recovery from anaesthesia should take place under appropriate supervision in a designated area which conforms with College Professional Document PS4 *Recommendations for the Post-Anaesthesia Recovery Room*.

3.4.2 Contingency plans should exist for the safe emergency evacuation of patients from the operating suite and/or recovery areas under adequate medical supervision.

4. SPECIFIC ISSUES WITH PARTICULAR ANAESTHETISING LOCATIONS

This is a general document which is intended to be interpreted in the context of the particular service for which anaesthesia is administered. Additional specific issues occur with some particular anaesthetising locations:

4.1 Delivery suites and Operating Rooms used for Obstetrics

4.1.1 Staffing: For the establishment and management of epidural blockade in labour, the presence of a midwife trained and competent in obstetric epidural management is required.

4.1.2 Analgesia equipment: Any apparatus used for administration of inhalation analgesia must deliver at least 30% oxygen.

4.1.3 There must be suction apparatus for the exclusive use of the anaesthetist which is separate from that required for resuscitation of the neonate.

4.1.4 There must be separate oxygen outlets and suitable attachments for administering oxygen to the mother and to the neonate.

4.1.5 Neonatal resuscitation equipment must include a suitable range of items for:

4.1.5.1 Administration of oxygen to the neonate.

4.1.5.2 Clearing of the airway.

4.1.5.3 Intubation and ventilation of the lungs.

4.1.5.4 Administration of intravenous fluids and drugs.

4.1.5.5 Maintenance of the neonate's temperature.

4.1.6 An appropriate range of drugs must be available.

4.2 ECT Locations

Where provision of an anaesthesia delivery system is not essential, as in an ECT area, there must be:

4.2.1 A breathing system capable of delivering 100% oxygen for both spontaneous and controlled ventilation. An alternative breathing system should be immediately available. Where more than one patient is to be treated, this equipment must be duplicated or there must be an inline viral filter. See College Professional Document PS28 *Guidelines on Infection Control in Anaesthesia*.

4.2.2 Adequate reserves of oxygen must be available. If a reticulated or indexed gas connection system is in use, an oxygen failure warning device is necessary. An emergency cylinder supply of oxygen is necessary in the event of a central supply failure.

4.3 Dental surgeries

4.3.1   There must be a dental operating chair which will allow the patient to be placed rapidly in the horizontal or head-down position.

4.4 Organ Imaging Locations

4.4.1   Monitoring equipment complying with College Professional Document PS18 *Recommendations on Monitoring During Anaesthesia*. Although special problems are encountered in MRI facilities, appropriate equipment to meet the recommendations is available.

4.4.2   The specific problems associated with the location of the anaesthesia delivery system, monitoring equipment and other necessary equipment (eg drug trolley and suction apparatus) in an environment where space is often limited due to the presence of imaging equipment must be prospectively considered.

RELEVANT PROFESSIONAL DOCUMENTS

PS1   *Recommendations on Essential Training for Rural General Practitioners in Australia Proposing to Administer Anaesthesia*
PS2   *Statement on Credentialling in Anaesthesia*
PS4   *Recommendations for the Post-Anaesthesia Recovery Room*
PS7   *Recommendations on The Pre-Anaesthesia Consultation*
PS8   *Guidelines on The Assistant for the Anaesthetist*
PS18   *Recommendations on Monitoring During Anaesthesia*
P28   *Policy on Infection Control in Anaesthesia*
PS31   *Recommendations on Checking Anaesthesia Delivery Systems*
T3   *Minimum* Safety *Requirements for Anaesthesia Machines for Clinical Practice*
TE3   *Policy on Supervision of Clinical Experience for Vocational Trainees in Anaesthesia*

COLLEGE PROFESSIONAL DOCUMENTS

College Professional Documents are progressively being coded as follows:

TE   *Training and Educational*
EX   *Examinations*
PS   *Professional Standards*
T   *Technical*

POLICY - *defined as 'a course of action adopted and pursued by the College'. These are matters coming within the authority and control of the College.*

RECOMMENDATIONS - *defined as 'advisable courses of action'.*

GUIDELINES - *defined as 'a document offering advice'. These may be clinical (in which case they will eventually be evidence-based), or non-clinical.*

STATEMENTS - *defined as 'a communication setting out information'.*

This document is intended to apply wherever anaesthesia is administered.

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

Professional documents are reviewed from time to time, and it is the responsibility of the practitioner to ensure that the practitioner has obtained the current version. Professional documents have been prepared having regard to the information available at the time of their preparation, and the practitioner should therefore have regard to any information, research or material which may have been published or become available subsequently.

Whilst the College endeavours to ensure that professional documents are as current as possible at the time of their preparation, it takes no responsibility for matters arising from changed circumstances or information or material which may have become available subsequently.

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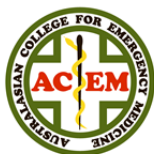
**AUSTRALASIAN COLLEGE
FOR EMERGENCY MEDICINE**

STATEMENT ON
RESPONSIBILITY FOR CARE IN EMERGENCY DEPARTMENTS

Policy Nr: S18

1.   PURPOSE & SCOPE

The objective of this document is to provide guidance to the staff of emergency departments on their role and responsibility in the provision of care to the patients in their facilities, and the transfer of responsibility for care upon admission to, or discharge from, hospital.

This statement is based on the principles of modern organisation management, precedent and advice. Where an individual hospital wishes to have alternative administrative arrangements, these should be formally documented to ensure that appropriate accountability is created.

2.   THE EMERGENCY DEPARTMENT

Emergency Departments (EDs) comprise distinct physical facilities and organisational structures established in hospitals to deliver emergency medical care to the acutely ill and injured. Emergency departments are similar to other hospital clinical units and will typically have an organisational structure including a director and senior medical and nursing staff who are credentialed and who are ultimately accountable to the hospital executive for the performance* of the department.

The organisation of work in the emergency department must bring together the elements of physical facility, clinical equipment and other technology and human resources to create a care process which meets appropriate quality standards:
- Reception
- Triage
- Initial assessment and resuscitation
- Detailed assessment and investigation
- Transitional evaluation and monitoring
- Disposition

* Performance may be conceived as the casemix and quality adjusted volume of services delivered for the budget provided.

3.   RESPONSIBILITY FOR CARE

The primary responsibility for the management of patients physically within the emergency department and undergoing this care process rests with the medical practitioner designated in charge of the emergency department at the time. This responsibility extends until the conclusion of the emergency care process.

4.   DANGEROUS OVERCROWDING

Emergency departments are built and staffed to meet predefined patient loads. When emergency departments are overcrowded or have patient loads which exceed their physical or staffing capability, emergency physicians

have a responsibility to inform hospital management that patient care could be compromised and hospital management has a responsibility to restore a safe working environment.

5.   HANDOVER

The end-of-shift transfer of clinical responsibility is an important medical duty that is vital to the continuity of the medical care of patients within the emergency department. Systems are required to ensure adequate clinical handovers occur, are documented, and are resourced in terms of appropriately constructed rosters.

Systems must be in place within the emergency department that clearly enable staff to identify the treating emergency department doctor for all patients within the ED.

6.   CONSULTATION

It is common for other specialists to be consulted about patients undergoing the care process in an emergency department. Such consultation must be documented, and may involve advice on investigation or treatment provided by telephone, or may involve the clinician to whom the referral for consultation has been made personally attending the patient in the emergency department. In some circumstances, this consultation may extend to the performance of procedures on the patient in the emergency department.

The clinician providing such advice or care is responsible for the outcome within the scope of the consultation but provided the patient remains physically in the emergency department, the primary responsibility for care still resides with the emergency department medical staff.

7.   DISCHARGE

For patients being returned to the community, the responsibility for care extends to the point at which the patient leaves the department. Thereafter, responsibility for care will be shared to varying degrees between the Emergency Department, any consulting specialists who may have been involved in the discharge process, the patient and any practitioner or organisation to whom referral for follow up may have been arranged.

8.   SPECIAL CIRCUMSTANCES

8.1   Admitted, But No Inpatient Bed

The hospital executive is responsible for the establishment and maintenance of a bed management system that minimises access block for emergency patients requiring admission to an inpatient unit.

Occasions will arise where the emergency care process has been completed, and the need for admission determined and administratively completed but transfer to the relevant inpatient clinical area cannot occur because of the lack of an available bed. The patient will have been referred to the inpatient unit and a consultation of varying complexity may have occurred. This process must be documented in the clinical record.

In this circumstance, the emergency department retains the primary responsibility for the management of the patient including observation, medication administration, nursing care, and the immediate response to any emergent situation. The admitting unit is responsible for the timely development, documentation, and communication of a treatment plan, and for related drug orders. The admitting inpatient unit is responsible for the outcome of those elements of the investigation or treatment plan it has prescribed, for assisting the bed management system to locate an appropriate bed, for appropriate periodic review of the patient including regular documented updating of the ongoing treatment plan, and to respond to any emergent situation notified by the ED. Full transfer of responsibility occurs when the patient arrives at the inpatient clinical area and the treatment plan implementation is taken over by the medical and nursing staff of that unit.

8.2   Transfer to Ward Prior to Receiving Unit Formal Assessment

A decision to admit a patient to an inpatient ward may be made by the emergency department within the policy and procedure framework of an organisation. In this situation, a ward bed may become available for transfer of the admission prior to a patient being formally received by the inpatient unit. In such circumstance it is the responsibility of the emergency department medical staff to communicate directly with the receiving unit medical staff, to hand over clinical care, to specify the timeframe for review of the patient, and to explain interim treatments which have been ordered. It is the responsibility of the emergency department staff to prepare an interim plan and orders for the ward care of the patient until the planned review time by the receiving unit, and to take reasonable and appropriate steps to ensure the clinical safety of the patient until reviewed.

8.3   Transfer Team

In some hospitals, critical care units will send a team to the emergency department to transfer the patient to their intensive care facility. The medical and nursing handover then occurs in the emergency department and the transfer of responsibility occurs at that point.

The same principle applies where the emergency medical system provides specialised retrieval teams to undertake interhospital transfers.

8.4   Multidisciplinary Teams and Advanced Allied Health and Nursing Roles

It is not uncommon for emergency departments to establish advanced allied health and nursing roles and a system of multidisciplinary teams to manage all or part of the emergency care process for certain types of patient eg major trauma, cardiac arrest, sexual assault etc. As the designated medical practitioner in charge of the ED is accountable for the clinical and operational performance of the ED at any point in time, they retain primary responsibility for patient care irrespective of who participates in the model of care within the ED.

While specific team leadership may be determined by seniority, experience, agreement or hospital policy, the command and control of the ED infrastructure cannot be passed to others who are not credentialled in Emergency Medicine and who are not in a position to have an overview of the needs of all patients in the ED when determining priorities.

The objective of advanced allied health and nursing roles and multidisciplinary teams is to increase the expertise available to manage complex cases and it is therefore incumbent on the ED staff with primary responsibility to carefully consider the advice of all members of the team in managing the emergency care process.

8.5   Statutory Exceptions

There may be some statutory exceptions to the principle that patients in the emergency department are the responsibility of the emergency department. This might include patients in custody as well certain mental health and public health emergencies.

8.6   No Senior Staff

In some emergency departments, there may be times when there are no specialists, senior medical officers or advanced trainees in emergency medicine on duty in the emergency department. ACEM does not believe that primary responsibility for the care of emergency patients in designated emergency departments can be vested in junior medical staff. Therefore, in the circumstances, while there must always be a medical officer in charge of the emergency department, the primary responsibility for care and appropriate systems must be determined by the hospital. These arrangements must be clearly published and made known to those involved. The hospital has overall responsibility for system control and errors.

8.7   Did Not Wait

Patients who present for care to the emergency department and subsequently fail to wait for care, or who leave after commencement of care, may be at some risk after leaving. The ramifications of such a decision not to wait for care fundamentally reside with the patient or responsible guardian where this person is able to make a rational decision. It is expected that emergency department staff will provide information where possible to enable the patient or carer to make a fully informed decision.

Where a patient declines to wait or absconds, and is considered at significant clinical risk, it is the responsibility of the emergency department staff to notify management (or in appropriate cases, any relevant statutory authority having responsibility for the patient) to facilitate appropriate follow up of the patient. Emergency departments should monitor 'did not wait' patients and implement systems to detect patients who may be at significant risk following departure from the ED.

Where possible to gain compliance, emergency department staff should complete appropriate 'did not wait or abscond' proformas which are countersigned by the patient or guardian to indicate understanding of potential risk.

9.   SUMMARY

The primary responsibility for the care of patients in the Emergency Department lies with the senior medical and nursing staff of the ED so long as the patient is physically treated there. While some sharing of responsibility for aspects of the emergency care process may occur when other clinical units are consulted, the emergency department remains responsible for primary management, including resource prioritisation.

In the circumstance where the emergency care process has been completed and the patient has been administratively admitted, but remains physically in the ED due to the lack of an inpatient bed, the ED staff retain primary responsibility for the delivery of care, while the inpatient unit is responsible for the development and maintenance of the ongoing treatment plan through appropriate periodic review.

Directors of Emergency Departments should ensure that all staff in their departments understand the organisational structure of the ED, and the full extent of their responsibility for care until the patient is safely delivered and handed over to another clinical area.

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Australasian College for Emergency Medicine
ABN 76 009 090 715

STATEMENT ON
EMERGENCY DEPARTMENT ROLE DELINEATION

1. INTRODUCTION

The role and level of function of a hospital based emergency service depends on various factors, including the type of hospital in which it is located, its geographical location, location in the public or private sector and the place of the hospital within a health system network.

This guide to role delineation for Australasian Emergency Departments describes the level of function, structure and resources required for Emergency Departments to fulfill currently recognised roles. While closely related to the role of the hospital in which it functions, the role delineation described in this document refers to the functional capacity of the Emergency Department itself.

ACEM uses this descriptive framework as there are inconsistencies between existing role delineation definitions used by State, Territory, and National Health departments.

1.1 Significance of Role Delineation
The role delineation of an Emergency Department is a major determinant of the level of staffing, resources and physical design required. These factors are also influenced by the casemix-weighted patient throughput of the department, and its research, teaching, pre-hospital and other roles.

This document provides a guide for the classification of existing Emergency Departments by role delineation, and also outlines the functional capacity and resources required to adequately fulfill that role.

1.2 Definition of an Emergency Department
This document should be read in conjunction with the ACEM Policy Document 'Standard Terminology'. A hospital based emergency service must have facilities and functions greater than the minimum standard for 'Rural Emergency Service' Role delineation (section 5) in order to be considered an Emergency Department. Smaller or less well equipped services are not considered to be 'Emergency Departments', but may be considered to be hospital based emergency services in accordance with this policy.

1.3 Interpretation of Terminology
The specific terminology used, particularly for nursing roles, should be interpreted according to local practice. Further advice can be obtained from the regional ACEM Faculty Board or regional ACEM councillors.

2. MAJOR REFERRAL EMERGENCY DEPARTMENT*

2.1 Structure
Sophisticated purpose-designed area, separate resuscitation area with capacity for frequent management of major trauma and other life-threatening emergencies. Capacity for invasive monitoring and short-term assisted ventilation.

S12 Statement on Emergency Department Role Delineation

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2.2 Nurse Staffing

Experienced RN's on-site 24 hours, many having completed post-basic training. Dedicated nurse educator and CNC. Dedicated Nursing Director plus Nurse Managers 24 hours.

2.3 Medical Staffing

Full-time Medical Director with specialist qualifications in Emergency Medicine, supported by extensive out-of-hours Emergency specialist cover (ideally 24 hours, 7 days). Advanced training Registrars on-site 24 hours.

2.4 Patient Care

Can provide resuscitation, stabilisation and initial treatment for all emergencies. On-site ability to provide team response. May send out teams of appropriately trained staff to disaster site.

2.5 Network Role

Designated Major Trauma Service. Provides Tertiary Referral Service to other network hospitals. Provides advice and stabilisation for complex cases referred from other network hospitals. May provide or participate in regional Retrieval Service, including aeromedical service.

2.6 Access to Other Specialist Consultation

Specialists in Intensive Care, Anaesthesia, Paediatrics (if mixed dept), Liaison Psychiatry, medical and surgical subspecialties available or on-call 24 hours. Rapid access to Neurosurgery and Cardiothoracic Surgery services. Extended hours access to Allied Health professionals and Social Worker.

2.7 Access to Support Services

24 hour availability of pathology, radiology, CT and Operating Theatres. Ideally extended-hours access to Nuclear Medicine, Ultrasound, Interventional Radiology and MRI.

2.8 Other Processes

Formal Quality Improvement program, including morbidity and mortality review. Dedicated clinical and management information system. Formal Disaster Plan. Membership of Emergency Department staff on principal hospital planning committees. Formal training program in Emergency Medicine and Nursing. Education program for staff. Undergraduate education program. Active research program.

* AMWAC Terminology : Major Referral Hospital

3. URBAN DISTRICT EMERGENCY DEPARTMENT*

3.1 Structure

Purpose-designed area with separate resuscitation facilities and capacity for assisted ventilation.

3.2 Nurse Staffing

Experienced RN's on site 24 hours, some having completed post-basic training. Dedicated NUM. Access to Clinical Nurse Educator. Access to Clinical Nurse Consultant.

3.3 Medical Staffing

Full-time Medical Director with specialist qualifications in Emergency Medicine, supported by extended-hours specialist cover (ideally 16 hours, 7 days). Experienced medical officers, with resuscitation training, on-site 24 hours.

3.4 Patient Care

Can manage all emergencies, including stabilisation and assisted ventilation, and provide definitive care for most. On-site ability to provide team response. May send out teams of appropriately trained staff to disaster site.

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3.5   Network Role
May be Urban Trauma Service links with Referral Hospital for Tertiary level subspecialty services. Access to Retrieval Service.

3.6   Access to Other Specialist Consultation
Specialists in Intensive Care, Anaesthesia, General Surgery, General Medicine, Paediatrics, Orthopaedics and liaison Psychiatry on-call 24 hours. Access to Allied Health professionals and Social Worker.

3.7   Access to Support Services
24 hour availability of pathology, radiology and operating theatres. Normal hours access to Nuclear medicine and ultrasound. After hours on-call access to CT and angiography desirable.

3.8   Other Processes
Formal Quality Improvement Program, including morbidity and mortality review. Dedicated clinical and management information system. Formal Disaster Plan. Participation of Emergency Department staff in hospital planning committees. Access to formal training in Emergency Medicine and Nursing. Participation in undergraduate education. Staff education program. Research program desirable.

* AMWAC Terminology : Other Capital City Hospital

4.   MAJOR REGIONAL/RURAL BASE EMERGENCY DEPARTMENT*

4.1   Structure
Purpose-designed area with separate resuscitation facilities and capacity for assisted ventilation.

4.2   Nurse Staffing
Experienced registered nurses on site 24 hours, some having completed post-basic studies. Dedicated NUM. Access to Clinical Nurse Educator. Access to Clinical Nurse Consultant.

4.3   Medical Staffing
Full-time Medical Director with specialist qualifications in Emergency Medicine, supported by extended-hours specialist cover. Experienced medical officers, with resuscitation training, on-site 24 hours.

4.4   Patient Care
Can manage all emergencies, including stabilisation and assisted ventilation, and provide definitive care for most. On-site ability to provide team response. May send out teams to disaster site.

4.5   Network Role
May be a Regional Trauma Service. Participation in regional retrieval system desirable.

4.6   Access to Other Specialist Consultation
Specialists in Intensive Care, Anaesthesia, General Surgery, General Medicine, Paediatrics, Orthopaedics and liaison Psychiatry on-call 24 hours. Access to Allied Health Professionals and Social Worker.

4.7   Access to Support Services
24 hour availability of pathology, radiology, and operating theatres. After hours on-call access to CT and angiography desirable.

4.8   Other Processes
Formal quality improvement program, including morbidity and mortality review. Dedicated clinical and management information system. Formal disaster plan.

Participation of Emergency Department staff in key hospital planning committees. Access to formal training in Emergency Medicine and Nursing. Participation in undergraduate education. Staff education program. Research program desirable.

