

NSW GOVERNMENT ACTION PLAN

FOR HEALTH

**Intensive Care
Service Plan -
Adult Services**

Plan Plan Plan Plan Plan

*to provide a
first class service
to the critically
ill In NSW,*

NSW HEALTH DEPARTMENT

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Intensive Care Service Plan – Adult Services.

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The Hon Craig Knowles, MP
Minister for Health
Level 33
Governor Macquarie Tower
1 Farrer Place
SYDNEY NSW 2000

Dear Minister

On behalf of the Intensive Care Clinical Implementation Group, we commend to you our final *Intensive Care Services Plan – Adult Services*.

We have welcomed this opportunity to plan and improve intensive care services for patients in NSW through a process that acknowledges the importance of intensive care in supporting other acute health services.

We thank you for the opportunity to be involved.

The Intensive Care Clinical Implementation Group included intensive care clinicians, rural clinicians, a consumer representative and senior NSW Health executives. The focus has been to develop short and long term strategies to ensure that we meet the increasing demand for intensive care beds across NSW. To ensure that this service is delivered in an appropriate manner, workforce, quality and information technology issues have also been considered.

The Intensive Care Service Plan Sub-Group was chaired by Dr Tony Burrell. Their Plan recommends formalising and strengthening networks across and between Area Health Services. We recommend that this document be considered together with the other endeavours of the Intensive Care Clinical Implementation Group:

- Quaternary ICU Services Review - Dr Heather Low, Chair
- Report on Issues Relating to Rural Critical Care in NSW - Dr Paul MacDonald and Ms Denise Harris, Co-Chairs
- The ICU Nursing Workforce Report - Mrs Kate Needham, Chair
- The NSW Episode Funding Guidelines for Intensive Care Services - a collaboration between the Intensive Care and Funding Models Groups of the NSW Government Action Plan

Our recommendations should also be integrated with the Emergency Department Services Plan and the Report of the Greater Metropolitan Services Implementation Group.

Because of the emphasis of the Services Plan on intensive care in metropolitan Areas, a detailed separate survey and report of rural intensive care services was undertaken. This work highlighted the challenges facing rural units in staffing recruitment and retention. Ms Denise Harris and Dr Paul Macdonald deserve special thanks for overcoming the tyranny of distance to attend meetings, cover all rural areas in their survey and produce a report that was unanimously endorsed by the Intensive Care Group.

The common theme of our Plan is networking. Implementation of the Plan and cooperation with our statewide retrieval services will allow us to provide a first class service for people who are critically ill in our community.

Underpinning our work is a simple message of the **four C's**:

- **Care of patients:** throughout this process, we must not lose sight of our fundamental aim - caring for people who are critically ill
- **Care of staff:** one of the greatest challenges we face is the recruitment and retention of qualified staff to maintain our service
- **Capacity:** our Plan specifically addresses intensive care capacity at a state and local level. As modern health care evolves the demand for this high level care increases. Monitoring of our ability to respond to this changing demand is essential.
- **Communication:**
 - between patients, families, carers and clinicians
 - between all clinicians involved in the care of the patient
 - between clinicians and managers
 - between hospitals within and across Area Health Services throughout NSW.

All these are important.

Having finalised the Plan, we recommend that the Intensive Care Group, with broader added rural representation, continue its important work in collaboration with the proposed statewide Adult Intensive Care Unit Coordination and Monitoring Unit.

The challenge of the last 15 months has been made more rewarding by the incredible enthusiasm and support of all our Implementation group members. As Co-Chairs we thank them for their commitment and dedication. We would also like to thank the NSW Health Department Secretariat, Lynda Smart and Dr Steevie Chan for their hard work.

Theresa Jacques
Co-Chair

Kate Needham
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Executive summary

Accessibility to intensive care is vital to the health of the community and the health system at large. The Intensive Care Unit is a pivotal component of the hospital and, in a broader sense, the critical care system.

This Plan recommends the adoption of a network model, formalising and strengthening networks across and between Area Health Services. In addition it recommends that the delivery of intensive care services, both location and mode of delivery, should be examined by individual Area Health Services. Future planning should reflect appropriate capacity and function of intensive care services within each Area Health Service to best meet community need and improve service delivery.

It is acknowledged that significant work has been undertaken in the past and documents such as 'Intensive Care Strategic Direction – A Framework for the NSW Health System' (1999) and 'Better Practice Guidelines for Bed Management' (1998) should be used in conjunction with the Intensive Care Service Plan – Adult Services.

The Intensive Care Clinical Implementation Group recommends that:

1. Available data based on projected population numbers, age profiles and current practice, indicates that the peak intensive care bed space requirements for the state will be in the year:

- 2001 – 549 bed spaces
- 2006 – 582 bed spaces
- 2011 – 619 bed spaces

These numbers are planning projections. They are not absolute and the number of beds in operation at any given time will fluctuate based on demand. It is recommended that the number of bedspaces increase incrementally and that the location of these beds be based on demonstrated demand.*

2. Area Health Services that are estimated to have a minimal increase by 2011 should maintain the current Area bedstock to ensure that service delivery is able to be maintained, while other Areas increase the level of service provision. That is there should be no reduction in intensive care bed capacity.

- Where increases in bed numbers are recommended, these increases should occur as a staged progression over the projection period.

3. An integrated network of Intensive Care Units based on the hub and spoke model should be adopted on a Metropolitan Area Health Service / Rural Critical Care Network basis.

4. Rural areas should be linked with a metropolitan site based on the default critical care networks.

5. Each Area Health Service or Rural Critical Care Network should have a Director of Intensive Care Services. Some Area Health Services may need to consider funding this position up to 0.5 FTE.

6. Each Area Health Service should be ultimately responsible for meeting the intensive care needs, superspecialty services withstanding, of the Area and agreed network services. This means that each Area Health Service makes an appropriate contribution to the state's intensive care bedstock.

- The number of non superspecialty 'out of Area' transfers and transfers to access an intensive care bed should be kept to a minimum. Such transfers should be considered a critical incident and reviewed by the Area Health Service and clinicians on a regular basis.

- Transfers for an intensive care bed 'out of Area' should only occur after direct consultant to consultant discussion.

- Intra Area networking of hospital services should be encouraged where appropriate.

7. Effective intensive care services should be developed by concentrating units in major hospitals within each Area.

* For more details, refer to pages 6-9.