* AMWAC terminology : Major Provincial Hospital

5.   RURAL EMERGENCY SERVICE*

5.1   Structure
Designated assessment and treatment area with separate resuscitation facilities in a rural hospital.

5.2   Nurse Staffing
Designated nursing staff available 24 hrs per day, who carry out triage. Designated NUM. Some RN's having completed or undertaking relevant post-basic studies.

5.3   Medical Staffing
24 hours access to medical officers. Ideally full-time Director, preferably with specialist qualifications.

5.4   Patient Care
Manages a range of acute illness and injury, including resuscitation and limited stabilisation. Provides local trauma service, with stabilisation prior to transfer.

5.5   Access to Other Specialist Consultation
Specialists in general surgery, general medicine, Anaesthesia and Paediatrics on call 24 hours. Access to Allied Health professionals and Liaison psychiatry.

5.6   Access to Support Services
Availability of pathology, radiology and operating theatres during normal hours, on-call access after hours.

5.7   Other Processes
Formal quality improvement program.

*AMWAC Terminology : Large Rural Hospital

6.   PRIMARY CARE / REMOTE RURAL EMERGENCY SERVICE

6.1   Structure
Designated assessment and treatment area in a small hospital.

6.2   Nurse Staffing
Nursing staff from inpatient wards available to cover Emergency Presentations.

6.3   Medical Staffing
Visiting Medical Officers or Senior Medical Officers on call.

6.4   Patient Care
Provides mainly non-scheduled GP services for minor illness and injury. Resuscitation and limited stabilisation prior to referral to a higher level of care. May provide local trauma service, with basic stabilisation and early consultation and transfer.

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6.5 Access to Other Specialist Consultation

Access by phone to specialist consultation. Well-organised communication system with referral network. Access to retrieval and transport service.

6.6 Access to Support Services

On-call access to pathology, radiology and operating theatres.

7. DESCRIPTION: NURSING ROLE TERMINOLOGY

NUM   Nurse Unit Manager - Overall departmental nursing manager
CNE   Clinical Nurse Educator - Nurse dedicated to clinical teaching
CNC   Clinical Nurse Consultant - Nurse functioning as a specialist nursing consultant

* precise terminology and roles may differ from region to region

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ACEM POLICY ON
STANDARD TERMINOLOGY

1. INTRODUCTION

Terminology related to emergency medicine as defined in this document is applicable to Australasia and is internationally recognisable. It will apply to all Fellows and trainees of ACEM for both verbal and written communications and the use of terms such as accident and emergency medicine, emergency medicine specialist, emergency doctor, emergency room doctor, accident and emergency department or casualty is to be actively discouraged. It is not in the interests of the community for a health care facility without acute inpatient beds and services to use the terms emergency department, emergency, accident, or similar terms when referring to or signposting the service it provides for acute or urgent care.

2. EMERGENCY MEDICINE

Emergency medicine is a field of practice based on the knowledge and skills required for the prevention, diagnosis and management of acute and urgent aspects of illness and injury affecting patients of all age groups with a full spectrum of undifferentiated physical and behavioural disorders. It further encompasses an understanding of the development of pre-hospital and in-hospital emergency medical systems and the skills necessary for this development.

2.1 Notes

This is the definition agreed to by the American College of Emergency Physicians, the Australasian College for Emergency Medicine, the British Association for Accident and Emergency Medicine and the Canadian Association of Emergency Physicians contained in the Charter of the International Federation for Emergency Medicine (October 1991). The National Specialist Qualification Advisory Committee of Australia recognises emergency medicine as a principal specialty, as does the Australian Medical Council and the Medical Council of New Zealand.

3. EMERGENCY PHYSICIAN

An emergency physician is a registered medical practitioner trained and qualified in the specialty of Emergency Medicine. The recognised qualification of an emergency physician in Australasia is the Fellowship of the Australasian College for Emergency Medicine (FACEM).

3.1 Notes

A trainee for the FACEM is known as registrar in emergency medicine. The term senior registrar in emergency medicine is reserved for an emergency physician holding a recognised senior registrar post. The term research fellow in emergency medicine is reserved for an emergency physician holding a recognised research post.

4. DEPARTMENT OF EMERGENCY MEDICINE

A Department of Emergency Medicine is the pyramidal structure for the medical staff within a hospital who are responsible for the provision of medical care plus management teaching and research in emergency medicine.

4.1   Notes

The director of a Department of Emergency Medicine is known as Director of Emergency Medicine.

The Director of Emergency Medicine has overall clinical and administrative responsibility for all patients in the Emergency Department as per the ACEM Policy Document "Guidelines for Responsibility in Emergency Departments". All staff in the department are responsible to the director on operational matters. This does not preclude policy and ethical responsibility which staff members may have to others in the hospital. Senior medical staff other than the department director are known as Staff Specialist in Emergency Medicine, Specialist in Emergency Medicine, Consultant in Emergency Medicine, Emergency Physician or Deputy or Assistant Director of Emergency Medicine.

5.   EMERGENCY DEPARTMENT

The Emergency Department (ED) is the dedicated area in a hospital that is organised and administered to provide a high standard of emergency care to those in the community who perceive the need for or are in need of acute or urgent care including hospital admission. The features of an Emergency Department include the following.

5.1   Structure

The Emergency Department must be part of a recognised hospital and be licensed or otherwise recognised as an Emergency Department by the appropriate State or Territory authority. It must be purpose designed and include a dedicated area with the capacity for advanced life support including mechanical ventilation designed and used for the reception and stabilisation of critically ill patients.

5.2   Nurse Staffing

There must be registered nurses on duty in the Department at all times. There must be a nursing structure with a senior nurse with appropriate emergency nursing qualifications and experience being responsible for the organisation and operation of the nursing services. Designated nursing staff must be available 24 hrs per day to perform triage.

5.3   Medical Staffing

The Emergency Department must have a medical director who should be an Emergency Physician. There must be 24 hour per day on-site access to medical officers, and there must be 24 hour per day on-call access to a designated senior doctor for clinical support. This senior doctor should also be an emergency physician, and must act with the authority of the medical director. It is recognised that both the medical officers and senior doctors may be called to other parts of the hospital, but they must have a primary commitment to the Emergency Department.

5.4   Patient Care

The Emergency Department must provide for the reception, triage, initial assessment and management of the full range of patients presenting with acute illness and injury. Where the range of care is limited (for example, to paediatrics), pre-hospital and other policies will be in place to ensure appropriate presentation. The department will be able to provide or arrange extended care beyond the initial phase for most patients depending on hospital infrastructure.

5.5   Network Role

The Emergency Department will take an appropriate role in local and regional patient care networks commensurate with its role delineation. Networking and transfer arrangements must be in place for patients whose clinical needs cannot be met within the hospital.

ACEM Policy on Standard Terminology

5.6 Access to Other Specialist Consultation

An Emergency Department must have adequate specialist cover for opinion and/or referral 24 hour per day in such specialties as in general surgery, orthopaedic surgery, general medicine, anaesthesia, intensive care and paediatrics. Adequate arrangements must be in place for specialist care and/or transfer for those patients requiring specialist care in fields such as neurosurgery, ophthalmic surgery, vascular surgery, and psychiatry. The Department must also have access to an appropriate range of allied health professionals.

5.7 Access to Support Services

There must be 24 hour per day access to pathology, radiology and operating theatres services.

5.8 Other Processes

The Emergency Department must have a formal quality improvement program including review of morbidity, mortality, and recognised Emergency Medicine Clinical Indicators, and submission of data to a recognised hospital quality program such as ACHS EQuIP. There must be a dedicated clinical and management information system which records both presentation details and recognised clinical indicators. The medical records system, contingency arrangements, rostering practices and credentialling processes must be appropriate and must meet relevant standards. There must be a formal complaints process and provision of continuing medical education.

6. ARRIVAL TIME

The first recorded time of contact between the patient and the Emergency Department staff. A recording accuracy to within the nearest minute is appropriate. There should be no delay between the physical arrival in the ED of a patient who is seeking care and their first contact with staff.

7. TIME OF MEDICAL ASSESSMENT AND TREATMENT

Although important assessment and treatment may occur during the triage process, this time represents the start of the care for which the patient presented. A recording accuracy to within the nearest minute is appropriate. Usually it is the time of first contact between the patient and the doctor initially responsible for their care, often recorded as "time seen by doctor". Where a patient in the ED has contact exclusively with nursing staff acting under the clinical supervision of a doctor, it is the time of first nursing contact, often recorded as "time seen by nurse". Where a patient is treated according to a documented, problems specific, clinical pathway, protocol, or guideline approved by the Director of Emergency Medicine, it is the earliest time of contact between the patient and staff implementing this protocol. This is often recorded as the earlier of "time seen by nurse" or "time seen by doctor".

8. DEPARTURE TIME

This is the time the patient physically leaves the Emergency Department, representing the end of the episode of emergency treatment. This includes patients who are discharged home, transferred to another hospital, die in the Emergency Department, are transferred to another part of the hospital for definitive care, or are admitted to a ward, including an observation ward which may be located in the ED. It does not include patients sent to another area for treatment when return to the Emergency Department is expected, nor does it include patients statistically admitted to beds within the Emergency Department but still receiving care from the same staff. Accuracy to within the nearest minute is appropriate.

ACEM Policy on Standard Terminology

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9.   READY FOR DEPARTURE TIME

This represents the time when, in the opinion of the treating doctor, no further emergency medicine care is necessary. This time is significantly more subjective than arrival time or departure time, but maybe useful in a single hospital setting for comparative purposes.

10.   INPATIENT BED REQUEST TIME

This represents the time when a formal request is made to obtain an inpatient bed for a patient requiring admission to hospital. This time is signi ficantly more subjective than arrival ti me or departure time, but ma ybe useful in a single hospital setting for com parative purposes. Different hospital systems collect this t ime in di fferent ways and it may be before or after the Ready for Departure Time.

11.   WAITING TIME

This is the difference between arrival time and time of initial medical assessment and treatment. A recording accuracy to within the nearest minute is appropriate.

12.   ASSESSMENT AND TREATMENT TIME

This is the difference bet ween the ti me of initial medical assessment and treat ment and ready for departure time. A recording accuracy to within the nearest minute is appropriate.

13.   PATIENT CARE TIME

This is the difference between the T ime of Medi cal Assessment and Treat ment and t he Departure time. It represents the ti me for which the patient receives medical care fr om Emergency Department staff. A recording accuracy to within the nearest minute is appropriate.

14.   TOTAL ED TIME

This is the difference bet ween the arri val time and departure time. A recording accuracy to within the nearest minute is appropriate.

15.   ADMISSION DELAY TIME

This is the difference between the ready for departure time and the departure time for patients who are admitted to hospital, die in the Emergency Department, or are transferred to another hospital for admission. This time is significantly more subjective than waiting time or assessment and treatment time, but maybe useful in a single hospital setting for comparative purposes.

16.   ACCESS BLOCK

This refers to the percentage of patients who were admitted or planned for admission but discharged from the emergency department (ED) without reaching an inpatient bed, transferred to another hospital for admission, or died in the ED whose total ED time exceeded 8 hours, during the 6 month time period.

ACEM Policy on Standard Terminology

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17. **ED OVERCROWDING**
This refers to the situation where Emergency Department function is impeded primarily because the number of patients waiting to be seen, unde rgoing assessment and treatment, or waiting for departure exceeds either the physical or staffing capacity of the Emergency Department.

18. **DIAGRAMMATIC REPRESENTATION**
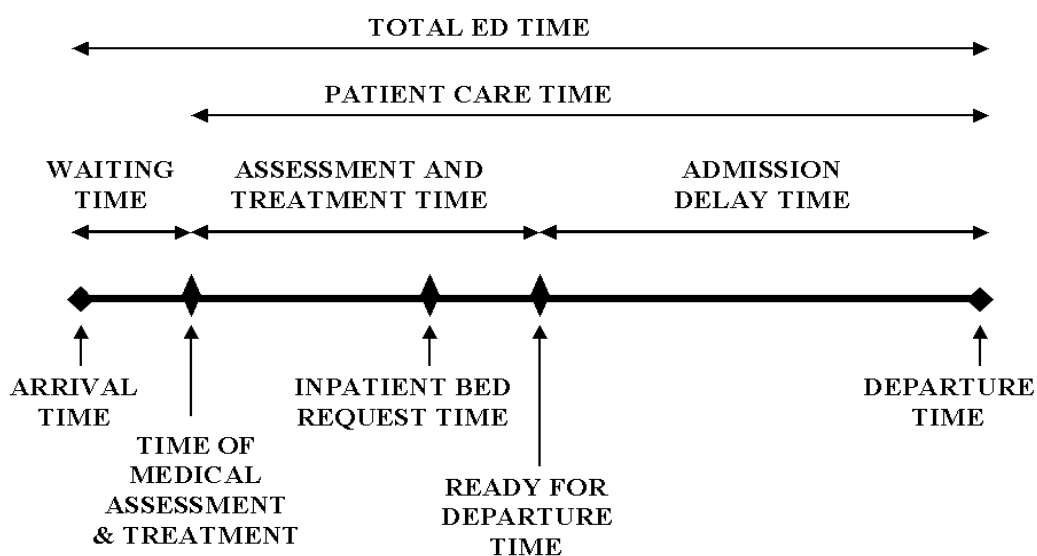
P02   Adopted by Council November 1993
      Reviewed and adopted November 2000
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Australasian College for Emergency Medicine
ABN 76 009 090 715

GUIDELINES
ON
EMERGENCY DEPARTMENT DESIGN

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PREAMBLE

These guidelines are the first revision of the original publication of 1998. They are designed to assist clinicians, planners and architects in producing a design for an emergency department which is of adequate size and contains adequate facilities to fulfill its role. As emergency departments have high patient turnover, varied casemix and a large workforce, their design is crucial to their function. Emergency departments must be planned with due consideration for the potential for growth and expected changes in health care delivery. Current and potential models of care must be considered.

Key considerations include safety and security, amenity, access, image and consumer expectations, and evolving work practices.

This paper was produced with the input of many people who have direct experience with ED design or redevelopment. The guidelines are based on extensive consultation and research, including results of design and equipment surveys from more than 60 emergency departments over 15 years and detailed evaluation of plans of existing departments.

Recommended sizes for various spaces are expressed in relation to departmental activity. In general, a combination of activity (number of attendances), acuity (types of attendances) and the desired performance level (waiting times and access block) determine the amount and type of space required. In addition, workforce is broadly proportional to activity. Therefore staff area sizes are also related to departmental activity.

These guidelines are based on current Australasian conventional emergency department practice but do include reference to variations in service models that have been incorporated into recent designs. The best outcomes will be achieved if there is close consultation and collaboration between managers, emergency department clinicians and architects in designing emergency department facilities. Consumer involvement at key review points is highly desirable. An image gallery of contemporary facilities is provided for illustrative purposes only.

This is a living document which will evolve as emergency medicine develops.

1.   **INTRODUCTION**

The emergency department is a core clinical unit of a hospital and the experience of patients attending the emergency department significantly influences patient satisfaction and the public image of the hospital. Its function is to receive, triage, stabilise and provide emergency management to patients who present with a wide variety of critical, urgent and semi urgent conditions whether self or otherwise referred. The emergency department also provides for the reception and management of disaster patients as part of its role within the disaster plan of each region. In addition to standard treatment areas, some departments may require additional specifically designed areas to fulfill special roles, such as:

- The management of paediatric patients
- The management of major trauma patients
- The management of psychiatric patients

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- The management of patients following sexual assault
- The management of infectious patients
- The extended observation and management of patients
- The management of prisoners in custody
- The management of patients affected by chemical, biological or radiological incidents
- Undergraduate, postgraduate teaching
- Transport and retrieval services
- Telemedicine

In addition to clinical areas, emergency departments require facilities for the following essential functions:

- Teaching
- Research
- Administration
- Staff amenities

Information which would assist in the planning of an emergency department include

- Annual census and trends
- Average daily census with peak patient volumes
- Triage categories of patient presentations
- Admission/transfer rate, including the number of cases requiring monitoring
- Average length of stay
- Turnaround times for radiology and pathology
- Patient mix, identifying those who are >65 years of age, and paediatric cases
- Additional information which pertain to the role delineation of the department ie. trauma service, regional referral service

In general planning, the physical design goals should not be confused with operational goals. Designing a functional emergency department will not resolve access block. In order to maximise functional consideration, it is recommended that

- The clinical areas be designed to accommodate higher acuity patients. All treatment spaces should be wired for monitoring with access to the patient available from all sides
- Paediatric clinical spaces require as a minimum the same space requirements if not more than adult patient care spaces to accommodate family members and /or carers, storage area for toys, books etc
- The department design has the ability to respond to clinical demands.
- The central station or 'arena' department design concept is appropriate to a certain department size. When this is exceeded modular design principles should be adopted to maximise operational practices ie. subgrouping patient care areas each with ready access to its own clinical support areas and its own central station to avoid staff fragmentation
- Overuse of specialty rooms be avoided. Maintain flexibility to cope with emerging advances in clinical care ie. staff access to computer wireless technology in clinical recording
- Spatial consideration be made to accommodate family members and/or carers who will be accompanying the patient
- Privacy and confidentiality be maximised
- The clinical areas have the capacity to be isolated to prevent cross infection or cross contamination in the event that an area becomes contaminated

Once designed, the plan should be tested by using a number of clinical scenarios ie. multiple trauma, chest pain, paediatric resuscitation, mental health presentation with a behavioral problem, gynaecological presentation, potentially infectious or poisoned patients ie. MRSA, TB, SARS, "white powder", fracture, malaria, to ensure optimal patient flow.

2.   **MAJOR SPACE DETERMINANTS**

2.1 General

Space determinants revolve around the major functional areas of the department. These may be divided broadly into:

- Ambulance and ambulatory entrances
- Reception/Triage/Waiting area
- Administrative area
- Resuscitation area
- Acute Treatment area (of non-ambulant patients)
- Consultation area/fast track area (for ambulant patients)
- Staff workstations
- Specialty areas, eg.
  - Paediatric areas
  - Distressed relatives/interview room
  - Procedure room(s)
  - Plaster room
  - Pharmacy/drug preparation
  - Ophthalmology/ENT
  - Mental Health Assessment
  - Isolation room(s)
  - Decontamination areas
  - Teaching areas
  - Tutorial room
  - Support services
  - Storage
  - Clean and dirty utility
  - Shower/bathroom/toilets
  - Staff rooms
  - Linen trolley bay
  - Mobile equipment bay
  - Mobile X-Ray equipment bay
  - Cleaner's room
  - Lounge/beverage preparation area
  - Emergency services officer/lounge
  - Offices and administration area
  - Diagnostic areas eg. medical imaging unit/ laboratory area (optional)
  - Emergency department short stay/observation ward (optional)
  - Circulation space

2.2 Total Size

The total internal area of the emergency department, excluding observation ward and internal medical imaging area if present, should be at least $50m^2/1000$ yearly attendances or $145m^2/1000$ yearly admissions, whichever size is greater. The minimum size of a functional emergency department that can incorporate all of the major areas is $700m^2$. These figures are based upon access block being minimal. Emergency Departments may take extended amounts of time from conception to completion, therefore allowances for future growth and development must be made in the design process.

The total size and number of treatment areas will also be influenced by factors such as: patient numbers, casemix and activity; projected population growth and changing population demographics; anticipated changes in technology; laboratory and medical imaging turnaround time; inpatient bed accessibility; and staffing number and structure.

2.3 Total Number of Treatment Areas

The total number of patient treatment areas should be at least 1/1100 yearly attendances or 1/400 yearly admissions, whichever is greater in number. Areas such as procedure, plaster and interview rooms are not considered as treatment areas nor are holding bays or observation unit beds for admitted patients. The number of resuscitation areas should be no less than 1/15,000 yearly attendances or 1/5,000 yearly admissions and at least 1/2 of the total number of treatment areas should have physiological monitoring.

3. FUNCTIONAL RELATIONSHIPS

The functional relationships may be summarised by the following diagram:

EMERGENCY DEPARTMENT		
Direct Access	*Ready Access*	*Access*
Ambulance Medical Imaging Short Stay Unit	Car Parking Helipad (if applicable) Coronary Care Unit Intensive Care Unit Operating Rooms Pathology/Transfusion Service Medical Records	Inpatient wards Pharmacy Outpatients Mortuary

3.1 Medical Imaging

The Unit is dedicated to the imaging of emergency department patients. It should have a general X-Ray table, upright X-Ray facilities and an additional overhead gantry in the trauma bay/resuscitation area is recommended. The presence/absence of a film processor is dependent upon proximity to the main Medical Imaging Department or the use of digital radiography. Immediate access to CT scanning, Magnetic Resource Imaging (MRI), Ultrasound and Nuclear Medicine modalities will enhance the emergency department's effectiveness. A system of electronic display of images and reports (ie. Picture Archiving Communications System or PACS) is highly desirable.

3.2 Medical Records

Access is required so that patients' previous medical histories are obtainable without delay. A system of mechanical or electronic medical record transfer is desirable to minimise delays and labour costs. Access to medical records must be available 24 hours/day.

3.3 Intensive Care Unit and Coronary Care Unit

Rapid access is highly desirable to minimise transfer times of critically ill patients.

3.4 Operating Rooms

Rapid access is highly desirable in certain surgical emergencies, eg. ruptured aortic aneurysm, ectopic pregnancy, major trauma etc

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3.5 Pathology

Rapid access is highly desirable to minimise turnaround times for laboratory investigations. Mechanical or pneumatic tube transport systems for specimens and electronic reporting of results are recommended. Point of care access for electrolyte/blood gas analysis, pregnancy testing and urine testing are highly desirable.

3.6 Pharmacy

Proximity is desirable to enable prescriptions to be filled by patients with limited mobility.

4.   DESIGN CONSIDERATIONS

4.1 General

This should allow rapid access to every space with a minimum of cross traffic. There should be close proximity between the Resuscitation/Acute Treatment areas for non-ambulant patients and other treatment areas for ambulant patients, as staff may require relocation at times of high workload. Visitor and patient access to all areas should not traverse clinical areas. Protection of visual, auditory and olfactory privacy is important whilst recognising the need for observation of patients by staff.

4.2 Site Selection

Decisions regarding site location have a major influence on the eventual cost and operational efficiency of the department and should be made in conjunction with emergency department staff. The site of the emergency department should, as much as possible, maximize the choices of layout. In particular, sites of access points must be carefully considered.

4.3 Staging

If redevelopment is planned, the disruption to the function of the emergency department should be minimised.

4.4 Access and Car Parking

The emergency department should be located on the ground floor for ease of access, should be close to public transport, and adequately signed to ensure ease of way finding (ACEM Guidelines on ED Signage). Car parking should be close to the entrance, well lit and available exclusively for patients, their relatives and staff. Protected proximate parking areas should be available for urgent call in staff. Appropriate physical barriers should protect "drop off" zones.

Undercover parking should be available for:

- Appropriate number of ambulances. This will be determined by case load and availability of ambulance access to other parts of the hospital for non-emergency patients.
- On call duty emergency physician
- Taxis and private vehicles which drop off/pick up patients (including those with limited mobility) adjacent to the ambulance patient entrance.
- Police vehicles
- Fire Brigade

The emergency department should be clearly identified from all approaches. Illuminated signage is required for some signs to ensure visibility at night. The use of graphic and character display (eg. a white cross on a red background with the word "emergency") is encouraged. Multilingual signage may be required in departments with a significant caseload of culturally and linguistically diverse patients.

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4.5 Fire Safety

Emergency Departments should be constructed to comply with fire regulations.

4.6 Grouping of Rooms - Functional relationships

An emergency department is comprised of the following functional areas:

Entrance/Reception/Triage area
Resuscitation area
Acute Treatment area   and associated
Consultation area   workstations
Staff/amenities
Administration area
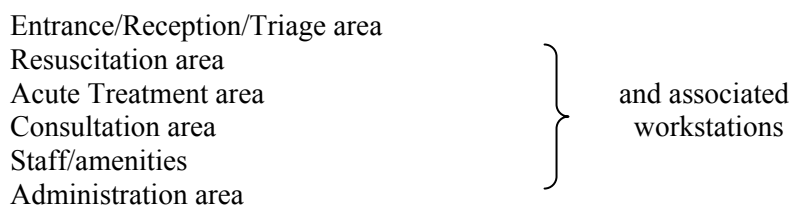
The main aggregation of clinical staff over 24 hours will be at the staff station in the Acute Treatment/Resuscitation area. This should be the focus around which the other clinical areas are grouped. The Entrance/Reception/Triage area is the focus of initial presentation and hospital administrative functions. The Administration area should be accessible to the clinical areas but should not impair the clinical function of the department. These support areas are best arranged around the periphery of the department.

4.7 Bed Spacing

In the Acute Treatment area there should be at least 2.4 metres of clear floor space between beds. The minimum length should be 3 metres.

4.8 Lighting

It is essential that a high standard focused examination light is available in all treatment areas. Each examination light should have a power output of 30,000 lux, illuminate a field size of at least 150mm and be of robust construction.

Clinical care areas should have exposure to daylight wherever possible to minimise patient and staff disorientation. Lighting should conform to Australian/New Zealand Standards.

4.9 Sound Control

Clinical care areas should be designed so as to minimise the transmission of sound between adjacent treatment areas and sound levels should conform to Australian and New Zealand Standards and World health organization guidelines. Distressed relatives/Interview rooms and selected offices should have a high level of sound control to ensure privacy.

4.10 Service Panels

Service panels should be minimally equipped as follows:

a. Resuscitation room (for each patient space)
- 3 x oxygen outlets
- 2 x medical air outlets
- 3 x suction outlets
- 16 x GPOs in at least two separate panels
- 1 x nitrous oxide outlet (optional)
- 1 x scavenging unit

b. Acute Treatment bed - adult and paediatric
- 2 x oxygen outlets
- 1 x medical air outlet
- 2 x suction outlets
- 8 x GPOs in two separate panels
- 1 x nitrous oxide outlet (optional)
- 1 x scavenging unit

c. Procedure room/suture room/plaster room
- 2 x oxygen outlets
- 1 x medical air outlet
- 1 x suction outlets
- 8 x GPOs in two separate panels
- 1 x nitrous oxide outlet
- 1 x scavenging unit

d. Consultation room
- 1 x oxygen outlet
- 1 x suction outlet
- 4 x GPOs

e. External service panels
- 3 x oxygen outlets
- 2 x medical air outlets
- 2 x suction outlets
- 12 x GPOs in at least two separate panels
- 1 x nitrous oxide outlet (optional)
- 1 x scavenging unit

4.11 Physiological Monitors

Each Acute Treatment area bed, should have access to a physiological monitor. Central monitoring is recommended. Monitors should have printing and monitoring functions which include a minimum of:

- ECG
- NIBP
- Temperature
- SpO^2

4.12 Storage Around Bed

Adequate storage space for disposable and non-disposable medical equipment should be available near each bed space. Storage space may consist of modular plastic type bins or other materials involving a similar design concept. There should be adequate consideration for the temporary holding of patient belongings.

4.13 Cabling

Adequate cabling should be provided to ensure availability of GPOs to all clinical and non-clinical areas. Provision should also be made for cabling of telephone, patient call, emergency call, and computers to areas where these are necessary. Wide bandwidth cabling should be installed for electronic imaging systems telemedicine and internet applications. It is anticipated the availability of wireless applications will increase, and this will complement the above applications.

4.14 Medical Gases

Medical gases should be internally piped, to all patient care areas.

4.15 Doors

All doors through which patients may pass must be of sufficient size to accommodate a full hospital bed with attached intravenous flasks and traction apparatus with ease and must be designed in accordance with Australian and New Zealand Standards. There should be at least one pathway through the emergency department to key areas (imaging, OR, ICU) that will accommodate a bariatric bed.

4.16 Corridors

In general, the total corridor area within the department should be minimised to optimise the use of space. Where corridors are necessary, they should be of adequate width to allow the cross passage of two hospital beds or a hospital bed and linen trolley without difficulty. There should be adequate space for trolleys to enter or exit any of the consulting rooms, and to be turned around. Standard corridors should not be used for storage of equipment, linen, waste or patients.

4.17 Air Conditioning

The emergency department should have a separate air system capable of rapid change from recirculation to fresh air flow. Special purpose rooms (eg. Infectious Disease Isolation Room) or areas (ie. paediatric waiting area) may have special flow and filtering requirements.

4.18 Information/Communications Support

Emergency departments are high volume users of telecommunications and information technology. Telephones should be available in all offices, at all staff stations, in the clerical area and in all consultation and other clinical rooms. A central communications area for the disposition of all incoming calls is recommended. The use of multifunction, wireless communication devices should be considered. Additional phone jacks should be available for the use of facsimile machines and computer modems where required. A dedicated telephone to receive admitting requests from outside medical practitioners is desirable. Cordless phones or phone jacks should be available for access to patients' beds.

An intercom or public address system that can reach all areas of the emergency department should be available. Public telephones with acoustic hoods should be available in the waiting area. A direct line to a taxi company is desirable. Direct telephone lines bypassing the hospital switchboard should be available. They would be used in internal and external emergencies or when the hospital PABX is out of service. The staff station should have a dedicated inward line for the ambulance and emergency services. There should be facsimile lines in clinical as well as administrative areas. Direct radio communication should be available between the ambulance service and the emergency department. including incoming aeromedical transport.

An electronic emergency department information system should be installed to support clinical management, patient tracking and departmental administration. Sufficient terminals should be available to ensure that queuing does not occur, even at peak times. Computer terminals and telephones need to be co-located to optimize staff efficiency. Workspace design should include sufficient bench-widths or suitable suspension devices for screens, keyboards, drives and printers. Additional computer terminals, software and peripheral devices should be installed to enable other departmental functions. The increasing use of electronic medical records should be anticipated and access to electronic knowledge bases should be routine.

4.19 Patient Call Facilities

All patient care areas including toilets and bathrooms require individual patient call facilities. Emergency department bed spaces should have call buttons that can be easily reached by a patient on the emergency department trolley.

4.20 Emergency Call Facilities

All bed spaces and clinical areas, including toilets and bathrooms, should have access to an emergency call facility so staff can summon urgent assistance. The emergency call facility should alert to a central module situated adjacent to the staff station as well as to the Staff and Tutorial rooms.

4.21 Duress Alarm

A duress alarm system should be available to staff working in any area with potentially aggressive patients, particularly those in isolated areas, to ensure safety.

4.22 Hand Washing Facilities

Hand washing facilities should comply with Australian and New Zealand Standards. Alcohol hand rubs should be available at each bedside. Basins for hand washing should be available within each treatment area and should be accessible without traversing any other clinical area. There should be basins at a ratio of 1 for every 4 beds and at the ratio of 1 to 1 for every Procedure/Resuscitation/Consulting room/Triage/Isolation area. Taps in clinical areas should be fitted with anti-splashback devices and operated hands free. Dispensers for non-sterile latex gloves, face masks and gowns should be available in the vicinity of each hand basin and each treatment area to assist staff compliance with standard precautions.

4.23 Emergency Power

Emergency power must be available to all lights and GPOs in the Resuscitation and Acute Treatment/Observation areas of the department. Emergency lighting should be available in all other areas. All computer terminals should have access to emergency power. In the event of a total power failure, sufficient space and power points should be available to enable a backup system of lighting to be stored and maintained.

4.24 Wall Finish

Hospital beds, ambulance trolleys, and wheelchairs may cause damage to walls. All wall surfaces in areas which may come into contact with mobile equipment should be reinforced and protected with buffer rails or similar. Bed stops should be fitted to the floor to stop the bed head from coming into contact with and damaging fittings, monitors, etc.

4.25 Floor Covering

The floor covering in all patient care areas and corridors should have the following characteristics

- Non slip surface
- Impermeable to water, body fluids
- Durable
- Easy to clean
- Acoustic properties that reduce sound transmission
- Shock absorption to optimise staff comfort but facilitate movement of beds.

Office(s), Tutorial, Staff rooms, Clerical areas and the Distressed Relatives' room should be carpeted.

4.26 Wall Clocks

A wall clock should be visible in all clinical areas and waiting areas. Time-elapse clocks are desirable in the resuscitation, procedure and plaster rooms. Times displayed in all areas and on computers must be synchronised.

4.27 Electricity Supply

The electricity supply to the emergency department should be surge protected to protect electronic and computer equipment. The Resuscitation area should be cardiac protected and the Acute Treatment area body protected and the electricity supply to other patient care areas should be in accordance with Australian and New Zealand Standards.

5. DESCRIPTION OF PATIENT FLOWS

The following diagram outlines the various pathways that a patient may follow when (s)he enters the emergency department:

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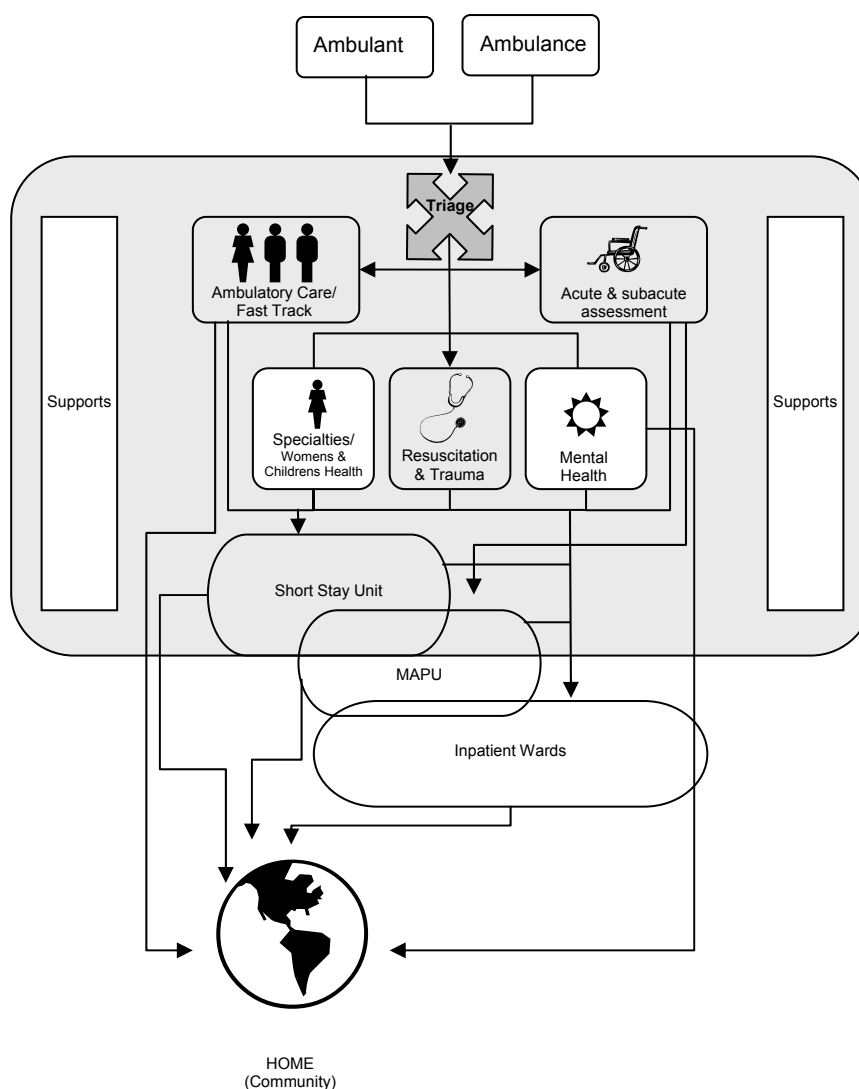
5.1 Triage

Patients may present self-referred or via emergency services (ambulance, police etc). All patients should be triaged through a single point. The aim of triage is to "sort" patients in order to provide optimum care consistent with their medical need and to ensure the efficient utilisation of the available resources. All patients are allocated to a Category of the Australasian Triage Scale.

5.2 Reception

There is a close operational relationship between Triage and reception. After triage, patient details are recorded by the clerical staff and a medical record either raised or a previous medical record retrieved.

5.3 Treatment

Patients may be directed to:

a. Resuscitation area
b. Acute Treatment area
c. Consultation/Fast Track area
d. Medical Imaging
e. Waiting area

In areas a. - c., consultation/examination/investigations/treatment will be performed either in sequence or concurrently, depending on the severity of the patient's condition. Support services and, in certain cases, specialised areas, eg. plaster room, may be utilised. After assessment and treatment, patients are either admitted, transferred or discharged.

5.4 Patient and Visitor Exit Routes

Patient and visitor exit routes out of the emergency department should be clearly sign posted from within the emergency department. In situations where doors with electronic locks are utilised, manual locks or release switches are mandated.

5.5 Disasters - Chemical Biological, Radiation Incidents

In these circumstances, plans may provide for Reception, Triage and initial treatment, including wet and dry decontamination to occur outside the Emergency Department.

6.   ESSENTIAL CLINICAL AREAS

6.1 General Requirements of all Treatment Areas (Including Triage)

- Service panel
- Examination light
- Wall mounted sphygmomanometer
- Ophthalmoscope/otoscope
- Shelving
- Miscellaneous equipment
- Waste bins and sharps containers
- Patient call and emergency call facilities
- Foot stool
- Patient trolley
- Handbasin for use by Triage nurse and administrative staff
- Access to alcohol hand rubs
- Access to gloves
- Appropriate seating for relatives/carers

6.2 Ambulance Entrance

Apart from vehicular access considerations, signage and weather protection, the Ambulance Entrance and environs may become an important reception and treatment area in the event of a disaster or chemical/biological/radiation incident. The public address system should be switchable to include these areas. The requirement to perform wet decontamination on ambulant and non-ambulant individuals and groups should be available including the deployment of modesty screening. All hospitals should have external service panels. Direct access to an internal decontamination room should be available.

6.3 Resuscitation Room/ Bay

This room is used for the resuscitation and treatment of critically ill or injured patients. It has the following requirements:

- Minimum size for a single bed resuscitation room is 35m^2 or 25m^2 for each bed space if in a multibedded room (not including storage area).
- Area to fit a specialised uninterrupted resuscitation bed
- Space to ensure 360° access to all parts of the patient for procedures
- Circulation space to allow movement of staff and equipment around the work area.
- Space for equipment, monitors, storage, wash up and disposal facilities.
- Appropriate lighting, equipment to hang IV fluids etc.
- Maximum possible visual and auditory privacy for the occupants of the room and other patients and relatives.

The Resuscitation area should be easily accessible from the ambulance entrance and separate from patient circulation areas and must be easily accessible from the staff station in the Acute Treatment/Observation area. The Resuscitation area should have a full range of physiological monitoring and resuscitation equipment. The rooms should be equipped with work benches, storage cupboards, hand basins, X-Ray viewing facilities (or digital imaging system) and computer access. The Resuscitation area should have solid partitions between it and other areas. Movable partitions between bed spaces in multibedded are recommended.