- The optimal number of beds for a single unit depends on its role. A workable unit size is in the range of 12 and 15 beds. This allows for appropriate intensivist/nursing infrastructures at NSW Health role level 5/6 (level 3 Faculty of Intensive Care, Australian and New Zealand College of Anaesthetists Minimum Standards). A unit of this size could be considered as a basic unit or 'pod'.
 - For larger hospitals intensive care facilities could be developed as multiples of this number eg 3 x 'pods' requiring 3 intensivists/senior trainees rostered on clinical duty, three Nurse Unit Managers and so on.
 - Other hospitals will be encouraged to develop NSW Health role level 4 (level 1 Faculty of Intensive Care, Australian and New Zealand College of Anaesthetists Minimum Standards) Intensive Care or High Dependency Units consistent with the hospital role.
8. In rural areas the intensive care service should be developed at the regional referral or base hospital. The regional intensive care service should be at NSW Health role level 5 (level 2/3 Faculty of Intensive Care, Australian and New Zealand College of Anaesthetists Minimum Standards) and the service should have in place an appropriate organisational structure.
- Currently a number of Area Health Services have no role level 5 unit but a role level 4 unit functioning at a higher level of clinical care. As a matter of priority rural Area Health Services should examine the structure and role of Intensive Care Units and implement the recommendation above. Developing a role level 5 unit will also enhance the ability to recruit and retain qualified intensive care staff.
 - Patients located in units providing a service at NSW Health role level 4 or less (level 1 Faculty of Intensive Care, Australian and New Zealand College of Anaesthetists Minimum Standards) and requiring ventilation for greater than 24 hours should be transferred to a regional intensive care service. It is acknowledged that the enhancement of units to a role level 5 will be incremental. During the implementation phase consultation with a regional centre may occur after 24 hours or within an agreed network protocol.
 - The number of available bedspaces should be based on workload with a significant flexibility factor included.
- The Director of the regional intensive care service(s) should be involved in the management of the Area Critical Care Network.
 - The Director should be a full time equivalent with appropriate intensive care qualifications. It is acknowledged that there will be an implementation phase for this recommendation and it is a goal that Area Health Services should work towards.
 - A formal working relationship should be developed between the Intensive Care Unit and the anaesthetic or Emergency Department consultants to provide appropriate senior medical cover for the unit.
 - External appointment of the Director with a linked tertiary unit and peer group support should be considered.
9. The utilisation of High Dependency Units should become widespread.
- They should form part of the continuum of critical care rather than existing as separate High Dependency Units which have evolved in a piecemeal fashion in some hospitals. High Dependency Units should be aligned with intensive care services. This encourages maximum flexibility and utilisation of such services without the extra step of another admission/discharge process to a separate High Dependency Unit. This will alleviate exit block in busy times. This will also avoid the issue of variable occupancy in a number of smaller High Dependency Units.
 - It may be more useful not to make the distinction between intensive care and high dependency beds and consider all beds as 'multipurpose'.
 - High Dependency Units should have appropriate information systems, clinical indicators and formal audit processes in place.
10. An Intensive Care Coordination and Monitoring function is required at a Statewide level.
11. An improved data collection and verification process should be implemented.

Introduction

The NSW Government's Action Plan for Health arising from the NSW Health Council, and Ministerial Advisory Committee on Health Services in Small Towns, identified critical care (emergency services and intensive care), acute care and care for people with complex and ongoing health needs as priority areas for the NSW health system. Systemwide changes were recommended so that health services are better able to manage the increasing demand for intensive care services and where the greatest contribution can be made in improving the quality, efficiency and effectiveness of care delivered to consumers of the NSW health system. Planning for peaks of activity, particularly during winter, is seen as an integral part of this.

The NSW Government, through its Action Plan for Health aimed to achieve three broad outcomes in respect to intensive care services:

1. Improved management and funding of intensive care services
2. Improved coordination of critical care services (intensive care services, Emergency Departments, trauma and other emergency services)
3. Improved planning of services on a statewide basis.

To facilitate the Government's Action Plan it was intended that:

- The Department develop a statewide service model for the networking and distribution of intensive care services across NSW
- A new funding system for intensive care services be implemented from 1 July 2001.

It is planned that long term reform will be accomplished by the implementation of the statewide Intensive Care Services Plan. The aim of the Plan is to provide a statewide service model outlining the future network for the provision, location, and capacity of intensive care services across NSW. The service model aims to promote efficient and appropriate utilisation of intensive care services by providing a framework for each Area Health Service to develop detailed specifications of the level of services required at each stage of the network and at each Intensive Care Unit.

In the past six years NSW Intensive Care Units have experienced increasing pressure without a significant increase in intensive care bed capacity or the nursing complement. In March 2000, following the release of the NSW Health Council Report, 12 additional funded intensive care beds, with a nursing requirement 5.2 full time equivalents to staff each bed, came on line and has provided some relief. An additional ten beds were opened for winter 2001.

But the increase in demand for intensive care services is likely to continue. Although poorly studied, a number of factors impact on this increased demand eg: aging population, intensive care support for complex treatment modalities, increasing evidence that specialist intensive care services improve patient outcome (eg 31% improvement in stroke outcome¹). With continuing increase in intensive care activity, it is also necessary to increase the skilled intensive care nursing and medical workforce through recruitment, education and staff retention strategies.

Current intensive care service delivery in NSW

There are a significant number of adult Intensive Care Units in the NSW public health system supplying a range of services from tertiary units providing specialty and complex care to smaller district and rural units caring for a range of acute illnesses, including coronary episodes.

Metropolitan

As documented by the Metropolitan Services Implementation Group², metropolitan services include the Hunter, Illawarra and Central Coast for the purposes of this exercise. As well, the Intensive Care Modelling Subgroup has considered Intensive Care Units to be those providing a service consistent with level 4 or above (intensive care) in the 'Guide to the Role Delineation of Health Services 2000' (draft)³. A copy of the 'Guide to the Role Delineation of Health Services 2000' – intensive care extract is included in the Appendix.

In the Sydney metropolitan area there are 58 facilities which provide acute care, 24 of which provide adult intensive care services operating at level 4 or above. A further 14 are considered to provide intensive care services at level 3 or below.

A list of current sites and activity can be found in the Appendix 1 and 2.

Rural

In rural NSW there are 129 facilities which provide acute care, 15 of which provide intensive care services operating at role level 4 or above. A further 18 are considered to provide services at role level 3 or below.

A list of current sites and activity can be found in the Appendix 3.

Intensive care beds

According to 1996 data (collected at a time of non peak utilisation) 473 intensive care beds were staffed and available for patient care in NSW. Of these, 344 were ventilator beds and 212 of these beds were located in tertiary units.⁴ This equates to:

- 7.5 staffed beds/100,000
- 5.4 ventilator beds/100,000
- 3.3 tertiary beds/100,000

Because of varying activity in Area Health Services, it is difficult to determine the precise numbers of intensive care beds in the state at any one time. Differing concepts of what constitutes intensive care have led to dissimilar data being recorded between Area Health Services.