Each Resuscitation bed space should be equipped with:

- Service panel as described. Service pendants or pods should be used to maximise access to patients.
- Physiological monitor with facility for ECG, printing, NIBP, SpO^2 , temperature, invasive pressures, CO^2 and printing
- An operating room light with a minimum illumination of 80,000 lux
- Radiolucent resuscitation trolley with cassette trays
- Wall mounted diagnostic set (ophthalmoscope/otoscope)
- Overhead IV track

The Resuscitation area should also have

- A full range of airway management equipment
- X-Ray viewing box - 4 panels for each bed, or digital imaging system
- Wall clock with real time and stop clock function
- Paediatric open care unit for the resuscitation of neonates (in departments that see paediatric patients) with oxygen/suction facilities and an overhead radiant heater
- Computer outlet and terminal
- A minimum of 2 standard telephones
- Hands free telephone
- Cardiac arrest/resuscitation drug and equipment trolley
- Portable monitor/ defibrillator

- Transcutaneous pacemaker
- Infusion pumps
- Fluid warming devices including infusors and warming cupboards
- Portable ventilator with invasive and noninvasive functions
- Whiteboards
- Restricted drugs cupboard
- Humidifier
- Patient warming devices (ie. Bair Hugger)

The following should be immediately accessible:

- Intravenous access trolleys
- Thoracotomy tray
- Intercostal catheter
- Urinary catheterisation tray
- Airway management tray (including surgical airway equipment)
- Invasive vascular access insertion tray
- Paediatric resuscitation equipment
- Refrigerator (to Australian Standards for maintenance of cold chains)

Imaging facilities should include:

- Overhead X-Ray
- X-Ray screening (lead lining) of walls and partitions between beds
- Resuscitation trolley with X-Ray capacity
- Portable ultrasound

6.4 Acute Treatment Area

This area is used for the management of patients with acute illnesses.

Its requirements are:
- Area to fit a standard mobile bed.
- Storage space for essential equipment, eg. oxygen masks.
- Space to allow monitoring equipment to be housed.
- Minimum space between beds is 2.4 metres.
- Each treatment area must be at least 12 m^2 in area.

Patients with serious or potentially serious illnesses, are managed in this area. There must also be a separate Paediatric area for the treatment of children. All of these beds must be situated to enable direct observation from the Staff Station. Access to the Clean and Dirty Utility rooms, Procedure room, Pharmacy room, and patient shower and toilet is necessary. Each area must be separated by solid partitions that extend from floor to ceiling. The entrance to each area must be able to be closed by a movable partition or curtain.

Each bed should be serviced by the following:

- Service panels as above
- Physiological monitor with ECG, NIBP, SpO_2 , temperature, printer
- Sphygmomanometer
- Ceiling mounted rail for IV hooks
- The area must have X-Ray viewing boxes/digital imaging systems located in strategic areas
- Access to alcohol rubs and gloves

6.5 Isolation Rooms

Isolation rooms should be provided for the treatment of potentially infectious patients. They should have negative ventilation, an ante room with scrub up facilities and be self contained such that they have en-suite facilities, compliant with Australian Standards. The spaces themselves should be fitted as per Acute Treatment areas. Position of these rooms should be adjacent to areas where patients are received ie Triage to allow for the immediate isolation of potentially highly infectious patients. Each Department should have one Type 5 isolation room with additional requirements being determined by hospital location, role and patient demographics.
Isolation rooms may also be used to treat patients with conditions that require separation from other patients e.g. patients who require privacy for clinical conditions, or who are a source of visual or auditory distress to others. Deceased patients may be placed there in the company of grieving relatives. These rooms must be completely enclosed by floor to ceiling partitions and have a solid door.

Each department must have at least 2 single rooms, with at least one room/10,000 annual attendances being recommended. The requirement for single rooms will be increased in departments which have a significant casemix of obstetric/gynaecological conditions.

6.6 Decontamination Room

A decontamination room should be available for patients who are contaminated with toxic substances. In addition to the requirements of an isolation room, this room must:

- Be directly accessible from the ambulance bay without entering any other part of the department
- Have a flexible water hose, floor drain and contaminated water trap
- Have storage space for personal protective and decontamination equipment

6.7 Acute Mental Health Area

Patients suffering from an acute psychological or psychiatric crisis have unique and often complex requirements. An Emergency Department (ED) should have adequate facilities for the reception, assessment, stabilisation and initial treatment of patients presenting with acute mental health problems.

It is not intended that this should reproduce the facilities of dedicated mental health admission centres, nor be used for prolonged observation of uncontrolled patients. The main purpose of such an area is to provide a safe and appropriate space for interview and stabilisation.

Acute mental health presentations have the potential to disrupt the normal operation of an ED. Conversely, the busy environment of an ED may not be conducive to the care of patients with acute mental health crises.

Patients presenting with symptoms of an acute mental health crisis may have co-existent medical problems which require concurrent management. Life-threatening illness or injury remains the first priority, and should be managed within the appropriate clinical area of the ED.

In the interests of good patient care, uncontrolled patients should never be left unsupervised in any area of an ED and the acute mental health area should be remote from paediatric areas.

Design Considerations

Principles to be considered in the design include:

Location
The acute mental health assessment facility should ideally be located adjacent to the emergency department. If this is not possible and it is located within the emergency department, patient flows should be separated where possible to maximise privacy and to minimise disruption. A separate secure entrance for use by community emergency mental health teams and police may be desirable.

Patients should be continuously observable by staff either directly or via closed circuit television.

Safety for staff
The designated area should be within close proximity of other continuously staffed areas of the department, with ready access to assistance when required. As far as possible, the facility should not contain objects that could be thrown at staff. There should be two separate exits to allow escape of staff if one exit is blocked. The exit doors should open outwards, and should be lockable from the outside but not from inside. If a window is incorporated, it should be made from shatter-proof material. All window furnishings such as shading devices etc., should be appropriately designed and located so that they cannot be accessed by patients and used for potential self harm. All areas should have readily accessible duress alarms. Mobile, wireless duress alarms may be worn by staff.

Safety for patients
As far as possible, the area should be free of heavy or breakable furniture, sharp or hard surfaces which could injure an uncontrolled patient, and should also incorporate tamper resistant electrical fittings. It should also incorporate interior design features that promote calmness, such as muted colours and soft furnishings and appropriate lighting.

Patient tracking devices may enhance security.

Privacy
The area should be separate enough from adjacent patient care areas to allow both privacy for the mental health patient and protection of other patients from potential disturbance or violence. There should be both acoustic and visual separation from adjacent clinical areas, but ready access for staff in the event of an urgent need for intervention. The incorporation of sound-insulating material is recommended.

Intravenous sedation
An appropriate clinical space should be available for the rapid and safe IV sedation of uncontrolled patients. This must include sufficient space for a bed or trolley, several staff, and appropriate monitoring for the care of a heavily sedated patient. According to departmental policy, this may be a clinical bay in the acute treatment area, or a separate facility may be provided in the mental health area. Operational policies should ensure that any patient who has received sedation which impairs their level of consciousness should be managed in a clinical area with appropriate monitoring and observation.

Description of Areas

Ideally the facility should contain at least two separate but adjacent areas:

1. Interview Room

This room should have two exit doors, swinging outward and lockable from outside, to allow for the escape of staff members when one exit is blocked.

One door should be large enough to allow a patient to be carried through it and consideration should be given to the installation of a "barn door" (where upper and lower sections of the door can be opened independently or together). This type of door has the advantage of allowing direct observation of, and communication with, a patient inside the room without staff being required to enter the room.

This room should also be:

- decorated in muted colours
- shielded from external noise
- furnished with only soft furnishings with no hard edges (furniture made mostly of foam rubber have an advantage in this regard)
- designed in such a way that direct observation of the patient by staff outside the room is possible at all times.
- arranged to ensure that patients have no access to air vents or hanging points.
- fitted with a smoke detector
- fitted with a duress alarm at each exit.

Electricity and medical gases should not be available to the patient. The patient must be able to be directly observed. This may be backed up with closed circuit television for the safety of staff.

The room is required to be of sufficient size to enable a restraint team of five members to surround a patient within the room, yet allow sufficient separation between the patient and restraint team to make it difficult for the patient to strike any member of the team. Because of this, and the need to avoid enclosed spaces for agitated patients, the room should ideally be square (or near square) in shape and at least $16m^2$ in floor area.

2. Examination/Treatment Room

This should be immediately adjacent to the interview room. It should contain adequate facilities for physical examination, however the inclusion of unnecessary and easily dislodged equipment should be avoided. If operational policy dictates that IV sedation is to occur in this area, it should contain the appropriate facilities and monitoring equipment, mounted out of reach of the potentially violent patient. It should contain the minimum of additional fittings or hard furnishings that could be used to harm an uncontrolled patient or staff. It should be of sufficient size to allow a restraint team of five people to surround a patient on a standard Emergency Department bed and should be at least $16m^2$ in floor area.

6.8 Consultation Area

Consultation areas are provided for the examination and treatment of ambulant patients who are not experiencing a major or serious illness requiring resuscitation or monitoring. The Consultation area may be configured as a Fast Track area for the treatment of patients who suffer from non-complex and single system conditions. The configuration of the consultation areas will be determined by casemix and local operational policies.

Each area should be of sufficient size to house:

- Service panel as above
- Examination couch/trolley
- Minimum 12 m^2 in area
- Desk and three chairs
- Computer outlet and terminal

Consultation rooms may be adapted to serve specific functions:

- ENT conditions:
  Full ENT set, including suction
  ENT microscope
  Head light
  Tuning forks
  Head mirrors

- Ophthalmology conditions:
  Motorised vision screen
  Slit lamp
  IV pole
  Room should have black out capability/preferably windowless
  Ophthalmology trolley.

- Dressings:
  Dressing trolley
  Wall storage for dressing materials

6.9 Plaster Room

The Plaster room allows for the application of Plaster of Paris and other splints and for the closed reduction under sedative, or regional anaesthesia, of displaced fractures or dislocations. It must be at least 20 m^2 in size, excluding crutch or splint storage areas. Provision for physiological monitoring during procedures will be necessary.

The following equipment and fitments are required:

- Service panel as above
- Storage for plaster bandages
- X-Ray viewing panel (2 panels/bed) or digital imaging system
- Monitoring equipment (NIBP, SpO^2, ECG) including access to resuscitation equipment
- Nitrous oxide delivery system or storage space for a portable nitrous oxide delivery system
- Storage space of a pneumatic cuff and its gas supply
- Plaster trolley
- Sink and drain with a plaster trap
- Work bench
- A splint and crutch store should be accessible to the Plaster room
- Pneumatic tourniquet

6.10 Procedure Room(s)

The Procedure room(s) may be required for the performance of procedures such as lumbar puncture, tube thoracostomy, thoracocentesis, abdominal paracentesis, bladder catheterisation, suturing etc.

It requires noise insulation and must be at least 20 m^2 in size.

Minimal equipment and fittings include:

- Service panel as above
- Operating theatre light suspended from the ceiling with minimum 80,000 lux
- X-Ray viewing box/digital imaging system
- Monitoring equipment: NIBP, SpO^2, ECG with access to resuscitation equipment.

6.11 Staff Station

The Staff Station in the Acute Treatment area will be the major staff area within the department. The station should provide an uninterrupted view of patients and the floor may be raised to achieve this aim. It should be centrally located and constructed in such a fashion to ensure that confidential information can be conveyed without breach of privacy. An enclosed area is recommended for this reason and also to provide security of staff, information and privacy. The use of sliding windows and adjustable blinds can be used to modulate external stimuli and a separate write up area may be considered. The staff station(s) must be at least $10m^2$ in size or $1m^2/1000$ yearly attendances, whichever is larger. Ergonomic design is essential.

The following equipment and fittings should be accessible:

- Telephones
- Direct line for GP admitting calls only
- Direct line telephone for incoming Ambulance/Police use only
- Computer terminals
- Printer
- Facsimile machine
- Photocopier
- GPOs
- X-Ray viewing boxes/digital imaging systems
- Dangerous drugs/medication cupboards
- Emergency and patient call display
- Under-desk duress alarm
- Valuables storage
- SES emergency radio
- Police blood alcohol sample safe (where required)
- Storage for stationery
- Pneumatic tube access or similar for specimens to Pathology, the transfer of medical records and medical imaging requests
- Writing and work benches
- Part of the staff station should be acoustically isolated from the remainder of the department in order to allow privacy of confidential medical discussion

6.12 Short Stay Unit

A Short Stay Unit is used to describe a unit managed within and by the Emergency Department whose prime orientation is to manage acute problems for patients with an expected length of stay of less than 24 hours. Where provided, a short stay unit should be facilitated similar to a hospital ward. 8 beds is considered to be the minimum functional size. The configuration of the short stay unit should be a minimum of 1 bed per 4000 attendances per year. This figure will be influenced by the function and case mix of the unit. All beds should be capable of physiological monitoring at least similar to an acute cubicle. There should be a separate staff station of an appropriate size and an office for the nurse unit manager/clinical nurse consultant. Hospital beds (not ED trolleys) must be provided.

6.13 Medical Assessment and Planning Unit

A Medical Assessment and Planning Unit (MAPU) is used to describe other hospital units which may be co-located with the Emergency Department. The prime orientation is to provide streamlined and intensive assessment utilizing multidisciplinary team interventions in the management of the acutely ill patient to optimize process, length of stay and health outcomes.as an alternative to the traditional inpatient units. This unit is usually managed and staffed by inpatient medical teams. The configuration and function of each MAPU will be

determined by case mix and local operational policies. Generally, the MAPU will be configured for up to 30 inpatient beds where patients will be accommodated in standard ward style arrangements.

7. WAITING ROOM

The waiting area should provide sufficient space for waiting patients as well as relatives/escorts. The area should be open and easily observed from the Triage and Reception areas. Seating should be comfortable and adequate space should be allowed for wheelchairs, prams, walking aids and patients being assisted. Zoning of the waiting room should be considered, with quiet areas, a television lounge, and family or small group areas.

Natural lighting should be maximized.

There should be an area where children may play with suitable furnishings. Infection control should be considered.

Television should be available but should not dominate the waiting area or be unduly noisy. The ability to broadcast department status information or public health messages is desirable.

The use of art, photographs and murals, particularly of nature scenes, should be considered.

There must be access to:

- Triage and Reception areas
- Toilets
- Baby change room
- Light refreshment facilities which may include automatic beverage dispensing machines.
- Telephones, taxi phone and change machines
- Health literature

It is desirable to have a separate waiting area for children. This area should be suitably furnished, including a Video/TV, and provided with equipment for safe play activities. It is separated for sound from the general waiting room and must be visible to the Triage Nurse.

The waiting area must be of a total size of at least $5.0m^2$ /1000 yearly attendances in area, that includes seating, telephones, vending machines, display for literature, public toilets and circulation space. The waiting room should include one seat per 1000 yearly attendances.

The area should be continuously monitored by electronic surveillance to safeguard security and patient well being.

7.1 Security Room

The location of an office for security personnel near the entrances should be considered.

This room should be so positioned as to enable direct visualisation of the waiting room, triage and reception areas with immediate access to these areas being essential. Remote monitoring of other areas in the department by CCTV and of staff duress/personal alarms should also occur from this area.

8.   **RECEPTION/TRIAGE AREA**

The department should be accessed by two separate entrances; one for ambulance patients and the other for ambulant patients. It is recommended that each entrance area contains a separate foyer that can be sealed by the remote activation of security doors. Access to treatment areas should also be restricted by the use of security doors. The ambulance entrance should be screened as much as possible for sight and sound from the ambulant patient entrance. Both entrances should direct the patient flow towards the Reception/Triage area. The Reception/Triage area should have clear vision to both the waiting room, the children's play area (if provided) and the ambulance entrance. Assessment, observation and first aid are provided in the Reception/Triage area which should have visual and auditory privacy.

The Triage area should have access to the following equipment and fittings:

- NIBP monitor
- SpO^2
- GPOs
- Computer terminal with printer, security mounted
- Handbasin for hand washing, equipment for standard precautions
- Towel rail
- Examination light
- Mobile examination trolley
- Telephone
- Chairs and desk
- Scales
- Storage space for bandages, basic medical equipment, stationery
- Whiteboard

9.   **RECEPTION/CLERICAL OFFICE**

Administrative staff at the reception counter may receive patients arriving for treatment and direct them to the Triage area. After assessment at the Triage area, patients or relatives will generally be directed back to the Reception/Clerical area where clerical staff will conduct registration interviews, collate the medical record, and print identification labels. When the decision to admit has been made, clerks interview patients or relatives at the bedside or at the reception counter to finalise admission details.

The counter should provide seating and be partitioned for privacy at the interview. There should be direct communication with the Reception/Triage area and the Staff Station in the Acute Treatment/Observation area. The area should be designed with due consideration for the safety of staff, and access for the disabled.

Other functions may include:

- General enquiries from the public
- Processing loans of surgical aids
- The receipt of monies

The Reception/Clerical office should have access to the following equipment and fitments:

- Computer terminals
- Telephones
- Facsimile machine
- Photocopier
- Computer printers
- Storage space for stationery and medical records
- GPOs
- Work bench

The combined area of the reception/triage/clerical area should be at least $1.8m^2$ /1000 yearly attendances (not including storage areas for medical records).

10.   TUTORIAL ROOM

This room provides facilities for formal undergraduate and postgraduate education and meetings. It should be in a quiet non-clinical area, near the Staff room and offices.

Provision should be made to have the following available:

- VCR/DVD R
- Television
- Slide projector
- Overhead projector
- Projection screen
- Whiteboard
- Computer terminal and outlet
- Digital projector
- X-Ray viewing facilities/digital imaging system
- Telephone
- Examination couch
- Storage cupboard, large enough to store simulation mannequins and training materials

This room must be at least $0.8m^2$/1000 yearly attendances in area.

10.1 Library

A quiet area containing appropriate written, audiovisual and electronic reference materials. Ideally, all computer terminals will be able to access knowledge databases.

10.2 Telemedicine Area

Departments using telemedicine facilities should have a dedicated, fully enclosed room with appropriate power and communications cabling provided. This room should be of suitable size to allow simultaneous viewing by members of multiple service teams and should be close to, or integrated with the Staff Station.

11   ADMINISTRATION AREA

Offices provide space for the administrative, managerial, safety and quality, teaching, and research roles of the emergency department.

Consistent with the role delineation of the Emergency Department, office space should be provided for the following:

- Director
- Deputy Director
- Director of Emergency Medicine Training
- Director of Emergency Medicine Research
- Nurse Manager
- Nurse Educator
- Nurse Practitioner(s)
- Staff Specialist(s)
- Registrars
- Secretary
- Social worker/Mental health crisis worker
- Information support officer/data manager
- Research and project officers
- Clerical supervisor
- Other support staff as necessary (eg CARS nurse, Aged Services Emergency Team, dedicated allied health etc)

All departments should incorporate private meeting room/s into the office area.

The total office area must be at least $4m^2$ /1000 yearly attendances. Offices should be at least $9m^2$ in size and be equipped with a telephone and computer terminal. Open plan offices with multiple workstations may be suitable.

12.   CLINICAL SUPPORT AREAS

12.1 Clean Utility

This should be of sufficient size for the storage of clean and sterile supplies and should possess adequate bench top area for the preparation of procedure trays and equipment.

12.2 Dirty Utility/Disposal Room

Access should be available from all clinical areas.

There should be sufficient space to house the following:

- Stainless steel bench top with sink and drainer
- Pan and bottle rack
- Bowl and basin rack
- Utensil washer
- Pan/bowl washer sanitiser
- Flushing sink
- Storage space for testing equipment, eg. urinalysis
- An optional disposal room adjacent to the dirty utility should be considered.

12.3 Equipment/Store Room

This is used for the storage of equipment (eg. IV poles) and disposable medical supplies for the department. There should be sufficient space and GPOs to store and charge battery powered equipment, eg. infusion pumps. The total area of dedicated store rooms must be at least $2.2m^2/1000$ yearly attendances. This does not include storage space within treatment areas. As a general principle, emergency departments should have sufficient storage space to carry one week's supply of disposable medical supplies and intravenous fluids. Local logistic issues and risk management considerations may dictate larger storage capacity.

12.4 Pharmacy/Medication Room

Used for the storage of medications used by the department. Entry should be secure with a self-closing door. The area should be accessible to all clinical areas and have sufficient space to accommodate a pharmacy preparation area, the pharmacy impress system, and a refrigerator suitable to ensure cold chain integrity. Consideration of the space requirements for automated dispensing machines may need to be considered.

12.5 Linen Trolley Bay

12.6 Mobile Radiology Bay

This is used to house and charge mobile x-ray equipment which should be readily accessible to the major treatments areas including the Plaster room.

12.7 Trolley/Wheelchair/Hoist/Gazunda Bays

12.8 Beverage Bay with ice maker

12.9 Blanket Warming Cupboard

12.10 Disposal Room

12.11 Disaster Equipment Store

This should be located near the Ambulance Entrance and should be of a size consistent with the role of the ED in a major incident or disaster. There needs to be hanging space for specialised clothing/protective suits, work benches for equipment checking and GPO's for battery banks.

12.12 Cleaners Room

12.13 Patient Bathroom

- Shower and toilet facilities
- Hospital bath with hoist

12.14 Interview Room

This is used for relatives who may be interviewed or counselled in private. It should be acoustically treated and be removed from the main clinical area of the department.

12.15 Distressed Relatives' Room

All emergency departments should have a distressed relatives room. Departments with more than 25,000 yearly attendances should have 2 rooms for the relatives of seriously ill or deceased patients. They should be acoustically insulated and have access to beverage making facilities, a toilet and telephones. A single room treatment area should be in close proximity to these rooms and should be of a size appropriate to local cultural practices. In departments with less than 25,000 yearly attendances a single distressed relatives' room is usually sufficient.

12.16 Laboratory

A designated area for performing point-of-care investigations such as arterial blood gas and electrolyte analysis and urine testing should be considered.

13.   STAFF FACILITIES

13.1 Staff Room

At least one room should be provided within the department to enable staff to distress during rest periods.

Food and drink should be able to be prepared and appropriate table and seating arrangements should be provided. It should be located away from patient care areas and have access to natural lighting and appropriate floor and wall coverings. The staff room should be based upon the number of staff working at any one time and their anticipated needs, and as an initial guide, this should be at least $0.8m^2$ /1000 yearly attendances adjusted depending on staff numbers.

13.2 Staff Change/Lockers/Toilets/Shower Facility

Access to male and female staff change, locker rooms and shower facilities should be available. Appropriate security and restricted access to this area should be available.

14.   SECURITY

The emergency department receives a large number of patients and their visitors, many of whom may be distressed, intoxicated or involved in violence. The hospital has a duty of care to provide for the safety and security of employees, patients and visitors. Policies, structures and training should be in place to minimise injury, psychological trauma and damage or loss of property. The precise details of security features should be designed in conjunction with a security risk assessment for the specific site. The following specific security issues should be considered:

14.1 Perimeter Access Control

Ambulatory and Ambulance entrances should be separate, with electronically operated locks, and glass should have high impact resistance. Access from the waiting areas to the treatment areas should be controlled. There should be restricted access from the remainder of the hospital into the ED.

14.2 Design of Reception/Triage Areas

The interface between the waiting areas and the reception/triage areas should be carefully designed so as to permit appropriate communication, to patients and visitors. It should also provide an unobstructed view of the waiting area, whilst maintaining adequate safety for staff. Security can be provided through counter design, vertical partition or other methods. The reception/triage area should be designed to cater for the easy access of wheelchair bound or otherwise disabled patients.

14.3 Duress Alarms

Fixed and/or personal duress alarms should be positioned in suitable areas as suggested by the security risk assessment.

14.4 Security Personnel

Uniformed security personnel may be required at very short notice to assist with a safety or security issue. Their base should be positioned either within or immediately adjacent to the ED, with rapid communication links.

14.5 Electronic Surveillance

Relatively secluded or isolated areas should be monitored electronically (for example, by closed circuit TV), with monitors in easily visible and continuously staffed areas.

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Guideline: National Burn Service Initial Assessment & Management of Burn Injuries

Purpose

- This document provides a guideline for the initial assessment and management of burn patients outside of a Regional Burn Unit
- This is not intended as a full therapeutic manual for burn treatment

Responsibility

- This guideline applies to teams of health professions caring for burn patients outside of a Regional Burn Unit.

Associated Documents

Other documents relevant to this guideline are listed below:

NZ Legislation	
CMDHB Clinical Board Policies	Referral, Transfer and Discharge in the National Burn Centre
NZ Standards	
Organisational Procedures or Policies	
Other related documents	

Guideline

This guideline includes the following:

1.	Emergency Assessment and Management of Burn Injuries
2.	First Aid Management of Burn Injuries
3.	Referral guidelines
4.	Wound assessment
5.	Fluid Resuscitation
6.	Wound Management
7.	General Considerations

⚠️	**Important:** **Contact your Regional Burn Unit with any concerns or questions about any burn injuries or treatment.**

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Counties Manukau District Health Board			

1: Emergency Assessment and Management of Burn Injuries

⚠️ | **Important:** **Attention to the burn wound must always be subsequent to the Primary Survey being performed, ie. assessment of airway, breathing, circulation, neurological status etc (see Guideline on Emergency Management of Severe Burns).**

Step	Action
A	Airway
B	Breathing
C	Circulation
D.	Disability
E.	Environment
F.	**Fluid**

i. Airway: clear airway; maintain cervical spine protection; consider early intubation if airway compromised. ICU/anaesthetic review PRN.

ii. Breathing: apply supplemental oxygen – consider early mechanical ventilation.

iii. Circulation: establish IV access – 2 wide bore short cannulae, preferably, but not necessarily, through unburnt tissue; IV fluid bolus; control any site of haemorrhage

iv. Disability: assess cognitive function; GCS; PERLA; Glucose

v. Environment: - examine for other injuries, remove rings/clothing; keep warm

vi. Fluid resuscitation as indicated proportional to burn size/severity (see below)

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2: First Aid Management of Burn Wounds

Appropriate first aid treatment of burn wounds is important to:

- Prevent further tissue damage and progression of the burn wound.
- Minimise complications associated with swelling.
- Manage pain associated with the burn wound.
- Prevent hypothermia.

Step	Action
1.	Ensure Emergency Care room is heated and doors are kept closed
2.	Apply recognised first aid:. 20 minutes cold running water (between 8-25 °C aiming for 15°C). Apply immediately or within the first 3 hours from the burn injury. Keep the patient warm to prevent hypothermia
3.	Avoid hypothermia: keep the patient's body as warm as possible. Check patient's temperature – if <36ºC apply external heating devices
4.	Remove clothing and jewellery
5.	**Cling Film :** the wound may be covered with Cling Film to minimise pain, prevent the wound from drying out and to allow assessment by multiple health professionals without disturbing the wound. **Note:** Cling Film is a temporary transport dressing only, applicable for the first eight hours only (from time of burn). More definitive dressings are covered in the Wound Management Pathway.
	To cover the wound with Cling Film: - Apply the Cling Film to the burn wound, ensuring the inside surface of the Cling Film is against the wound. - Do not wrap Cling Film tightly around limbs as this may restrict swelling. Instead lay it loosely lengthwise along the limbs. - Sterile guards may be used over the Cling Film for comfort and security.
6.	**Management of Swelling:** - Elevate all burned limbs on pillows as soon as possible. - If the face, head or neck is burned, elevate the head of the bed. - Circumferential burns to limbs require hourly monitoring of the colour, warmth and capillary refill of the extremities. - Deep circumferential burns may require early escharotomy. If any signs of circulatory compromise, or difficulty breathing in the case of extensive torso burns, escharotomy must be considered – see Escharotomy Guidelines.
7.	**Give adequate analgesia:** e.g. iv morphine
8.	**Give tetanus toxoid / tetanus immunoglobulin as indicated**

3: Referral Guidelines

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The following injuries must always be referred to /discussed with a Regional Burn Unit.

1. Burn > 10% TBSA in an adult. Burn >5% TBSA in a child
2. Full thickness burn >5% TBSA in either adult or child
3. Burns of special areas: face, hands, feet, perineum
4. Electrical Burn
5. Chemical Burn
6. Burn associated with an inhalation injury
7. Circumferential burns of limbs/ chest
8. Burn at the extremes of age (eg. <2yrs or > 70yrs)
9. Associated trauma
10. Non-accidental injury
11. Burn injury in patients with pre-existing medical disorders that could complicate management, prolong recovery or increase mortality
12. **Any burn which has failed to heal with conservative management after 2 weeks**

> **Important: Referrals to the National Burn Centre must always be made through the local Regional Burn Unit.**

Download referral form (www.nationalburnservice.co.nz) & fax to the appropriate Regional Burn Unit

- Auckland Regional Burn Unit (Co-located with National Burn Centre), Middlemore Hospital
  Ph: 09 270 0000 (ask for on call Plastic Surgery Registrar)
  Fax: 09 276 0114

- Waikato Regional Burn Unit , Waikato Hospital
  Ph: 07 839 8899 (ask for on call Plastic Surgery Registrar)
  Fax: 07 8398725

- Wellington Regional Burn Unit, Hutt Hospital
  Ph: 04 570 9999 (ask for on call Plastic Surgery Registrar)
  Fax: 04 570 9239 (Plastic and Burn Ward)

- Canterbury Regional Burn Unit, Christchurch Hospital
  Ph: 03 364 0640 (ask for on call Plastic Surgery Registrar)
  Fax: 03 364 0456 (Dept. Plastic Surgery)

Admission into any hospital is typically based around one of the following:
1. the need for wound care which cannot be delivered as an outpatient *(eg frequent or complex dressing issues)*
2. analgesic requirements too great to be managed as an outpatient *(eg ongoing narcotic analgesia requirement or failure to manage dressing-change pain)*
3. functional, social and/or psychosocial indicators requiring rehabilitation or specialist services *(eg physiotherapy, occupational therapy)*
4. concerns over progression of the burn injury and or its sequelae *(eg oedema compromising circulation or airway)*

4: Wound Assessment

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1. History
2. Burn Depth
3. Body Surface Area Estimation
4. Non-accidental injury

1.	History/ Documentation
i.	Cause of burn injury: Flame, electricity, chemical
ii.	Time of injury
iii.	First Aid measures
iv.	Other trauma
v.	Past medical history
vi.	Medications / allergies / vaccination history
vii.	Initial management
viii.	Communication / advice from NBC/ RBUs

2. Burn Depth	ANZBA Classification
• Epidermal	Dry, no blisters Very superficial Heals spontaneously in 7-10 days
• Superficial dermal	Fine blisters, blanches with pressure Painful Heals within 2 weeks
• Mid dermal	Dark pink, large blisters, sluggish refill Less painful Heals 14-21 days
• Deep dermal	Blotchy red/ white, no blisters No sensation Heals very slowly – usually needs grafting
• Full thickness	White, waxy, charred Insensate Grafting needed if $>1cm^2$

Initial Assessment & Management of Burn Injuries Guideline

3.	Estimation: Total body surface area burnt
i.	Rule of nines: Head 9%, Anterior chest 9%, Abdomen 9% Upper/ mid/ low back 18% Each lower limb 18%, Each upper limb 9% Perineum 1% *Note: The rule of nine's is different in children*
ii.	Area of ***patient's*** palm with fingers extended :1%

⚠ | **Important: Non-accidental injuries should be considered for all at risk populations, both paediatric and geriatric.** |

4.	Non Accidental injury
	Indicators of potential non-accidental injury or scalds include:
1.	Delay in seeking help
2.	Historical accounts differ over time
3.	History inconsistent with wound appearance or development of child
4.	Past history of NAI
5.	Inappropriate behaviour by patient/ caregivers
6.	Scalds with defined immersion lines: glove and stocking pattern
7.	Symmetrical pattern
	Note : All non-accidental injuries should be referred to the Regional Burn Unit The investigation of non-accidental injury should not be performed by the patient's primary surgical / nursing team but by a dedicated team skilled in child protection

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5: Fluid Resuscitation

Intravenous resuscitation required for:

- **all adult burn patients with > 15% TBSA injury**

- **all paediatric patients with > 10% TBSA injury**

> ⚠ **Important: Any patient with a burn size requiring fluid resuscitation must be discussed with your Regional Burn Unit and have hourly urine outputs measured.**

1.	Resuscitation: **Modified Parkland formula** **3-4mls Crystalloid / %TBSA burned/ kg body weight** Appropriate crystalloid fluids includ: Lactated Ringers, Hartmans, Plasmalyte *Avoid Normal Saline as large volumes will result in a hyperchloraemic metabolic acidosis*
2.	½ calculated volume in first 8 hrs; ½ calculated volume in next 16hrs – from time of burn injury
3.	Monitor urine output and aim for an output of: - 0.5ml/kg/hr adults; 1ml/kg/hr children. Urinary catheter should be placed if IV resuscitation required ***Note*** *: the presence of haemochromagens in the urine (dark discolouration) indicates the presence of muscle and blood breakdown products and requires increasing goal urine output to 1-2ml/kg/hr.*
4.	Monitor bloods: at least once during each resuscitation period FBC, Haematocrit; U&E; CoHb
5.	For children < 30kg maintenance fluid containing glucose should be administered in addition to resuscitation fluid
6.	Colloid 0.3-0.5%/kg/TBSA can be considered: after the first 18-24hrs , for very large burns, inhalation injury, large paediatric burns

6: Wound Management

Definitive management of burn wounds should be performed in facility where final treatment will take place.

⚠️ **Important: Burn wounds are initially sterile and routine use of systemic antibiotics is not advised.**

1.	Take wound swab prior to cleaning and applying dressing
2.	Debride all loose skin, clean wounds with aqueous chlorhexidine
3.	Blisters… i. leave small blisters intact; ii. debride blisters over joints or if restricting movement iii. snip large, tense blisters
4.	If patient due for transfer and will reach the local Regional Burn Unit within 8 hours, cling film is an acceptable dressing
5.	If patient due for transfer within 24 hours dress wounds with simple dressing: non-adherent layer and secondary pad
6.	If transfer is to be delayed more than 24 hours commence dress with silver dressing such as Acticoat (or Silver cream dressing) *after* consultation with the Regional Burn Unit
7.	Daily review of wound/ dressing initially appropriate
8.	For mixed depth burns consider use of Silver dressing such as Acticoat or equivalent.
9.	Acticoat needs to be changed every 3 (7) days. Moisten with water *not* saline (as this will inactivate the silver).
10.	Eyes… Irrigate gently with saline Flourescein to identify corneal injury Copious irrigation for chemical injury Antibiotic ointment *All ocular injuries should have an ophthalmological review*

⚠️ **Important: Toxic Shock Syndrome can develop rapidly even in very small paediatric burns. Maintain a high level of suspicion. If in doubt remove all dressings and commence appropriate treatment early!**

7: General Considerations

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- Burn patient are best managed by a multi-disciplinary team
- Early involvement of all team members improves patient outcomes

1.	Analgesia: Opiates: IV (not IM) morphine Paracetamol Entonox: for procedural pain; consider inhaled Penthrax Supervised sedation/ Ketamine
2.	Consider either splintage or active mobilisation all joints / hands / ankles
3.	Any concern regarding airway injury must have ICU / Anaesthetic review
4.	> 65years: consider Geriatric/ Rehab review
5.	Paediatric review as needed
6.	Psychological/ Psychiatric review as necessary. Burn patients have higher rates of premorbid psychiatric conditions than the normal population
7.	Early nutritional review / Vitamin supplementation
8.	Ophthalmology review for all ocular injuries
9.	Nasogastric tube – for medication/ nutrition / gastric decompression

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New Zealand National Burn Service
Referral Pathway to Regional Burn Units

Referral procedure to a Regional Burn Unit / Plastic Surgery Unit:

1. Referral form to be completed (http://www.nationalburnservice.co.nz/pdf/referralform.pdf)
2. Contact the Plastic Surgical Registrar for your Regional Burn Unit (RBU) / Plastic Surgery Unit

Auckland Region:
Counties Manukau District Health Board

Phone: **021 784 057** or 09 276 0000 locator 938017 (on-call plastic surgery registrar)
Fax: 09 276 0114

Waikato Region:
Waikato District Health Board

Phone: **07 839 8899** (ask for plastic surgery registrar on-call) Fax: 07 839 8725

Wellington Region:
Hutt Valley District Health Board

Phone: **04 570 9999** (ask for plastic surgery registrar on-call) Fax: 04 570 9239

Christchurch Region:
Canterbury District Health Board

Phone: **03 364 0640** (ask for plastic surgery registrar on-call) Fax: 03 364 0456

National Burn Centre (NBC) transfers:
The decision to transfer a patient to the National Burn Centre (Middlemore Hospital) is made following the referral procedure.

Referral criteria for Regional Burn Unit:

- Burns greater than 10% total body surface area (TBSA) or 5% in a child.
- Burns of special areas, eg. the face, hands, feet, genitalia, perineum and major joints.
- Full thickness burns greater than 5% TBSA.
- Electrical burns (including lightning injury).
- Chemical burns.
- Burn injury with inhalation injury.
- Circumferential burns of the limbs or chest.
- Burns at the extremes of age, ie. young children and the elderly.
- Burn injury in patients with pre-existing medical disorders that could complicate management, prolong recovery, or affect mortality.
- Any patient with burns and concomitant trauma (e.g. fractures) in which the burn injury poses the greater immediate risk of morbidity or mortality.

www.nationalburnservice.co.nz

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Initial Assessment & Management of Burn Injuries Guideline

Flow Chart – Wound Management v13

Continued...

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Initial Assessment & Management of Burn Injuries Guideline

Definitions

Terms and abbreviations used in this document are described below:

Term/Abbreviation	Description

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MINISTRY OF
HEALTH
MANATŪ HAUORA

National Health Emergency Plan:

Multiple Complex Burn Action Plan

2011

New Zealand Government

MINISTRY OF
HEALTH
MANATŪ HAUORA

Foreword

Health emergencies can range from the slow build-up of an infectious disease outbreak to the sudden devastation of an earthquake. Often the consequences are extreme and the likelihood is certain, but the actual timing is impossible to predict. All we can be sure of is that such events will certainly happen, that the health sector has to be ready to respond to them and that our plans need to be robust enough to last, yet flexible enough to deal with any foreseeable circumstances.

The *National Health Emergency Plan* 2008 (NHEP) shows how we in the health and disability sector would work together in a coordinated way with other government agencies to respond to disasters and emergencies.

The *National Health Emergency Plan: Multiple Complex Burn Action Plan* (the Action Plan) will provide specific guidance to the health sector in the event of a national burn emergency. It is designed to be used with the NHEP, which provides more detailed information in areas common to all disasters such as communication.

International attention to the emergency management of a burn disaster has been heightened by a number of recent events, most notably the Bali bombing in October 2002, and more recently, the response following the Black Saturday Fires of February 2009 in Victoria, Australia.

In the latter case, Australia was able to handle the entire patient load, and this became an important focus of local and national pride and unity during a period of turmoil. This Plan aims to enable New Zealand – in particular the New Zealand National Burn Service (NBS), with support from the Ministry of Health – to respond in a similar fashion to care for patients in a comparable New Zealand emergency.

The philosophy of the NBS is to provide an integrated national service to care for all burn patients within New Zealand. In the event of an emergency, the clinical load will be shared between the four regional burn units (RBUs) and the National Burn Centre (NBC) to avoid a single unit becoming overwhelmed.

The Ministry of Health acknowledges the contribution of the sector in developing this Action Plan, and the significant developments that have resulted from this work, including the establishment of skin banks; the prediction of sustainable capacity in critical areas such as intensive care and the development of teamwork. This work is an acknowledgement that any burn emergency in New Zealand will impact on a wide range of services, including ambulance and emergency care.

Charles Blanch
Director Emergency Management

Contents

1. Introduction

New Zealand has four regional burn units (RBUs), co-located with regional plastic surgery units at Christchurch Hospital, Christchurch; Hutt Hospital, Wellington; Waikato Hospital, Hamilton and Middlemore Hospital, Auckland. The National Burn Centre (NBC), co-located with the Auckland RBU at Middlemore Hospital, opened in 2006. The four RBUs and the NBC make up the New Zealand National Burn Service (NBS). Each unit sits within a district health board (DHB) structure, which has overall responsibility for management functions, including accounting for cross boundary referrals. Each RBU is located within a hospital or regional service capable of treating trauma, with established trauma services and an intensive care unit (ICU) capable of providing ventilatory support.

The focus of this Action Plan is on managing multiple complex burns in an emergency, and in particular, the resourcing required in such an emergency. It is expected that local RBU and DHB emergency planning will be cognisant of the management of major trauma associated with burns that is likely to be required in such a situation.