Definition of an Intensive Care Unit

The following definition has been used.

'An Intensive Care Unit is a specially staffed, and equipped, separate and self contained section of the hospital for the management of patients with life threatening or potentially life threatening conditions. An Intensive Care Unit provides special expertise and facilities for the support of vital functions, and utilises the skills of medical, nursing and other staff with expertise in the management of these problems'.⁵

Units providing a service of role level 4 or above should be considered intensive care services able to provide a diverse range of therapies.

Units providing a service of role level 3 or below should be considered High Dependency Units which support surgical services and Emergency Departments but only to the extent of overnight ventilation, if required.

Adult intensive care services is defined as all intensive care services except the specialty paediatric services and neonatal intensive care services.

High Dependency Units

The following definition has been used.

'A discrete unit within the hospital, able to supply critical care expertise at less intensive resource levels, providing a level of care that falls between the general ward level and the Intensive Care Unit'.⁶

A proportion of intensive care admissions are patients at low risk of serious morbidity; but with complex conditions that require intensive care expertise and a level of care that is not available at the general ward level. An approach to increasing intensive care bed availability is to provide an alternative clinical setting in which to care for 'lower risk' admissions. High Dependency Units are able to supply the level of intermediate care that is required, critical care expertise at less intensive resource levels. They should not be regarded as isolated units but part of the continuum of critical care. A close relationship between the and the High Dependency Unit allows provision of the coordinated care needed to optimise patient management and use of resources.

The Intensive Care Clinical Implementation Group recommends that the utilisation of High Dependency Units become widespread. As well, the group recommends that the most appropriate way to ensure functionality, and a continuum of care, is to have the general High Dependency Unit placed, administratively within the intensive care. Existing separate High Dependency Units which have evolved in a piecemeal fashion in some hospitals should be rationalised. This encourages maximum utilisation of such services without the extra step of another admission/discharge process to a separate High Dependency Unit. This will also avoid the variable occupancy inherent in a number of smaller High Dependency Units. Appropriate information systems clinical indicators, formal audit processes must be in place.

Intensive care service model and networking

The Group has recommended the following model on the understanding that acute care services and specialty services are being reviewed in other fora.

The following key principles were identified during the process:

- The Intensive Care Unit is an essential support service for the hospital, particularly in areas such as elective surgery and emergency care
- The role level of an Intensive Care Unit should be consistent with the needs of the community and hospital as reflected in volume and complexity of demand and should be adequately supported by diagnostic and clinical support services
- Each Area Health Service should be ultimately responsible for meeting the intensive care needs, superspecialty services withstanding, of the Area and agreed network services. Metropolitan Area Health Services have the additional responsibility for their linked rural Area Health Service
- Effective intensive care services should be developed by concentrating services in major hospitals with appropriate intensivist/nursing infrastructures at NSW Health role level 5/6 (level Faculty of Intensive Care, Australian and New Zealand College of Anaesthetists Minimum Standards). This will aid in the more efficient utilisation of clinical resources
- Other hospitals should be encouraged to develop NSW Health role level 4 (level 1 Faculty of Intensive Care, Australian and New Zealand College of Anaesthetists Minimum Standards) or High Dependency Units consistent with their role
- Where possible, Critical Care Units (Intensive Care and High Dependency) within a hospital should be collocated
- The intensive care and hospital bed base should be managed in a way which takes account of demand for beds for intensive care patients
- Core staffing in each Intensive Care Unit, medical and nursing, should be at the 75th percentile above minimum and below maximum demand
- Each Area Health Service or Rural Critical Care Network should have a Director of Intensive Care Services. Some Area Health Services may need to consider funding this position up to 0.5 FTE
- The number of 'no intensive care bed' transfers should be kept to a minimum and the acceptable level agreed with each Area Health Service. These should be considered as a critical incident and reviewed by the Area Health Service and clinicians on a regular basis.

The following principles were identified as having particular reference to the rural sector:

- It is acknowledged that the critical care network structure exists and that this should be formalised and strengthened across all rural Area Health Services
- Each network should have at least one regional intensive care service, developed to NSW Health role level 5 (level 2/3 Faculty of Intensive Care, Australian and New Zealand College of Anaesthetists Minimum Standards), and the service should have in place an appropriate organisational structure
- Currently a number of Area Health Services have no role level 5 unit but a role level 4 unit functioning at a higher level of clinical care. As a matter of priority rural Area Health Services should examine the structure and role of Intensive Care Units and implement the recommendation above. Developing a role level 5 unit will also enhance the ability to recruit and retain qualified intensive care staff
- Patients located in units providing a service at NSW Health role level 4 or less (level 1 Faculty of Intensive Care, Australian and New Zealand College of Anaesthetists Minimum Standards) and requiring ventilation for greater than 24 hours should be transferred to a regional intensive care service. It is acknowledged that the enhancement of units to a role level 5 will be incremental. During the implementation phase consultation with a regional centre may occur after 24 hours or within an agreed network protocol

- The number of available bedspaces should be based on workload with a significant flexibility factor to meet day to day variation in demand included
- The Director(s) of regional intensive care service(s) should be involved in the management of the Area Critical Care Network
- The Director(s) should be a full time equivalent with appropriate intensive care qualifications
- A formal working relationship should be developed between the Intensive Care Unit and the anaesthetic and/or Emergency Department
- External appointment of the Director with a linked tertiary unit for peer group support and leave relief should be considered
- Adequate leave support for medical and nursing staff must be available.

Networking

An integrated networking model is recommended by the group. In its simplest form, a 'hub and spoke' model may be adopted on a hospital/Area basis. It is acknowledged that in some Area Health Services that the networks may be more complex, and as a consequence there may be more than one 'hub' depending on clinical services provided and geographical considerations. This model will allow efficiencies to be gained across the whole system rather than isolated sectors. The roles of the hub and spoke as detailed below are relevant to intensive care services.

The adoption of this model would provide a network of units delivering critical care services in a planned and predetermined manner. The Plan aims to promote efficient and appropriate management and utilisation of intensive care services by providing a framework for each Area Health Service to develop detailed specifications of the level of services required at each stage of the network and at each Intensive Care Unit.

This model is one of professional inter-relationships, referral and support structures between the sites; not necessarily management of the spoke sites by the hub. The model emphasises clinical management and partnership, not centralised control.

In essence, implementation of the model would result in a clinical streaming effect, providing opportunity for:

- improving the management of the severely ill and injured by maximising coordination between services at all levels
- maximising flexibility in the use of staff and resources across services
- increasing the capacity of the system to respond to changing demands in the Area Health Service
- enhancing training, education and research capacity of the services.