Purpose of this Action Plan

This Action Plan provides specific direction to the health sector in the event of a national burn emergency. It must be read in conjunction with the *National Health Emergency Plan* 2008 (NHEP)[1], which provides overarching direction to the health sector, the Ministry of Health and the whole of government in the event of a health-related emergency. This Action Plan documents an agreed sequence of actions to be implemented in the event of a national burn emergency where injuries meet the Australia and New Zealand Burn Association's guidelines for referral to an RBU.

Appendix Five outlines the average operative time and other resources needed for given burn sizes at various stages of care. This information will enable objective estimation of when the clinical response is likely to become unsustainable with available resources. It will also facilitate estimations of the likely resource requirement for any given number of multiple (new and existing) burn patients.

This Action Plan has been developed by the RBUs and the NBC in association with DHBs and the Ministry of Health.

Activating the Multiple Complex Burn Action Plan

A national health emergency will be declared when a single RBU or the NBC is overwhelmed or is unlikely to be able to sustain the required clinical response to a burn incident due to the number and complexity of burn patients or a lack of resources. At this point, this Action Plan will be activated by the Ministry of Health in consultation with the NBS.

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1   Ministry of Health. 2008. *National Health Emergency Plan*. Wellington: Ministry of Health.
     URL: http://www.moh.govt.nz/moh.nsf/pagesmh/8669/$File/nhep-dec08.pdf

The management of an incident involving multiple complex burn injuries will have serious immediate and ongoing implications for regional and national health services in New Zealand. In particular, there will be requirements for:

- specialist triage (see below)
- intensive care, including isolation and ventilation for prolonged periods of time
- for each patient, multiple operating theatre visits and intra-operative decisions made by clinically skilled individuals over weeks to months per patient
- prolonged and intensive use of resources.

These needs are outlined in Appendix 5. They reinforce the important point that it is burn size, rather than burn numbers, that is the major determinant in declaring a National Health Emergency and implementing this Action Plan.

2. Relationship between this Action Plan and the National Health Emergency Plan

This Action Plan is a sub-plan of the NHEP. It describes the specific response required of the NBS, DHBs and the Ministry of Health in the case of a multiple complex burn emergency.

The Ministry will activate the NHEP when local or regional responses are overwhelmed or have the potential to be overwhelmed. At this point the Ministry will also assess whether the National Health Co-ordination Centre (NHCC) needs to be activated. The role of the NHCC is to provide national coordination of the health sector in an emergency.

Coordination of a health emergency at the national level will be affected by two factors in particular:

- whether the Ministry of Health is the lead government agency involved, or providing support to the lead agency
- the size and scope of the health sector and inter-agency coordination required to manage the response.

Since 2004, the Ministry's focus in this area has included publication of a series of emergency management-related documents to provide guidance in a health-related emergency. These mostly strategic documents are underpinned by specific action plans. Along with this Action Plan, the suite of guidance documents and action plans includes the following:

- *National Health Emergency Plan: Guiding Principles for Emergency Management Planning in the Health and Disability Sector* (2005)
- *National Health Emergency Plan: Hazardous Substances Incident Hospital Guidelines,* (2005)
- *Getting Through Together: Ethical values for a pandemic* (2007) (published by the National Ethics Advisory Committee)
- *National Human Resources Pandemic Guidelines* (2007)
- *National Health Emergency Plan: Planning for Individual and Community Recovery in an Emergency Event: Principles for psychosocial support* (2007)
- *National Health Emergency Plan: Influenza Pandemic Action Plan* (2008).

The relationship between these documents and the NHEP is illustrated below.

Figure 1:   The New Zealand national health emergency framework (NHEP, p. 3)
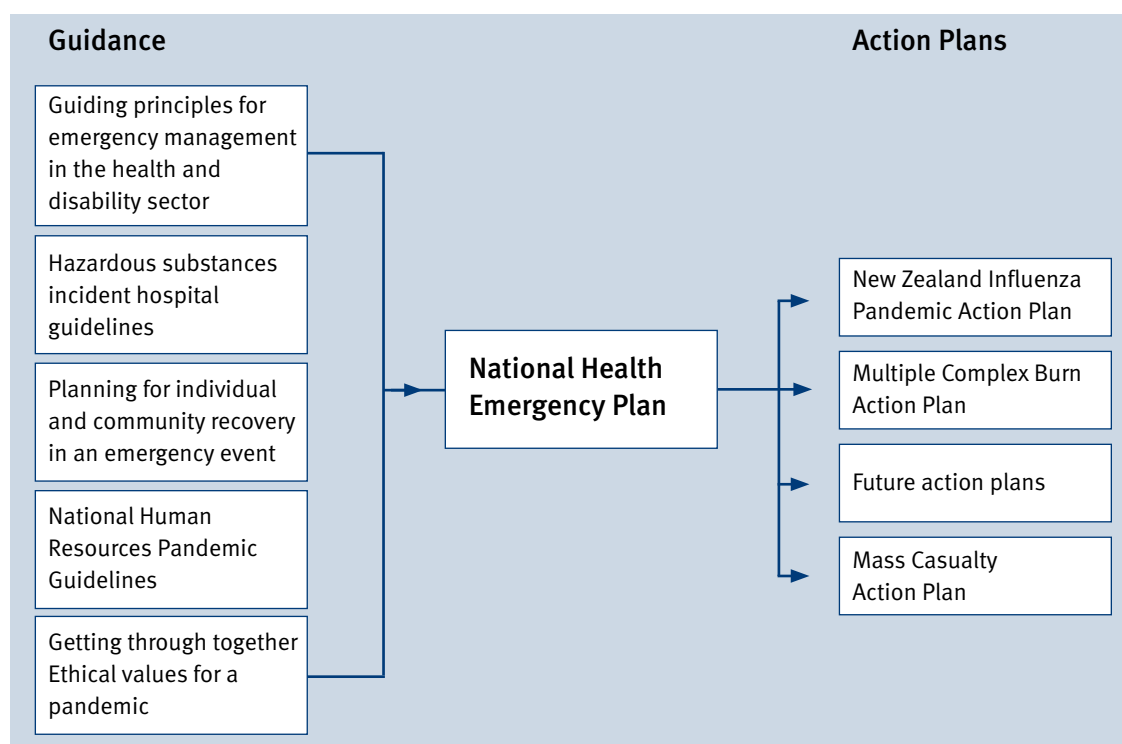
National emergencies are managed by a lead agency, which may be assisted by support agencies. In a civil defence emergency, the lead agency is the Ministry of Civil Defence and Emergency Management (MCDEM). MCDEM will adhere to the arrangements in the *National Civil Defence Emergency Management Plan* to manage the adverse consequences of such an event.

A range of other government agencies may take the lead in an emergency, depending on the nature of the incident. The lead agency is determined by government, and the decision will be made in discussion with MCDEM. If an emergency primarily involves multiple burn injuries, it is likely that the Ministry of Health will be required to act as lead agency with support and advice from the NBS.

3. Principles of Multiple Complex Burn Management in New Zealand

Planning for health emergencies should:

- encompass reduction, readiness, response and recovery

- enable an appropriate response to all potential hazards

- be applicable locally, regionally and nationally

- support the protection of all health service workers, health and disability service consumers and the population at large

- support services that are best able to meet the needs of patients/clients and their communities during and after an emergency event, even when resources are limited, and ensure that special provisions are made for hard-to-reach, vulnerable communities so that emergency responses do not create or exacerbate inequalities

- adopt an all-hazards ('hazardscape') approach and consider all natural and man-made hazards cumulatively across a given area

- recognise the importance of engaging with different cultures and communities, to ensure an inclusive approach

- include an awareness of the way resources, human and other, can be used to help people from culturally and linguistically diverse communities, and overseas visitors who may be unfamiliar with New Zealand practices

- accommodate the provision of welfare to health and disability providers' staff affected by the emergency.

This Action Plan reflects the following principles agreed between burn service providers, their DHBs and the Ministry of Health.

New Zealand burn patients will be treated in New Zealand. In the event of a national health emergency being declared, the Ministry of Health will coordinate emergency management. This may include a request for international support and cooperation. Decanting patients to Australia is not an integral part of this Action Plan.

Burn patients will be treated by the people most skilled in burn management. Professionals skilled in burn management are predominantly located at the four RBUs. This has implications for the clinical staff assigned to triage a burn disaster and provide subsequent clinical care.

Requirement for local planning

RBUs and the NBC are expected to develop and document their own emergency response and recovery plans to meet the requirements of this Action Plan in conjunction with their DHBs. Planning will include managing high complex burn patients who would not normally receive ongoing treatment in the particular facility. Local planning will be coordinated with DHBs' major trauma management plans and will include documented arrangements with key service providers such as ambulance services, emergency departments and regional hospitals without a burn service.

This Action Plan assumes that effective strategies to reduce risk and ensure readiness to cope with a burn emergency are in place throughout the NBS. It provides guidance to RBUs, the NBC and all DHBs with a focus on the response and recovery phases of emergency management according to the health sector alert code system.

Planning is expected to reflect the four 'R's structure accepted for national emergency planning in New Zealand, as follows:

Reduction involves a consideration of natural or man-made risks that are significant because of the likely adverse consequences they represent for human life and property. The key factor within the reduction phase is risk mitigation.

Risk mitigation strategies start with identifing and analysing of significant natural and man-made hazards. Analysis of these hazards, using a matrix based on the associated likelihood of emergency and potential consequences, enables calculation of a value representing the level of risk involved. The risk can then be prioritised. Thereafter a risk mitigation strategy can be developed to eliminate risks where practicable and, where not, to reduce the likelihood and magnitude of their impact.

Readiness involves planning and developing operational arrangements before an emergency happens. It includes considering response and recovery. It involves equipping, training and exercising in preparedness for all emergencies identified in risk analysis. All systems need to be developed, tested and refined in readiness for response.

Response involves those actions taken immediately after recognising an emergency is taking place or is imminent, during and after an emergency. It also involves the recovery of affected communities.

Recovery includes those processes that begin after the initial impact has been stabilised and extends until normal business has been restored. The aim is the immediate, medium-term and long-term holistic regeneration of a community following an emergency. Recovery also encompasses all opportunities to learn from an emergency response in order to reduce the risks from future emergencies. Health-related agencies from a local, regional, national or all-of-government level may be involved, and economic, social or legislative issues may be considered.

Activation trigger

Health emergency plans (HEPs) are activated when usual resources are overwhelmed or have the potential to be overwhelmed in a local, regional or national health emergency. For an event to trigger activation of a HEP, it must require more than the business-as-usual emergency management.

Appendix 5, which presents data derived from cases treated at the NBC, highlights the average resource requirements for delivering care to a burn patient, based on burn size and time from injury.

If a receiving RBU is unable (or likely to be unable) to provide the appropriate sustained clinical response to a burn incident, it will advise the Ministry of Health in conjunction with the NBS, to activate this Action Plan.

The NBC is the only unit with dedicated and protected burn operating theatre access. This is currently set at 1,440 minutes per week. Other RBUs use the acute surgery list, which is shared with other theatre users caring for acute surgical cases. When the operative requirement is greater than 1440 minutes per week, the RBUs may implement the options outlined in the 'Local plan: decanting and reallocation to maximise capacity and resources' section of this Action Plan.

Sequence of response

This Action Plan expands on and modifies the framework outlined in the 2006 'Guidelines for Dealing with Disasters Involving Large Numbers of Extensive Burns', endorsed by the International Society for Burn Injuries (*Burns* 2006; 32: 933-9), so that it is compatible with the New Zealand

health system. Once this Action Pan has been activated, a sequence of events follows, as outlined below.

Initial assessment – burn assessment and triage

Burn-injured patients will normally be taken to the nearest hospital by first responders (such as an ambulance service), for assessment and treatment. In some instances, it may be beneficial to triage at the scene of the emergency. At other times, it may be beneficial to bring triage close to the scene of the emergency, or to triage life-threatening injuries, including the burn, at the closest regional trauma hospital (beyond the RBU).

In essence, a burn injury is not immediately life-threatening, and its assessment should be carried out after immediately life-threatening injuries have been stabilised and treated.

Establishing types of burn injury and referring to RBUs

Agreed referral criteria (see Appendix 2) determine which burn injuries require referral to an RBU. Each RBU has a predetermined catchment area collectively covering all of New Zealand; health providers within these regions are already familiar with the referral process.

The most severe burn injuries will be transferred from a RBU to the NBC for intense and specialised care. Due to the large resource demands of a severe burn injury (see Appendix 5), transfer to the NBC is not an automatic process. The RBUs and the NBS will use available capabilities and capacity and existing processes to manage the combined needs of existing and new burn patients.

Caring for burn patients with associated major trauma

There are established trauma guidelines on caring for major trauma patients, which prioritise treatment to address various life-threatening conditions (beginning with a focus on airway, breathing and circulation). Immediate treatment for burn patients with concomitant major trauma will be provided within a context of routine major trauma assessment, transport and treatment.

Although a burn injury remains a major threat to life, in the first 24–48 hours, so long as fluid resuscitation, emergency procedures such as escharotomies (splitting burnt skin to allow circulation to limbs and/or breathing), and wound care are performed by competent health professionals in a supportive environment under the guidance of the burn team, the patient's transfer to a RBU or the NBC need not be immediate and can instead be planned and coordinated.

Progression of care

During the course of treatment, the needs of burn patients will vary, and health providers' choices in terms of appropriate care become wider.

The **immediate** care needs of burn patients are the same as those of any other trauma patient. They can be delivered by existing first responders and established trauma centres, with support from burn teams, to ensure that there is adequate fluid resuscitation, temperature control, wound care and recognition of life- or limb-threatening constrictions requiring escharotomies.

Initial burn care (24–72 hours post-burn) is highly resource-dependent, and one focus of the NBS has been to concentrate the skills and resources required to care for patients with life-threatening burn injuries at the NBC at Middlemore Hospital. The major resource requirement during the initial

phase is operative (requiring surgeons, anaesthetists, theatre time and the ICU); allied health and nursing requirements becoming more predominant in the later stages of care. The speed of an individual patient's progress, typically measured in weeks, is highly dependent on the burn size (see Appendix 5).

Although there is a wide variation of methods of burn wound management practiced in the world, the New Zealand NBS has agreed on the principles outlined in Appendix 1. These consensus guidelines were developed not only to standardise care but also to facilitate the transfer of patients requiring ongoing treatment.

The **intermediate and rehabilitation** phase occurs once the burn wound is sufficiently closed so that the patient is no longer in a life-threatening condition. Further surgeries may be required; these can be done at the NBC, an RBU or even a hospital with plastic surgery services.

Communication

Communication between RBUs and the NBC in an emergency

Referrals to the NBC are made following an agreed process, documented in the NBS Framework, and are subject to bed availability (this includes intensive care beds), (see Appendix 3).

All burn injuries require a referral form to be completed by the referring clinician (**www.nationalburnservice.co.nz/pdf/referralform.pdf**, see also Appendix 3); this form is forwarded to and discussed with the local RBU. The process of referral follows the agreed pathway as documented in the *Guideline: Referral, Transfer and Discharge in the NBC* (**www.nationalburnservice.co.nz/pdf/referral-transfer-discharge-guideline.pdf**).

In an emergency, it is important that communication be maintained between affected RBUs, the NBC, the local affected community and the concerned wider community. Communications staff within DHBs will be responsible for communicating with the media.

Communication using the single-point-of-contact system (SPOC)

The single-point-of-contact (SPOC) system is a method used to provide effective 24-hours, seven-days-a-week emergency communication between DHBs, their public health units and the Ministry.

The system is an integral component of readiness and remains in place at all times. It supplements, but does not replace, normal day-to-day non-emergency communications channels and processes within the NBS and associated DHBs.

The business-as-usual communication methods used by the NBC and the NBS – an on-call clinician and a cascade system – will continue to be used in the event of an emergency response.

Local plan: decanting and reallocation to maximise capacity and resources

The high and variable resource needs associated with the care of a burn mean that multiple options are required in order to provide a graduated response that will minimise the impact on other health delivery areas.

Decanting of patients refers to the transfer of patients to make space for others. Implementation of this Action Plan may require either all or a combination of:

- transfer of burn patients at different stages of care out of the NBC to RBUs (or vice versa), to make resources available for new burn patients and/or vice versa

- transfer of non-burn patients out of the hospitals where the NBC or RBUs are located to other hospitals, including transfer of non-burn ICU patients within the New Zealand ICU network, to ensure adequate capacity in ICU beds located at RBUs and the NBC.

Reallocation involves reprioritisation of available resources. Implementation of this Action Plan may require either all or a combination of the following.

- Burn team members (such as plastic surgeons, nurses or anaesthetists) employed at RBUs or the NBC and routinely involved in burn care typically have other responsibilities within the DHB. In an emergency, these responsibilities may be deferred to others with the appropriate skills in the same DHB to allow the burn team to concentrate on delivering burn care.

- Other staff (such as plastic surgeons) normally employed at DHBs in a non-burn capacity who are capable of supporting the burn team may be redeployed to burn care.

To **increase capacity**, implementation of this Action Plan may require all or a combination of:

- increasing the frequency and number of operating lists per week dedicated to burn care (which will require reduction in other surgical services not involved in the current emergency)

- increasing the duration of theatre shifts

- increasing in-patient burn injury bed capacity

- increasing the availability of support services (including but not limited to allied health, nursing, laboratory and radiology services).

Recruiting involves calling in additional resources not normally available. Implementing this Action Plan may require all or a combination of:

- leave cancellation

- roster alteration

- part-time employees taking on full-time employment

- recruitment of professionals with appropriate skills from outside the DHB (locally, regionally, nationally or internationally).

Rostering and coordination of limited resources is vitally important given the need for sustained intervention by a small number of capable health care professionals that is likely to arise in an emergency involving burn injuries. Staff fatigue and burn-out is best managed by rotating and relieving staff in a pre-determined and controlled manner. Implementing this Action Plan may require both or a combination of the following:

- implementing the processes outlined above

- coordinating teams to provide continuous but limited periods of service (for example two weeks), to ensure that safe work hours and rest periods during the day, between shifts and between periods of service, are maintained.

4. Health Sector Roles and Responsibilities

The responses required of the stakeholder groups identified in the following table are based on emergency plans developed by DHBs locally and regionally; and more specific plans developed by the RBUs and the NBC.

Primary responsibility for the management of an emergency lies with the affected local provider, which may be the local DHB or the DHB regional group, if a regional emergency plan is activated. At each phase of an emergency, specific actions need to be taken at the local, regional and national level.

Ambulance responsibilities

Mass casualty incident (MCI) including a multiple complex burn (MCB) response

The expected sequence of events in the case of an MCI/MCB emergency is as follows:

1. An MCI with MCB occurs. (This will probably involve police in a search-and-rescue type operation and/or MCDEM in a mass evacuation.)

2. Emergency services are notified by someone telephoning 111 and identifying the appropriate emergency service. The 111 National Crisis Communications Centre (NCCC) will then transfer the call to one of the three Emergency Ambulance Communications Centres (EACCs), which are located in Auckland, Wellington and Christchurch.

3. The initial assessment of an incident occurs by the first responders at the scene using standard risk assessment processes.

4. Once an incident has been classified by an EACC, local DHBs and the Ministry of Health will be notified. Police and fire services are informed routinely by the Communications Centres. Civil Defence Emergency Management (CDEM) groups will be informed of all serious incidents.

5. Ambulance services will attend the scene and further assess the incident risk. Depending on what they assess the risks to be, they will develop an escalation and response plan.

If regional ambulance resources are overwhelmed, ambulance services will activate their NCCC, which will coordinate with the NHCC and other national emergency management structures as required. The NCCC will coordinate the ambulance response.

St John maintains the National Transport Plan for an MCI on behalf of the ambulance sector. This Plan addresses various transport options, which include road-based ambulances, rotor and fixed-wing civilian and Defence Force aircraft, and other private transport options such as trains and buses. The Transport Plan focuses on transporting the injured to the appropriate DHB/s and decanting the receiving DHB/s in order to increase their capacity.