The model maintains a 'whole of sector' approach, concentrating highly specialised services in the hub sites, while lower complexity services are provided in the spoke sites.

Local factors such as access to services and geographical factors may determine the number of hubs in an Area Health Service.

The hub would be a large hospital providing a wide range of complex and acute inpatient services.

The role of the hub Intensive Care Unit will be twofold:

Clinical

- Manage and provide definitive care for all critical conditions (except superspecialty services)
- Act as the referral site for the spoke site eg. accepting complex conditions unable to be managed at the spoke
- Provide clinical support to spoke site to enable patients to be managed at the spoke site
- Training, development and education.

Administrative (in consultation with the spoke sites)

Coordinating role across the network in relation to:

- Setting standards and benchmarks
- Coordinating staffing, especially to meet seasonal demands
- Rotation of staff between the sites
- Coordination of communication to manage extreme capacity peaks
- Coordination of clinical and equipment standards.

The spokes would be smaller hospitals providing a range of acute inpatient services but limited or no complex services. The intensive care would be capable of managing most critical conditions and, dependent on the inpatient services available, providing definitive care for most.

The 'hub and spoke' model will function in the rural sector as well. The hub and spoke sites would have the same roles. However, the rural sites should be linked to a metropolitan tertiary referral hospital which would function as a tertiary hub, providing a default linkage for referrals, clinical advice and support, super-specialities withstanding.

For rural areas the Area Health Service Critical Care Network must provide:

- Local access to frequently required services for which local skills are available
- Efficient transfer of urgent and complex cases to larger centres where more specialised skills are available
- Greater levels of support (such as telemedicine and information technology) to assist staff in smaller units.

Networking should occur at all stages of the model, intra-Area and inter-Area. Intra-Area networking would consist of robust policies and coordination across the area sites.

Rural areas should be linked with a metropolitan site and it is recommended that the current default linkages⁷ for critical care networks be formalised.

These are outlined below:

Tertiary Referral Hospital Linked Health Service	
Royal Prince Alfred Hospital/Concord	Macquarie Far West
Prince of Wales	Southern (Bega, Queanbeyan)
Liverpool	Southern (Goulburn)
Westmead	Mid Western (Orange, Bathurst)
Nepean	Mid Western (Lithgow)
St George	Illawarra
St Vincents	Greater Murray
Royal North Shore Hospital	Central Coast New England
John Hunter	Mid North Coast Northern Rivers

Service model

State planning

Bed estimates, on a statewide basis, have been modelled using the following projection method. The aim was to plan for sufficient staffed public intensive care beds to meet peak demand for the State. Requirements have been projected for 2001 to 2011.

- 1998/99 inpatient statistics⁸ – episodes with intensive care hours from acute public hospitals
- The following were excluded: neonates (qualified baby flag + neonatal ANDRGs), episodes in paediatric specialty hospitals, non ventilated coronary care ANDRGs, episodes in non acute, psychiatric and community hospitals
- The following classes are included: quaternary (liver, heart, multiple organ transplant; burns – extensive burn SRG), superspecialty (neurosurgery and cardio thoracic surgery), tertiary (HCC ANDRGs in principal referral hospitals)
- Peak monthly hours calculated for hospital types (general, referral, paediatric and private)
- Beds required estimated from peak month: $icuhours_{peak\ month} / 24 / 365 / 0.97 * 12$
- A 3% bed turnover is allowed
- Age specific rates for State calculated by hospital type
- Data sorted into quaternary, superspecialty and tertiary classes as above

- Area Health Service demand estimated by applying State age specific rates to projected population (NSW Health) for 2001, 2006 and 2011
- Supply estimated by distributing quaternary, superspecialty and tertiary flows
- Whilst the projected requirements include private hospital intensive care beds, the distribution of these beds is a matter for the consideration by the private sector.

The following definitions apply:

- Peak demand is the maximum number of beds required in the busiest month of the year.
- Bed turnover is the time to empty and prepare the bed.

A major weakness of the method is that it only accounts for the population growth and age change components of the trend in intensive care bed utilisation. This may only account for a percentage of change over time and, thus, reduce the predictive reliability of the method. It must be noted that the method is rudimentary and requires a second stage of development to include measures of trend variation that are not due growth and changes in age profiles of populations. This is important as indications for intensive care management are changing with increasing demand observed.

The following requirements are projected for the State:

Year	Maximum Intensive Care bed space requirement* for peak demand
2001	549
2006	582
2011	619

* These bed space requirements include intensive care beds located in the private sector.

The above figures include tertiary and non tertiary beds in both the metropolitan and rural regions and equate to:

- 2001 – 8.6 intensive care beds/100,000
- 2006 – 8.6 intensive care beds/100,000
- 2011 – 8.8 intensive care beds/100,000

These numbers are planning projections. They are not absolute and the number of beds in operation at any given time will fluctuate based on demand. It is recommended that the number of bedspaces increase incrementally and that the location of these beds be based on demonstrated demand.

The estimated beds per capita in other countries vary widely and vary with the definition of an intensive care bed. Available figures per 100,000 population include⁹: France 38.4, US 30.5, Germany 28.6, Belgium 19, Sweden 18, Canada (Alberta) 16, Spain 14.8, Switzerland 11, Japan 11.8, Netherlands 10, Italy 9.4, New South Wales 8.6 – 8.8 (projected), Wales 7, England 5.5.

Data collected by the Australian and New Zealand Intensive Care Society (1998)¹⁰ show that NSW compares favourably with both Victoria (7.29/100,000) and Queensland (7.66/100,000) regarding public sector intensive care beds per capita.

Projected bed space requirements for times of peak demand were then distributed to Area Health Services by place of residence. It is acknowledged that each metropolitan Area Health Service is not self sufficient (super specialty and networked tertiary services for rural areas excluded); but this should be the ultimate aim. In addition inflows due to specific areas of expertise will continue.

The following should be used as a guide for planning only:

Area Health Service of residence	Guide to bed spaces required* by residents	
	2006	2011
Central Sydney	42	44
Northern Sydney	67	70
Western Sydney	56	61
Wentworth	26	28
South Western Sydney	67	71
Central Coast	31	33
Hunter	50	52
Illawarra	33	35
South Eastern Sydney	65	67
Northern Rivers	28	31
Mid North Coast	29	33
New England	16	17
Macquarie	9	10
Mid Western	15	15
Far West	4	4
Greater Murray	23	24
Southern	19	21

* These bed spaces required by residents of Area Health Services include intensive care services provided through the private sector. For Areas without tertiary referral hospitals these beds can be located in other Area Health Services.