Roles and responsibilities by heath sector alert code

Health sector alert code	Ambulance services Principal role: Provides first response	District Health Boards Principal role: Local operational management of response	Regional Burns Units Principal role: Regional coordination of burn management with DHBs	National Burns Centre Principal role: National coordination of burn management between RBUs	Ministry of Health Principal role: National and international coordination

Key roles and responsibilities aross all alert codes	• Communicates with health sector and other response agencies as necessary
	• Coordinates triage at scene of incident
	• Manages transport of patients
	• Activates local regional and national plans as necessary
		• Coordinates and manages the health sector response in their own region
		• Provides information to the Ministry, NBC and RBUs of potential need to activate the Plan
		• Liaises with other agencies and emergency services at the local level
		• Activates local disaster plans to maximise capacity, for example, decanting of non-burn patients from the NBC or RBUs
		
		Counties Manukau DHB (location of NBC)
		• Coordinates and manages the health sector response in its region to ensure the NBC has maximum capacity by:
		  – activating regional Memoranda of Understanding (MoUs) to decant patients from burn and ICU beds
		  – 'ring fencing' theatre time for burn operations
		• Ensures that adequate supplies and equipment are available to support NBC in an extreme emergency
			• Provide care for complex burn patients
			• Predict and monitor local service sustainable capacity
			• Provide a triage service
			• Supports non-burn hospitals/ services within the region with clinical advice and support
			• Communicate with:
			  – local DHBs to assist with local /regional response to a burn emergency
			  – NBC regarding clinical support matters including decanting and transfer of patients
			• Work with DHBs to implement local recovery plan
				• Senior medical staff within the NBS liaise with each other to determine the appropriate clinical placement for burn patients throughout the NBS
				• NBS coordinator within the NBC (based at Counties Manukau DHB) provides a link between the NBC and RBUs and liaises with the Ministry regarding sustainable capacity through SPOC system
				• Works with Ministry to implement national recovery plan
				• Provides information to the Ministry and DHBs of any potential need to activate the Plan
				• Provides care for patients with large burns (>30% total of body surface [TBSA])
				• Works with Ministry to provide clinical advice
				• Supports transfer of burn patients
					• Coordinates health sector operational response at the national level
					• Provides information to NBC and RBUs and DHBs of any potential need to activate the Plan
					• Provides information and advice to the Minister
					• Provides strategic direction on health sector response
					• Liaises with other agencies at the national level
					• Liaises with international agencies
					• Identifies and activates appropriate national technical advisory group(s), and ensures they analyse critical data as required
					• Provides clinical and public health advice on control and management
					• Approves/directs distribution of national reserve supplies
					• Ensures technical advisory groups analyse critical data
					• Provides information to assist with response
					• Plans for recovery

National Health Emergency Plan: Multiple Complex Burn Action Plan

Health sector alert code	Ambulance services **Principal role:** Provides first response	District Health Boards **Principal role:** Local operational management of response	Regional Burns Units **Principal role:** Regional coordination of burn management with DHBs	National Burn Centre **Principal role:** National coordination of burn management between RBUs	Ministry of Health **Principal role:** National and international coordination
Code White: Information	• Monitors situation • Reviews response plans • Advises staff and checks their availability • Checks equipment and supplies	**DHB closest to the incident** • Monitors situation and obtains intelligence reports and advice from ambulance services • Advises all relevant staff, services and service providers of the event and developing intelligence • Liaises with the Ministry regarding media statements • Reviews local and regional HEPs • Prepares to activate emergency plans • Liaises with other emergency management agencies within the region **Counties Manukau DHB (location of NBC)** • Liaises with NBC in preliminary planning • Prepares to decant ICU	**RBU closest to incident** • Advises appropriate staff and NBS of Code White • Reviews sustainable capacity using Appendix Five as a guide • Commences preliminary planning to increase capacity with a particular emphasis on ICU capacity • Reviews potential availability (liaising with human resources departments), of staff with burn experience • Alerts emergency equipment suppliers **Other RBUs** • Review sustainable capacity, using Appendix Five as a guide	• Reviews sustainable capacity, using Appendix Five as a guide • Commences preliminary planning to increase capacity with a particular emphasis on ICU capacity • Reviews potential availability (liaising with Counties Manukau DHB human resources department), of staff with burn experience • Investigates possibility of decanting non-burn/plastic clinical load onto other suitably credentialed clinicians • Liaises with NBS to determine additional capacity nationally • Alerts emergency equipment suppliers • Provides clinical advice to the Ministry	• Issues Code White Alert through SPOC system • Monitors situation and continues surveillance • May activate a national incident on Emergency Management Information System (EMIS) • Advises DHB chief executives, DHB SPOC and all public health unit managers of emerging situation and potential developments • Provides media and public with information and advice • Liaises with international agencies

Health sector alert code	Ambulance services **Principal role:** Provides first response	District Health Boards **Principal role:** Local operational management of response	Regional Burn Units **Principal role:** Regional coordination of burn management with DHB	National Burn Centre **Principal role:** National coordination of burn management between RBUs	Ministry of Health **Principal role:** National and international coordination
Code Yellow: Standby	• Continues to monitor situation • Confirms staff and their availability • Prepares equipment supplies	**DHB closest to the incident** • Prepares to activate DHB emergency operations centre (EOC) • Identifies and appoints DHB incident management team • Prepares to activate regional coordination • Advises and prepares all staff, services and service providers • Manages liaison with local agencies • Monitors local situation and liaises with the Ministry **Counties Manukau DHB (location of NBC)** • Activates regional MoUs to facilitate transfer of ICU/other patients • Facilitates transfer activities	**RBU closest to incident** • Alerts staff for standby through cascade system • Ensures emergency department/ICU and theatre are on standby • Activates emergency supply system • Completes arrangements to decant existing patients to free beds for new incoming burns • Prepares to triage patients as appropriate • Considers reallocation and recruitment of additional staff and resources **Other RBUs** • Remain on standby • Prepare to accept decanted burn patients from NBC and RBU closest to incident	• Alerts staff for standby through cascade system • Ensures emergency department/ICU and theatre are on standby • Activates emergency supply system • Completes arrangements to decant patients to free beds for incident admissions • Prepares to triage patients as appropriate • Considers reallocation and recruitment of additional staff and resources	• Issues Code Yellow Alert through SPOC • Identifies and appoints national incident management team • Activates a national incident on EMIS • Assesses whether activation of the NHCC is required, and activates if necessary • Determines and communicates strategic actions for response to the incident • Identifies national technical advisory group(s) as required • Advises the health sector via the SPOC system • Manages liaison and communications with other government agencies • Manages liaison with international agencies

National Health Emergency Plan: Multiple Complex Burn Action Plan

Health sector alert code	Ambulance services Principal role: Provides first response	District Health Boards Principal role: Local operational management of response	Regional Burn Units Principal role: Regional coordination of burn management with DHB	National Burn Centre Principal role: National coordination of burn management between RBUs	Ministry of Health Principal role: National and international coordination

Code Red: Activation	• Performs scene triage
	• Performs initial treatment
	• Identifies appropriate DHB or other health provider to treat the injured
	• Transports patients in order of priority
	• Coordinates and communicates with other emergency service providers (such as fire and police)
	• Alerts the closest DHB
	• Alerts the Ministry
	• May activate (Ambulance) National Co-ordination Centre
	• May inform CDEM Groups
	• May implement national transport plan
	• May request DHBs supply expert assistance to the incident
		DHB closest to the incident
		• Activates DHB EOC
		• Activates DHB incident management team
		• Manages DHB primary, secondary and public health service response
		• Liaises with other agencies at a district level
		• Provides Regional Co-ordination Centre with DHB/community intelligence
		• Facilitates transfer of burn patients to RBUs and NBC
		• Works with RBU to facilitate recovery planning
		
		Counties Manukau DHB (location of NBC)
		• Activates regional MoUs to support NBC to provide appropriate care for patients
		• Facilitates transfer of burn patients to and from NBC
		• Works with NBC to facilitate recovery planning
			RBU closest to incident
			• Activates RBU emergency plan
			• Decants patients from RBU as appropriate
			• Reallocates or recruits additional staff and resources as appropriate
			• Receives burn patients via emergency department
			• Assesses and treats patients according to clinical priority
			• Engages in inter-clinician discussion within NBS to:
			  – prioritise transfer of patients from RBU to RBU; and RBU to NBC
			  – monitor patient progress and transfer to and from NBC according to clinical need
			
			(Continued on next page)
				• Activates NBC emergency plan
				• Decants burn patients as appropriate
				• Reallocates clinical resources to provide necessary clinical response, as guided by Appendix 5
				• Reallocates or recruits additional staff and resources as appropriate
				• Receives burn patients via emergency department
				• Assesses and treats patients according to clinical priority
				• Facilitates inter-clinician discussion within NBS to:
				  – prioritise transfer of patients from RBU to RBU, and RBU to NBC
				  – monitor patient progress and transfer to and from NBC according to clinical need
				
				(Continued on next page)
					• Issues Code Red Alert; thereafter communicates via the four regional coordinators
					• Activates a national incident on EMIS
					• Coordinates health response at national level
					• Activates the NHCC
					• Activates national technical advisory group
					• Monitors the situation and revises and communicates strategic actions for response
					• Approves/directs distribution of national reserve supplies
					• Considers strategic recovery issues
					• Provides clinical and public health advice on control and management
					• Carries out national public information management activities
					• Manages liaison with other government agencies
					• Manages liaison with international agencies
					• Implements recovery planning

Health sector alert code	Ambulance services **Principal role:** Provides first response	District Health Boards **Principal role:** Local operational management of response	Regional Burn Units **Principal role:** Regional coordination of burn management with DHB	National Burn Centre **Principal role:** National coordination of burn management between RBUs	Ministry of Health **Principal role:** National and international coordination

Code Red: Activation			(Continued from previous page)
			
			Other RBUs
			• Activate RBU emergency plans as required
			• Decant patients as required
			• Receive transferred burn patients as required, transferring to RBU/ICU according to clinical need
			• Assess and treats patients according to clinical priority
			  – Engage in inter-clinician discussion within NBS to prioritise of transfer patients from RBU to RBU and RBU to NBC
			• Monitor patient progress and transfer to and from NBC according to clinical need
				(Continued from previous page)
				• Liaises with Ministry through SPOC on the sustainable capacity of the NBS
				• Plans transfer of patients within New Zealand
				• Commences recovery planning:
				  – for NBC
				  – within the NBS	

Health sector alert code	Ambulance services Principal role: Provides first response	District Heath Boards Principal role: Local operational management of response	Regional Burn Units Principal role: Regional coordination of burn management with DHB	National Burn Centre Principal role: National coordination of burn management between RBUs	Ministry of Health Principal role: National and international coordination
Code Green: Stand down	• Stands down (Ambulance) National Co-ordination Centre • Facilitates debriefs • Provides Ministry with information following debriefs • Reviews and updates plans	**DHB closest to incident** • Stands down DHB EOC • Stands down DHB incident management team • Focuses on recovery activities in the region • Facilitates debriefs • Provides Ministry with information following debriefs • Updates plans **Counties Manukau DHB (location of NBC)** • Reviews effectiveness of regional MoUs and systems in place to facilitate the operation of the NBC in a national burn emergency and makes appropriate changes to plan	**RBU closest to incident** • Activates RBU recovery plan • Transfers out-of-area patients back to local RBUs according to NBS criteria • Debriefs and reviews local RBU emergency plan with staff and emergency services and updates plan as necessary • Debriefs and reviews emergency management with NBS and updates plan **Other RBUs** • Activate RBU recovery plan • Transfer out-of-area patients back to local RBUs according to NBS criteria • Debrief and review of emergency management with NBS and updates plan • Debrief and review local RBU emergency plans and update as necessary	• Activates NBC recovery plan • Transfers patients back to RBUs according to NBS criteria • Debriefs and reviews the local NBC emergency plan with staff and emergency services and updates plan as necessary • Debriefs and reviews emergency management with NBS and updates plan as necessary	• Issues Code Green Alert • Advises other government and international agencies of stand down • Advises media and public • Stands down Ministry incident management team • Stands down NHCC • Focuses activities on national recovery issues within the health sector • Implements recovery plan in conjunction with other agencies • Supplies national information on recovery • Manages national debrief and evaluation of events • Reviews plans

Glossary and Abbreviations

District Health Emergency Plan (DHEP): a plan that describes the health emergency functions and capability required by the DHB, which takes an all-hazards approach and provides for both immediate events, short duration events and extended emergencies, on both small and large scales, as relevant to the DHB population. The DHEP will be built around the four Rs of emergency management: reduction, readiness, response and recovery.

Emergency Ambulance Communications Centre (EACC): a term used to describe one of three Ambulance Communications Centres located in Auckland, Wellington and Christchurch that dispatch the country's fleet of more than 600 ambulances, 250 rural doctors and nurses (under the PRIME programme), more than 40 emergency helicopters, the coastguard and other modes of response.

Emergency Operations Centre (EOC): an established facility where the response to an incident may be supported.

Health Sector Emergency Management Information System (EMIS): a web-based emergency information system that is used as the primary tool within the health sector for the management of local, regional and national emergencies. EMIS complements existing business-as-usual systems (such as EpiSurv and patient management systems).

Ministry of Civil Defence and Emergency Management (MCDEM): the Government's lead advisor in making New Zealand and its communities resilient to hazards and disasters through a risk management approach to the four Rs.

National Burn Centre (NBC): a centre that provides inpatient care for the highest level of burn injury complexity, defined as equal to or greater than 30 percent TBSA.

National Burn Service (NBS): the four regional burn units and the National Burn Centre provide an integrated national service for all burn patients within New Zealand.

(Ambulance) National Crisis Co-ordination Centre (NCCC): a national coordination centre for New Zealand ambulance services.

National Health Co-ordination Centre (NHCC): a service that provides national coordination of the health sector in an emergency. It is the main conduit for intelligence information across the health sector.

National Health Emergency Plan (NHEP): a Ministry 'umbrella' plan incorporating other health emergency-specific action plans; for example, the National Health Emergency: Multiple Complex Burn Action Plan, and the New Zealand Influenza Pandemic Action Plan. The NHEP provides guidance for the New Zealand health and disability sector for emergency management.

Regional burn unit (RBU): a unit that provides specialised and acute burn care treatment to patients based on the Australian and New Zealand Burn Association (ANZBA) referral criteria.

Regional Health Emergency Plan (RHEP): a plan that sets out the proposed response of DHBs in a given region to a regional incident and establishes a generic process for the management of regional incidents, irrespective of origin. It contains task assignments, assignments of roles and responsibilities, standard forms, and other relevant guidance.

Single Point of Contact (SPOC): a system used to facilitate communications in the health sector.

Sustainable capacity: analysis of treatment data for varying levels of burn injury used to develop an interim model to predict sustainable capacity in RBUs and the NBC. Prospective data collection and analysis will provide more accurate and detailed information over time. This model and the ongoing communication system within the NBS form the basis for the safe management of people with burn injury on a day-to-day basis and in a regional or national emergency.

Appendix 1:
Management of Burn Care Services

1) Organisation and management of burn care services in New Zealand

Burn care services in New Zealand are provided by primary, secondary and tertiary level health care providers, according to the severity and complexity of the burn injury.

Most severe

Complexity/
severity of burn
injury

Least severe

NBC

RBUs

Emergency and general
surgical departments

Self-help, GPs, district nurses, minor injury units
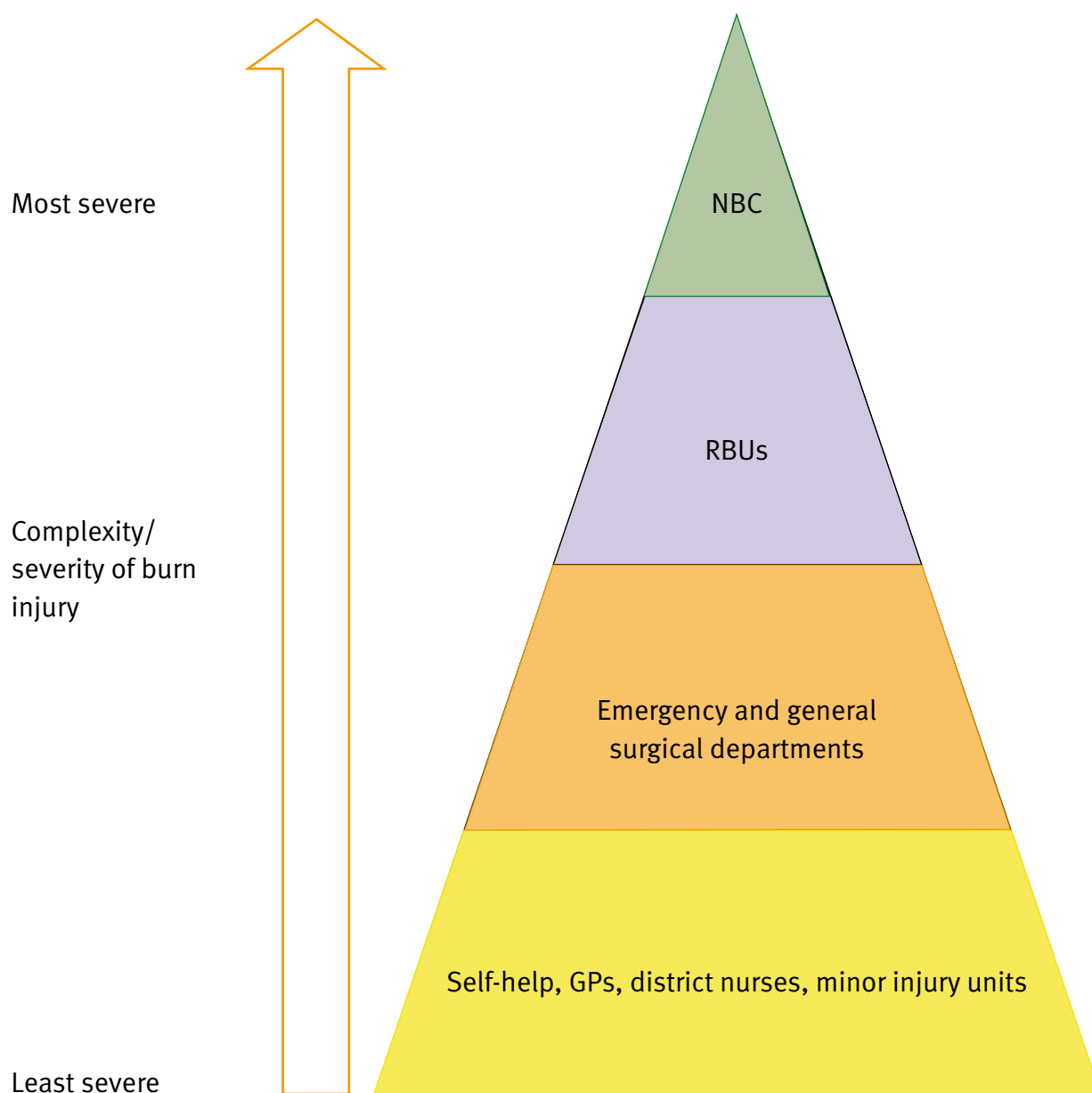
2) Escalation pathway for the management of a multiple complex burn emergency

Code White

Code Yellow

Code Red

Level 1 incident – RBU

- Local DHB enacts emergency plan
- Regional Health Emergency Plan (RHEP) ready to activate
- Other RBUs and NBC on standby

Level 2 – Major incident – NBC

- NBC/RBUs and their DHBs activate emergency plans
- Activate relevant DHB plans
- All other RHEPs ready to activate

Level 3 – National Health Emergency

Ministry of Health assumes coordination of emergency

NHEP: Multiple Complex Burn Action Plan **activated**

Can the emergency be managed locally?

No →

Can the other RBUs and NBC cope with casualities within their sustainable capacity?