Unit size

There is no international consistency regarding the recommended size of an Intensive Care Unit. The optimal number of beds for a single unit is an issue that may be influenced by the overall population requirement; but in practice is more likely to be dictated by local factors such as the nature of services provided by hospital and economies of scale (staff and equipment). Intensive Care Units with less than 10 beds may be less economical, depending on their casemix, and Intensive Care Units with greater than 20 beds start to become difficult to manage and lead to duplication of management roles.

For the purposes of this planning process, the optimal size of an Intensive Care Unit is considered to be 12 beds to 15 beds. Units of this size would allow for appropriate staffing, medical and nursing, as well as sufficient casemix for development of expertise, experience and training.

For larger intensive care facilities it is recommended that facilities be developed as ‘pods’ or multiples of this number.

Area planning

The difficulty with the broad approach outlined in the previous section is that each Area Health Service has different supply and demand issues. Possible modifiers include:

- geography of the Area Health Service
- level of self sufficiency in tertiary activity
- location of specialised services for rare or complex disorders
- current availability and distribution of bedspaces within the Area Health Service
- rurality factors
- associated rural Areas – distances, role of regional Intensive Care Units

- variations in health status and hospital utilisation
- private facilities.

It is proposed to examine each Area and estimate its requirements. It is essential to emphasise that each Area Health Service must be sufficiently resourced for intensive care and makes an appropriate contribution to the State intensive care bedstock.

It is accepted that where increases in bed numbers are recommended, increases would occur as a staged progression over a period of time. It is also recommended that those Area Health Services that are estimated to have a minimal increase by 2011 maintain the current Area bedstock to ensure that service delivery is able to be maintained while other Areas increase the level of service provision.

A proposed planning methodology is outlined in the Appendix 6.

Implications of the modelling process for metropolitan services

Using the planning principles outlined in the document, the following options for intensive care services could be inferred. The following comments are possible options.

South Western Sydney Area Health Service

- Population served: 756,950
- Major Intensive Care Unit: Liverpool Hospital
- Intensive Care Units: Bankstown Hospital, Fairfield Hospital and Campbelltown Hospital
- Referring hospitals: Camden Hospital, Bowral Hospital
- Currently developing specialty services at Liverpool Hospital

Comment:

As the Area is a growth area it would seem appropriate that services continue to develop and expand at Bankstown (1 'pod'), Campbelltown (1 'pod') and Liverpool (remainder).

The development of the unit at Campbelltown will need to be a staged process as clinical services at the hospital evolve.

Ultimately services at Campbelltown, Camden and Bowral should be networked.

There is an option to develop high dependency services at Fairfield and further network with Liverpool.

Wentworth Area Health Service

- Population: 307,766
- Intensive Care Unit: Nepean Hospital
- Referring Hospitals: Katoomba, Hawkesbury, Lithgow (Mid Western AHS)

Comment:

There is an option to expand services at Nepean as workload dictates.

There is an option to network services, particularly specialty services with Western Sydney Area Health Service.

Western Sydney Area Health Service

- Population: 679,098
- Intensive Care Units: Westmead, Blacktown, Mt Druiitt, Auburn Hospital
- Quaternary services at Westmead

Comment:

There is the option to increase services at Westmead to approximately 3 'pods'. Multiple High Dependency Units could be brought together into one unit.

The role of Auburn and Mount Druiitt hospitals as part of the Western Sydney intensive care network should be strengthened in terms of the provision of high dependency services.

Given the increasing population in Blacktown LGA there is the option to develop services at Blacktown to the intended 12 bed capacity ie. 1 'pod'.

Northern Sydney Area Health Service

- Population: 765,955
- Intensive Care Units: Royal North Shore, Mona Vale, Manly, Ryde and Hornsby Hospitals
- Quaternary services are at Royal North Shore Hospital

Comment:

Manly, Mona Vale and Ryde should be reviewed in the network role as providers of high dependency services.

Services at Royal North Shore should be expanded to better meet workload requirements.

Central Sydney Area Health Service

- Population: 488,964
- Intensive Care Units: Royal Prince Alfred, Concord Hospital
- Quaternary and superspecialty services provided in the Area

Comment:

Significant Area planning process underway.

South Eastern Sydney Area Health Service

- Population: 769771
- Intensive Care Units: St Vincents, St George, Prince of Wales, Sutherland
- Quaternary and superspecialty services provided in the Area

Comment:

There is an option to review the role of all units in light of Area critical care needs.

Projected to have minimal increase in bed numbers to 2011 but should maintain current bedstock to ensure service provision.

Hunter Area Health Service

- Population: 531,517
- Intensive Care Units: John Hunter Hospital, Newcastle Mater Misericordiae
- Tertiary services provided at John Hunter Hospital
- Provides regional role for northern NSW

Comment:

These resources appear limited for population and tertiary role.

Central Coast Area Health Service

- Population: 287481
- Intensive Care Unit: Gosford Hospital.

Comment:

Given the increasing population in Central Coast AHS intensive care services should be expanded to better meet local area demand.

Should be networked with Northern Sydney AHS intensive care services.

Illawarra Area Health Service

- Population 340,879
- Intensive Care Units: Illawarra Regional Hospital, Nowra (3 ventilator beds – transfer after 72 hours)

Comment:

There is an option to expand services to better meet local area demand.

Should be further networked with SE Sydney intensive care services.

Rural Area Health Services/Critical Care Networks have not been reviewed in detail.

Statewide monitoring

There is a need to provide structured monitoring of adult intensive care services. The Intensive Care Implementation Group recommends the establishment of an Adult Intensive Care Coordination and Monitoring Unit.

This unit with data warehouse, analysis and reporting system capacity would provide advice and feedback to NSW Health, Area Health Services and Intensive Care Units. Staffing should consist of 0.5 FTE medical coordinator, 0.5-1.0 FTE epidemiologist, 1 FTE Data Administrator, 1 FTE nursing coordinator and 1FTE secretary.

Like 'The Intensive Care National Audit & Research Centre' in the UK, the Unit should be the central data repository for NSW intensive care data from the national database. Its role would include: monitoring intensive care activity and ability of system to meet demand, research into patterns of demand and staffing,

central data repository for Area Health Service benchmarking and other quality management activities.

This unit should also provide expert advice to the Director-General and NSW Health regarding distribution and utilisation and outcomes of intensive care services at a state level. (Refer to *Figure 1*). It is anticipated that this unit would meet regularly with intensive care clinicians and Area Health Service managers to collaborate on intensive care management and performance.

Rationale for establishment of the unit are:

- Current capacity/activity measures only loosely gauged from state Medical Retrieval Unit data
- NSW Health Department data extremely variable
- Comparison can be made with the Pregnancy and Newborn Services Network covering 10 neonatal Intensive Care Units. The Adult monitoring unit would cover 50 Intensive Care Units.

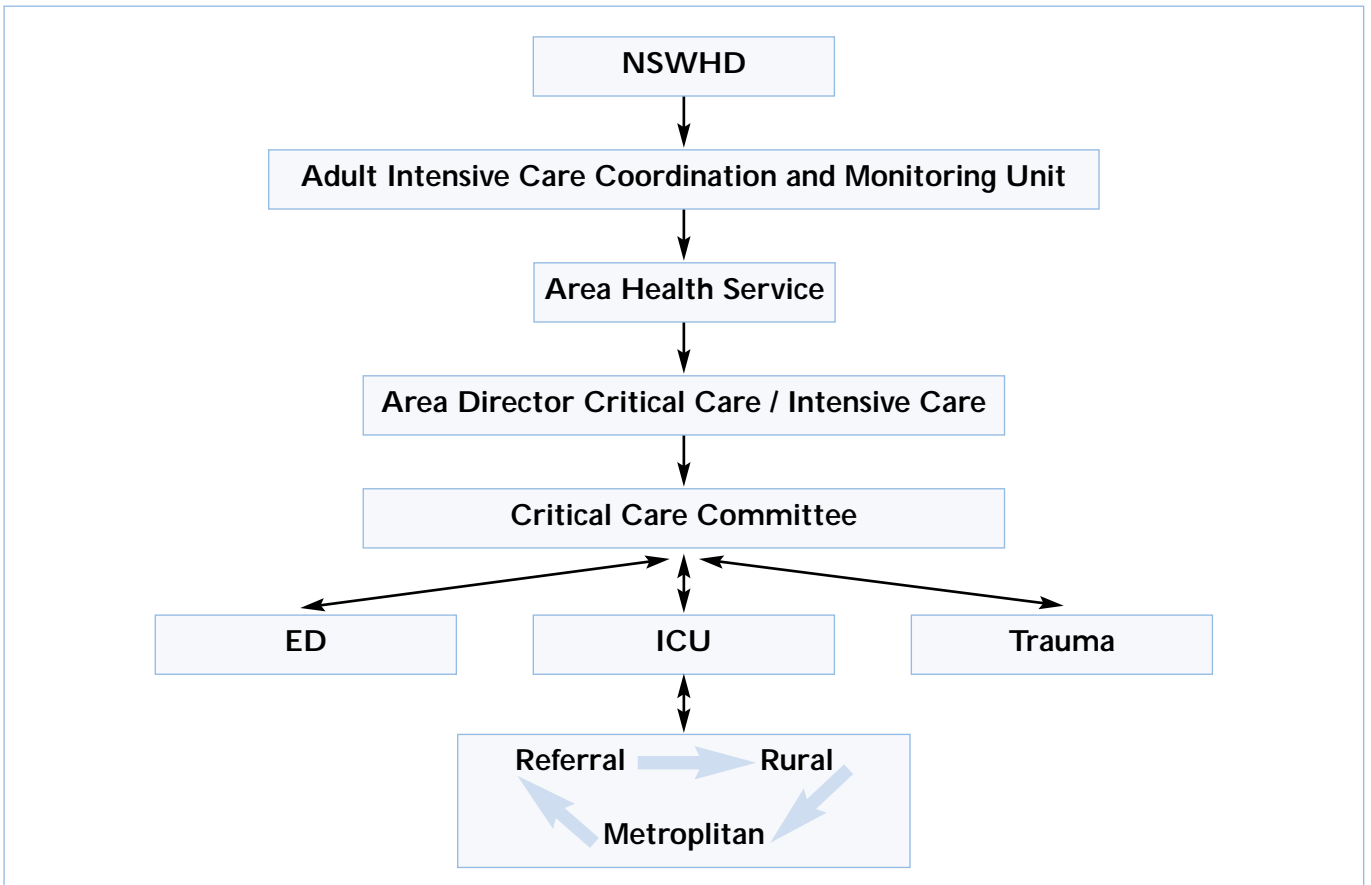


Figure 1: Proposed statewide monitoring process for Intensive Care Units

Information technology requirements for intensive care services

Hospitals are data intensive enterprises, with the critical care areas generating data at a higher and more continuous rate than banking networks. Hospitals need to allocate more resources to clinical information systems. Currently, despite having digital monitoring of patients, this data is then hand transcribed onto paper charts.

The NSW Health data on intensive care bed availability, usage and cost is of variable quality, but is being used to model intensive care services. Bed monitoring is derived from a twice daily ring-around by ambulance officers at the Medical Retrieval Unit. There is no recognition of the dynamic nature of bed management. There is no idea of global bed capacity even in general terms.

Current NSW Health information systems are still in evolution with Clinical Information Access Program still unavailable to clinicians at the bedside in many hospitals and problems with the Intranet from Area to Area. Rural units would benefit from wider availability of this resource.

Clinical Information Systems (CIS) and other unit based data systems, are designed without clinical consensus. There are inadequate or inappropriate reports or outputs from most systems eg: no patient or ward specific data available from the Patient Administration System. They have limited configurability and limited long term support. There is no data support provided to clinicians after initial implementation.

Improvement and development of new systems for the Department, Areas and hospitals is needed to move NSW intensive care services into the digital age.

Requirements:

1. Statewide

- NSW Health Adult Intensive Care Coordination And Monitoring Unit.

2. Area Health Services

- Web based real time intensive care activity/ staffing/ on-duty consultant log with secure access system for access by Area Health Service Intensive Care Units, Area Health Service administration, referring rural and metropolitan Intensive Care Units. A system is currently used by Hunter Area Health Service, Northern Sydney Area Health Service, South Eastern Sydney Area Health Service and their rural referral areas. An education/users manual is required for hospital and area staff. This can be developed from existing Department critical care systems.
- Area Intensive Care Committee review of intensive care activity/outcome/staffing data. Staffing requirements: 1 FTE data administrator to assist Area Director of intensive care services or chair of Intensive Care Committee.

3. Unit Level

- Electronic patient record concept be extended into intensive care with development and introduction of suitable Clinical Information System.
- Computerised basis for activity, quality and outcome indicators (eg National database in each NSW Intensive Care Unit).
- Computerised basis for staffing levels monitoring Staffing requirement: data support 1 FTE (tertiary) 0.5 FTE metropolitan/major rural.
 - Current data collection/support nonexistent and usually done on an ad hoc basis by senior clinicians.