No

Yes

Yes

- Local RBU emergency plan used to manage incident
- Other RBUs/NBC remain on standby and may supply clinical expertise if required

NBS's emergency plan used to manage incident

Ministry action, responsibility and authority acivated under the NHEP

Local and regional DHB action, responsibility and authority activated under NHEP

NBS action, responsibility and authority activated under NHEP

Appendix 2:
Referrals

1)   Burn referral criteria

The Australian and New Zealand Burn Association (ANZBA) recommends that patients should be referred to an RBU If they have:

- burns equal to or greater than 10 percent of TBSA

- burn in certain special areas (for example, involving the face, hands, feet, genitalia, perineum, or major joints)

- a full-thickness burn affecting more than five percent TBSA

- an electrical burn (including lightning injury)

- chemical burns

- a burn injury with an inhalation injury

- circumferential burn of the limbs or chest

- burns at the extremes of age (young children and the elderly)

- a burn injury with a pre-existing medical condition that could complicate management, prolong recovery, or affect mortality

- a burn injury with concomitant trauma (for example a fracture) in which the burn injury poses the greater immediate risk of morbidity or mortality.

Referral to the National Burn Centre

Severe burn injuries warrant consultation with, and typically transfer to, the NBC. These include:

- burns equal to or greater than 30 percent TBSA

- patients predicted to require prolonged ventilation (greater than 48 hours)

- full-thickness burns greater than 15 percent TBSA in the very young or very old

- electrical burns – caused by high voltage, with underlying tissue damage

- significant chemical burns.

Referrals to the NBC are made through the local RBU.

The NBS's website **www.nationalburnservice.co.nz** details the referral process and provides a resource for both clinicians and service users (see also Appendix 3).

2) The burn injury referral pathway

```
┌──────────────────┐
│ Referring doctor │
│ rings RBU        │
└──────────────────┘
        │
   ╱Suitable for╲                                      ┌──────────────────┐
  ╱  NBC referral? ╲────────── No ──────────────────▶ │ Transfer to RBU  │
   ╲              ╱                                     └──────────────────┘
        │
       Yes
        │
┌──────────────────────┐
│ Referring consultant │
│ and/or RBU consultant│
│ rings on-call burn   │
│ nurse and faxes      │
│ referral to RBU and  │
│ NBC                  │
└──────────────────────┘
        │
┌──────────────────────┐
│ Conference call      │
│ On-call burn nurse   │
│ calls back referring │
│ consultant and/or    │
│ RBU consultant with  │
│ on-call NBC consultant│
│ to discuss referral  │
└──────────────────────┘
        │
   ╱Suitable for╲                       ┌──────────────────────────────────────┐
  ╱  NBC referral? ╲──── No ──────────▶ │ Decline Referral                     │
   ╲              ╱                      │ On-call burn nurse faxes referring   │
        │                               │ consultants and RBU consultant       │
       Yes                              │ confirmation of 'declined' referral  │
        │                               └──────────────────────────────────────┘
   ╱Is there  ╲                         ┌──────────────────────────────────────┐
  ╱ surgical   ╲──── No ──────────────▶ │ Decanting Policy                     │
   ╲ capacity? ╱                        │ Consider decanting a less acute burn │
        │                               │ to either the referring RBU or back  │
       Yes ◀── ╱Is there ╲ ─── No ─────▶│ to domicile RBU                      │
        │      ╲surgical  ╱             └──────────────────────────────────────┘
   ╱Needs ICU ╲ ╲capacity?╱            ┌──────────────────────────────────────┐
  ╱ bedspace?  ╲──── No ──────────────▶ │ Transfer to NBC                      │
   ╲           ╱                        │ On-call burn nurse to fax            │
        │                               │ 'acceptance' of referral back to     │
       Yes                              │ referring consultant and RBU consultant│
        │                               └──────────────────────────────────────┘
┌──────────────────────┐
│ Conference call      │
│ On-call burn nurse   │
│ and NBC consultant   │
│ liaise with Middlemore│
│ Hospital ICU         │
│ consultant. May      │
│ require additional   │
│ call to referring    │
│ consultant/RBU       │            ┌──────────────────────────────┐
│ consultant for       │            │ New Call                     │
│ clarification OR     │            │ On-call burn nurse and NBC   │
│ Starship Paediatric  │            │ consultant contact referring │
│ ICU consultant       │            │ consultant and RBU consultant│
└──────────────────────┘            │ about 'decline' within two   │
        │                           │ hours of receipt of faxed    │
   ╱Accepted ╲                      │ referral                     │
  ╱ by ICU    ╲──── No ───────────▶ └──────────────────────────────┘
   ╲         ╱
        │
       Yes
        │
┌──────────────────────┐            ┌──────────────────────────────┐
│ New Call             │            │ Transfer to Middlemore       │
│ On-call burn nurse   │            │ Hospital ICU. On-call burn   │
│ and NBC consultant   │            │ nurse to fax 'acceptance'    │
│ contact referring    │── Yes ───▶ │ of referral back to referring│
│ consultant and RBU   │            │ consultant and RBU consultant│
│ consultant about     │            └──────────────────────────────┘
│ acceptance within two│
│ hours of receipt of  │
│ faxed referral       │
└──────────────────────┘
```

Appendix 3:
National Burn Service Referral Form

> No burn patient can be transferred to the National Burn Centre or Starship without the involvement of their regional burn unit. This important step cannot be bypassed.

Burn patient arrives
– complete trauma ABC (if required)
– complete first aid cooling (if not done)

↓

– Patient meets criteria for discussion + – transfer to a regional burn unit/ plastic surgery unit

↓

– Fax referral to regional burn unit and discuss case with on-call plastic surgery registrar
– Email photos to RBU

Referral criteria for regional burn unit

- Burns greater than 10% total body surface area (TBSA) or 5% in a child
- Burns of special areas, eg, the face, hands, feet, genitalia, perineum, and major joints
- Full thickness burns greater than 5% TBSA
- Electrical burns (including lightning injury)
- Chemical burns
- Burn injury with inhalation injury
- Circumferential burns of the limbs or chest
- Burns at the extremes of age, ie, young children and the elderly
- Burn injury in patients with pre-existing medical disorders that could complicate management, prolong recovery or affect mortality
- Any patient with burns and concomitant trauma (eg, fractures) in which the burn injury poses the greater immediate risk of morbidity or mortality

Fax and phone referral to:	Please tick applicable box below	
Christchurch Hospital ☐ tick here	Ph: Fax:	(03) 364 0640 (please ask for on-call plastic surgery registrar) (03) 364 0456 (Department of Plastic Surgery)
Hutt Hospital ☐ tick here	Ph: Fax: Email photos:	(04) 566 6999 (please ask for on-call plastic surgery registrar) (04) 570 9239 (Plastic and Burn Ward) referrals_plastics@huttvalleydhb.org.nz
Waikato Hospital ☐ tick here	Ph: Fax:	(07) 839 8899 (please ask for on-call plastic surgery registrar) (07) 839 8725 (Plastic Surgery Booking Clerk Office)
National Burn Centre Middlemore Hospital ☐ tick here	Ph: Fax: Email photos:	(09) 276 0000 (please ask for on-call plastic surgery registrar) (09) 276 0114 021 784 057 plasticreferrals@middlemore.co.nz oncallburnsnurse@middlemore.co.nz
Fax from:		
Designation:		
Date:		
Number of pages:	3	

Initial Treating Dr: _____ Ph: _____

Designation: _____ Fax: _____

Injury Details:

Time/Date of Injury: _____ ACC 45 No. _____

Arrival Date/Time at Hospital: _____

How Accident Happened: _____

_____

Burn occurred in confined space? Yes ☐ No ☐

Was there an explosion? Yes ☐ No ☐

Past Medical History: _____

_____

Daily Alcohol Intake: _____

Current Medications: _____

Allergies: Yes/No: _____

Discussed between which consultants?

RBU SMO: _____ **NBC SMO:** _____

Discussion (pls circle): Transfer to NBC   RBU   Other _____

Reason not transferred to NHC: _____

_____

Patient label

Next of Kin or Accompanying Person: _____

Ph: _____

Initial Assessment:

Airway: _____ Breathing: _____

Circulation: _____ – adequate supply to limbs? Yes/ No (please circle)

Cervical injury: _____

Tetanus toxoid: Current? Yes / No / Don't Know (please circle)

Analgesics Given: _____

Escharotomies? Yes ☐ No ☐ Where? _____

Transfer Checklist:

	Yes	No	n/a
Intubated			
Tetanus toxoid given			
Naso-gastric tube			
Oxygen			
Escharotomies			
Uretheral catheter			
Venous access			
Blood gases			
Urea: electrolytes, full blood count			
Urinalysis			
Jewellery removed			
Baseline data attached			
Fluid Balance Chart attached			
Burns Chart attached (Lund & Browder)			
X-rays and notes (copies) sent			

Monitoring

Urine output   Adults: 0.5 mL/kg/hr
                Children: 1 mL/kg/hr

(haemoglobinuria / myoglobinuria
→ 1–2 mL/kg/hr)

NB: This formula is a guideline only and does not replace clinical judgement. Adjustment may be necessary to maintain urine output.

Time (hourly)	Rate fluid in/hr	Urine out/hr

Patient Weight: _____ kg

Fluid Replacement Guide

First 24 hours

3–4 mL x kg x % burn

- Crystalloid (eg, Plasmalyte, Lactated Ringers) Do not include simple erythema.

Give approximately half in first 8 hours from time of burn, half in next 16 hours

For children add maintenance fluids – use Dextrose Saline:

Up to 10kg:	4 mL/kg/hr
+ from 10–20kg:	2mL/kg/hr
+ each kg >20kg:	1 mL/kg/hr

NB: This formula is a guideline only and does not replace clinical judgement. ADJUSTMENT WILL be necessary to maintain urine output.

Wound Management

Please consult with regional burn unit for advice prior to applying any wound care product.

Lund and Browder Burn Chart
Areas Burned

REGION	%
Head	
Neck	
Ant Trunk	
Post Trunk	
Right Arm	
Left Arm	
Buttocks	
Genitalia	
Right Leg	
Left Leg	
TOTAL BURN	

NB Exclude Erythema
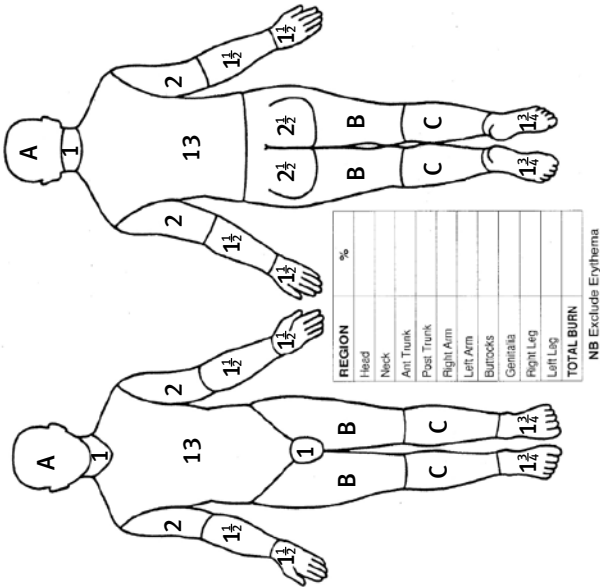
Size of Burn (% body surface area): _____

Partial Thickness

Full Thickness

Area	Age 0	1	5	10	15	Adult
A = ½ of head	9½	8½	6½	5½	4½	3½
B = ½ of one thigh	2¾	3¼	4	4¼	4½	4¾
C = ½ of one leg	2½	2½	2¾	3	3¼	3½

File Name:	W:\National Burn Centre\Models of Care\NBC Referrals\NBC Referrals\NBC Referral Form for NZ revised 240111 v13.doc	Last Updated:24 January 2011
Version:	2.1	Review Date: June 2011

Appendix 4:
Suggested Pathways of Burn Care

1)   Fluid resuscitation pathway

AIM – minimal amount of fluid required to maintain adequate urine output

Fluid Resuscitation

– children with burn injury greater than 10% TBSA (exclude erythema) AND add maintenance

– adults with a burn injury geater than 15% TBSA (exclude erythema)

– any patient who cannot tolerate enteral resuscitation

NB: Start enteral feeding and subtract this amount from intravenous (IV) resuscitation fluid

Increase naso-gastric (NG) feeds by 10–20 mL/hour and subtract amount from IV resuscitation to maintain same TOTAL mL/hour

Yes

Tolerating NG/ naso-jejunal feeds?

No

Decrease* NG feeds by 10–20 mL/hour and add amount from IV resuscitation to maintain same TOTAL mL/hour

*Decrease in tolerance of NG feeds is an early sign of sepsis.

Hourly urine output at goal?
– 0.5 mL/kg adult
– 1.0 mL/kg child
– 1–2 mL/kg if haemochromagens present

Yes

No – Less than goal

No
Greater than goal

Variance greater than 50 percent of goal?

Yes

No

Increase infusion rate by 20% and bolus 20 mL/kg

Increase infusion rate by 20%

Decrease infusion rate by 20%

No

Variance greater than 50% of goal?

Yes

Decrease infusion rate by 40%

2)   Burn wound management pathway

Primary and secondary survey
– treat life-threatening injuries

↓

Complete first aid
– 20 minutes, tepid running water
– up to 3 hours post burn

↓

Assessment
– burn size (see Lund and Browder chart)
– burn depth

Referral criteria for RBU

- burns greater than 10% TBSA adult, greater than 5% TBSA child
- full thickness burns greater than 5% TBSA
- special area (face, hands, feet, genitalia, perineum or major joints)
- electrical burns
- chemical burns
- associated inhalation injury
- circumferential burns of the limbs or chest
- burns at the extremes of age (children or elderly)
- pre-existing medical conditions that could complicate management, prolong recovery or affect mortality
- associated trauma
- suspected non-accidental injury

RBUs

Auckland region:
Counties Manukau DHB
Ph: (09) 276 0000
(ask for on-call plastic surgery registrar)
Fax: (09) 276 0114

Waikato region:
Waikato DHB
Ph: (07) 839 8899
(ask for on-call plastic surgery registrar)
Fax: (07) 839 8725

Wellington region:
Hutt Valley DHB
Ph: (04) 566 6999
(ask for on-call plastic surgery registrar)
Fax: (04) 570 9239

Christchurch region:
Canterbury DHB
Ph: (03) 364 0640
(ask for on-call plastic surgery registrar)
Fax: (03) 364 0456

NB: Referral to the NBC is via one of the RBUs only

Epidermal – should heal

Superficial/mid-dermal – should heal within 14 days

Deep dermal/full thickness – will probably require surgery

Moisturising cream

– Antimicrobial dressing/ specialist dressing
– Blister and oedema management
– Pain relief

Consider surgery — No → (to Antimicrobial dressing)
Consider surgery — Yes → Surgery

Day Three: reassessment

Intact skin? — Yes ↓

Burn depth progression? — Yes → Consider surgery — Yes → Surgery
Burn depth progression? — No ↓
Consider surgery — No → (to Change to moist wound healing product)

Healed. Continue moisturiser and sunblock

Healed, Continue moisturiser and sunblock. Consider scar and rehabilitation needs

Change to moist wound healing product if possible on day three (epidermal to surperficial dermal), or day five (mid to deep dermal). Otherwise, continue with antimicrobial dressing.

↓

Reassess every 3–5 days. Monitor for signs of wound infection or sepsis

Change to moist wound healing product if possible, otherwise continue with antimicrobial dressing

Healed

Likely healed less than three weeks post burn? — Yes → (to Change to moist wound healing product)
Likely healed less than three weeks post burn? — No → Consider surgery

Consider surgery — No → (to Change to moist wound healing product)
Consider surgery — Yes → Surgery

3) Surgical burn care pathway

Comfort care?
— Yes → Comfort care pathway
— No ↓

Patient stable?
— No → **Benefits from delay?** — Yes → Re-look in 24 to 48 hours
— Yes ↓

Benefits from delay? — No → Operate

Operate ↓

Pain. Excise burn and cover. Priorities are:
– line sites
– tracheostomy sites
– hands and elbows

Sure of burn depth?
— No → **Consider** rundown/test shave + /− Acticoat
Consider Biobrane or Aquacel Ag or Acticoat absorbent if superficial dermal
— Yes ↓

Full thickness/ deep dermal?
— No → Consider rundown/test shave...
— Yes ↓

Excise – either all or in sections ↓

Confident about wound bed?
— No → **Consider** Biobrane or cadaver
— Yes ↓

Patient still stable post debridement?
— No → **Consider** Biobrane or cadaver
— Yes ↓

Sufficient donor sites available?
— No → Graft areas possible. Priorities are:
– line sites
– tracheostomy sites
– hands and elbows
— Yes ↓

Auto-graft

4) Pathway for follow-up of patients discharged from National Burn Centre

```
┌─────────────────────────┐
│ Patient discharged from │
│ NBC following collaboration │
│ between NBC and RBU, with │
│ multi-disciplinary discharge │
│ summary │
└─────────────────────────┘
            │
            ▼
┌─────────────────────────┐
│ Transferred to │
│ RBU as inpatient │
└─────────────────────────┘
            │
            ▼
┌─────────────────────────┐
│ Review by RBU │
│ multi-disiplinary team. │
│ Community support and │
│ follow-up arrangements │
│ based on assessment │
│ and NBC discharge summary │
└─────────────────────────┘
            │
            ▼
┌─────────────────────────┐        ┌─────────────────────────┐
│ Medical/surgical │        │ Send follow-up reports │
│ follow-up in plastics │───────▶│ to NBC at: │
│ clinic by regional plastics │   │ • one month │
│ consultant │                    │ • six months │
└─────────────────────────┘        │ • one year │
            │                      │ post discharge from NBC │
            ▼                      └─────────────────────────┘
┌─────────────────────────┐
│ Follow-up by NBC at │
│ request of regional │
│ plastics consultant │
└─────────────────────────┘
```

Appendix 5:
Burn Care Requirements

TBSA size		Week 1	Week 2	Week 3	Week 4
0–9%	Theatre time (minutes):	139.34	14.42	5.06	1.67
	Number of theatre visits:	1.32	0.18	0.04	0.03
	Nursing time (hours):	8.14	3.36	1.02	0.47
	Physical therapy (PT) time (minutes):	41	24	8	2
	Occupational therapy (OT) time (minutes):	33	19	6	1
10–19%	Theatre time (minutes):	111.12	34.78	5.94	5.25
	Number of theatre visits:	2.08	0.35	0.08	0.09
	Nursing time (hours):	30	13	5	2
	PT time (minutes):	46	26	17	8
	OT time (minutes):	58	49	32	17
20–29%	Theatre time (minutes):	282.88	114.8	47.3	13.19
	Number of theatre visits:	1.73	0.88	0.42	0.2
	Nursing time (hours):	110	56	30	17
	PT time (minutes):	248	208	200	145
	OT time (minutes):	80	98	80	65
30–39%	Theatre time (minutes):	400.47	295.2	193.33	54.33
	Number of theatre visits:	2.4	1.86	1.54	0.86
	Nursing time (hours):	146	103	74	62
	PT time (minutes):	316	347	288	218
	OT therapy time (minutes):	118	81	138	102
40–49%	Theatre time (minutes):	640.25	425.42	303.5	155.92
	Number of theatre visits:	3.17	2.58	2	1.34
	Nursing time (hours):	179	171	109	77
	PT time (minutes):	268	310	305	278
	OT time (minutes):	106	155	126	103
50–59%	Theatre time (minutes):	808.4	429	276.6	154.8
	Number of theatre visits:	2.8	2	1.8	1
	Nursing time (hours):	176	180	97	94
	PT time (minutes):	357	367	432	335
	OT time (minutes):	165	160	183	181
›60%	Theatre time (minutes):	861.42	371.83	302	252.92
	Number of theatre visits:	3.16	2.33	2	1.75
	Nursing time (hours):	144	105	67	61
	PT time (minutes):	232	229	235	193
	OT time (minutes):	98	95	81	89

Note: Figures are per patient.