- Nursing staffing of Intensive Care Units remains a critical determinant of system ability to cope with critically ill patients. Systematic monitoring of this is currently non-existent and should be developed to monitor staffing patterns, recruitment and retention strategies.

Time frame

Short Term < 6 months

- Support for Intensive Care Committee / Adult Intensive Care Coordination and Monitoring Unit
 - Data manager and clerical support to start to address data issues and model change in Patient Administration System.
- Implement real time bed availability system. Available to all Area Health Service Intensive Care Units and Emergency Departments, especially in rural areas.
- Enable intranet connection to all Area Health Services – allow clinicians access to public databases.
- Ensure all Intensive Care Units have NSW Health intranet connection.

Medium Term – 6-12 months

- Modify Patient Administration System data points to reflect intensive care load.
- Propagate Patient Administration System data so it is used by clinicians and thus more accurate.
- Propagate DRG data to use clinically.
- Remodel costing of Intensive Care Unit.

Long Term

- Statewide implementation of Clinical Information systems at the bedside.
- Move towards electronic medical record in Intensive Care Units where the bulk of data is already digital.
- Implement statewide reporting strategy to capture case load, outcomes and costs.

Quality in intensive care

The overall aim of Quality in intensive care is to monitor process and outcomes, evaluate the effectiveness of critical care services and provide recommendations and advice to the Area Executive with regard to the improvement of critical care services.

Improving quality is dependent on mechanisms to analyse performance and variance at the unit, hospital and service network level. Indicators are intended to:

- Provide information about performance
- Identify areas for further investigation and potential action at a local level
- Enable comparison or benchmarking of performance across organisations
- Encourage sharing of information about performance and outcomes between organisations
- Promote the principles of better / best practice.

Most Intensive Care Units collect some performance indicator data at a local level; however; this is not currently available at a State level. Uniform data collection and development of consistent definitions require further work. There is a recognised need for allocation of resources to support collection of clinical outcomes and indicator data.

The following indicators are based on the six dimensions of quality as outlined in the Framework for Managing Quality of Health Services in NSW. These indicators are seen as 'Phase 1' indicators in that they are currently collectable and will provide valid comparative information. They need to be viewed in conjunction with the cross-dimensional issues of competence, information management, continuity of care, education and training for quality and accreditation.

1. Access

- No 'ICU' bed transfers
- Out of area transfers (exclude quaternary and returns)
- Ventilated hours in the Emergency Department

2. Efficiency

- Length of stay (selected basket of top Apache scores or top 10 DRGs)
- Ability to transfer patient to a ward bed within 4 hours of assessment as 'ready for discharge' by specialist

3. Effectiveness

- Unplanned readmissions to ICU within 48 hours of discharge
- Mortality rates (selected basket of top 10 DRGs)

4. Safety (need to clarify sources of data)

- Infection rates as a marker of nosocomial infection (Unit acquired MRSA > 48 hours post admission)
- Incident monitoring systems (yes or no)

5. Consumer participation (annual reviews)

- Patient / relative satisfaction surveys (yes or no)

6. Appropriateness

- Admission rates (selected basket of top 10 DRGs)

The above data needs to be centrally collected and disseminated to both the Statewide and Area ICU groups, and be monitored in an ongoing way if the indicators are to be an effective means of supporting quality improvement.

Implementation plan

Responsibility for implementation of the model would rest with Area Health Services. It is expected that implementation would be a staged process and changes in service delivery and physical infrastructure would occur over time. However, networking of services should be a priority aim and these processes put into place as a short term goal.

A communication strategy will be developed to ensure that all stakeholders and the community are fully informed regarding any changes, perceived or actual, that will occur to service delivery at both the State and Area level.

The following outlines the critical steps in the implementation pathway:

Date	Outline
June 2001	Draft Intensive Care Service Plan completed and endorsed by Intensive Care Clinical Implementation Group.
July 2001	Area Health Services model the planning parameters and provide advice regarding implications of the modelling process.
July 2001	Improved networking of intensive care services, inter-Area and intra-Area, in place. Area Health Service commence planning of future intensive care service configurations to improve service delivery.
Winter 2002	Statewide Monitoring Function including Quality and Performance Indicator collection.

Appendix 1

Metropolitan - Current sites and activity – Level 4 and above

Area Health Service	Intensive Care Unit	Role Level*	Separations 1997/1998**	Separations 1998/1999**
Central Sydney	Royal Prince Alfred	6	2457	2476
	Concord	6	447	415
Northern Sydney	Royal North Shore	6	2834	2334
	Hornsby-Kuring-Gai	4	441	478
	Manly	4	537	569
	Mona Vale	4	556	585
	Ryde	4	964	1179
South Eastern Sydney	Prince of Wales	6	2199	2266
	St George	6	696	683
	St Vincents	6	2764	3371
	Sutherland	5	1218	1109
South Western Sydney	Liverpool	6	1653	1763
	Bankstown/Lidcombe	5	661	703
	Campbelltown	5	986	1277
	Fairfield	4	N/a	349
Wentworth	Nepean	6	922	970
Western Sydney	Westmead	6	1442	1102
	Blacktown	4	314	370
	Mount Druitt	4	416	367
Central Coast	Gosford	5	1655	1533
Hunter	John Hunter	6	1145	1179
	Newcastle Mater	5	384	378
Illawarra	Illawarra Regional Hospital	5	2000	1923
	Shoalhaven	4	N/a	N/a

* Role level self designated by Area/Hospital and derived from information provided by Structural and Funding Branch, Policy Division (2000)

** Data derived from Inpatient Statistics Collection 97/98 (neonates and paediatrics excluded)

Appendix 2

Metropolitan - Current sites and activity – Level 3 and below

Area Health Service	Intensive Care Unit	Role Level*	Separations 1997/1998**	Separations 1998/1999**
Central Sydney	Canterbury	3	875	1046
South Western Sydney	Bowral	3	N/a	N/a
	Camden	3	N/a	N/a
Wentworth	Blue Mountains	3	N/a	N/a
Western Sydney	Auburn	3	728	664
Hunter	Belmont	3	N/a	N/a
	Cessnock	3	N/a	N/a
	Kurri Kurri	3	N/a	N/a
	Maitland	3	N/a	N/a
	Muswellbrook	3	N/a	N/a
	Singleton	3	N/a	N/a
Illawarra	Bulli	3	N/a	N/a
	Shellharbour	3	N/a	N/a

* Role level self designated by Area/Hospital and derived from information provided by Structural and Funding Branch, Policy Division (2000)

** Data derived from Inpatient Statistics Collection 97/98 (neonates and paediatrics excluded)

Appendix 3

Rural - Current sites and activity

Area Health Service	Intensive Care Unit	Role Level*	Separations 1997/1998**	Separations 1998/1999**
Far West	Broken Hill	3	N/a	N/a
Greater Murray	Albury	4	370	351
	Deniliquin	2	N/a	N/a
	Griffith	4	402	605
	Wagga Wagga	4	744	809
Macquarie	Dubbo	4	833	831
	Mudgee	2	N/a	N/a
	Narromine	2	N/a	N/a
	Wellington	3	N/a	N/a
Mid North Coast	Coffs Harbour	4	805	728
	Kempsey (Macleay Valley)	4	N/a	N/a
	Macksville	3	N/a	N/a
	Manning	4	904	929
Mid Western	Bathurst	4	152	123
	Cowra	2	N/a	N/a
	Forbes	2	N/a	N/a
	Lithgow	2	N/a	N/a
	Orange	4	1066	1046
	Parkes	2	N/a	N/a
New England	Armidale	4	553	630
	Gunnedah	3	N/a	N/a
	Guyra	2	N/a	N/a
	Inverell	2	N/a	N/a
	Moree	3	N/a	N/a
	Tamworth	4	592	651
Northern Rivers	Ballina	3	N/a	N/a
	Casino	3	N/a	N/a
	Grafton	5	N/a	N/a
	Lismore	5	852	947
	Macleay	3	N/a	N/a
	Murwillumbah	3	N/a	N/a
	Tweed Heads	4	N/a	N/a
Southern	Goulburn	4	N/a	N/a

* Role level self designated by Area/Hospital and derived from information provided by Structural and Funding Branch, Policy Division (2000)

** Data derived from Inpatient Statistics Collection 97/98 (neonates and paediatrics excluded)

Appendix 4

Guide to the Role Delineation of Health Services – (draft) Intensive Care extract

Level	Description	Minimum Level Of Support Services							
		Path	Phar	Diag Imag	NMed	Anaes	ICU	CCU	O/p/s
2	Recovery area for post-operative patients and different high dependency area for general ward patients requiring observation over and above that available in general ward area. Registered nursing equivalent to 4 hours/patient/day (1:6) desirable. Quality assurance activities ⁽²⁾ . Interpreters as per Circular 94/10.	2	2	2	-	2	-	1	-
		3	2	3	-	3	-	3	2
3	As Level 2 plus 24 hour access to Medical Officer ⁽¹⁾ on site or available within 10 minutes. Registered nursing equivalent to 6 hours/patient/day (1:4) desirable for designated high dependency beds. Has NUM ⁽¹⁾ . Separate recovery area preferable. The services of a specialist paediatrician are essential for children requiring management in Level 3 Intensive Care. Formal quality assurance program ⁽¹⁾ . Liaison psychiatry available. Access to medical and nursing education programs.	4	4	3	4	-	3	3	
		5	5	5	4	5	-	4	4
4	As Level 3 plus mechanical ventilation and simple invasive cardiovascular monitoring for several hours. Separate and self-contained facility in the hospital capable of providing basic, multi-system life support usually for less than 24 hours. Medical Director ⁽¹⁾ with training and experience in intensive care. In addition to attending specialist(s), the unit must have at least one RMO ⁽¹⁾ on site or available to the unit at all times. Equivalent to level I# of FICANZCA Guidelines.	5	5	5	4	5	-	4	4
5	As Level 4 plus mechanical ventilation, extra-corporeal renal support services and invasive cardiovascular monitoring for a period of several days. Separate and self-contained facility in hospital capable of providing complex multi-system life support. Medical Director ⁽¹⁾ accredited Intensive Care Specialist or consultant physician in intensive care. At least one specialist accredited with appropriate experience in intensive care. Plus one RMO(s) ⁽¹⁾ who is on site, predominantly present in the Unit and exclusively rostered to the Unit at all times.								

Level	Description	Minimum Level Of Support Services							
		Path	Phar	Diag Imag	NMed	Anaes	ICU	CCU	Op/s
5 continued	NUM ⁽¹⁾ with post-registration qualifications in intensive care or the clinical specialty of the Unit. Nurse in charge of the shift is a permanent staff member and appropriately qualified. All nursing staff of Unit responsible for direct patient care are RNs. Majority of nursing staff have post-registration qualifications in intensive care or clinical specialty of the Unit. 1:1 care for ventilations or equivalently critically ill. Capacity to provide greater than 1:1 care if required. At least two RNs ⁽¹⁾ in Unit if there is a patient in the Unit. Active medical and nursing education programs. Access to CNE ⁽¹⁾ . 24 hour access to pharmacy, pathology, operating suite and imaging. Appropriate access to Physiotherapist, Social Worker, Dieticians, Pastoral Care and other allied health services. Equivalent to level II [#] of FICANZCA Guidelines.	5	5	5	4	5	-	4	4
6	As Level 5 plus mechanical ventilation, extra-corporeal renal support services and invasive cardiovascular monitoring for an indefinite period. Separate and self-contained Unit in hospital capable of providing complex, multi-system life support for an indefinite period. Referral centre for intensive care patients. Medical Director ⁽¹⁾ accredited Intensive Care Specialist or consultant physician in intensive care. Plus one RMO ⁽¹⁾ who is in the hospital, predominantly present in the Unit and exclusively rostered to the Unit at all times. NUM ⁽¹⁾ with post-registration qualifications in intensive care or Units clinical specialty. Nurse in charge of shift is permanent staff member and appropriately qualified. Must be RNs ⁽¹⁾ if providing direct patient care. Majority of nursing staff have post-registration qualifications in intensive care or Unit clinical specialty. 1:1 care for ventilations or equivalent critically ill, greater than 1:1 for selected patients. More than two RNs ⁽¹⁾ present in the Unit if patient in the Unit. CNE ⁽¹⁾ and formal nursing educational program. Physiotherapy services are accessible. Appropriate access to other allied health services. Active research. Designated social worker. Biomedical engineering services on site. Equivalent to level III [#] of FICANZCA Guidelines.	6	6	6	5	6	-	5	6

(1) See "Glossary" in Appendix V

(2) See "Medical and Nursing Staff Definitions" in Appendix I,

Equivalent to this level of FICANZCA Guidelines

Appendix 5

Extract from Faculty of Intensive Care – Minimum Standards for Intensive Care Units – Policy Document IC1 (1997)

Levels of Intensive Care Units

The level of intensive care available should support the delineated role of the particular hospital. The role of a particular ICU will vary, depending on staffing, facilities and support services as well as the type and number of patients it has to manage.

1. Level III Adult Intensive Care Unit

A Level III ICU is a tertiary referral unit for intensive care patients and should be capable of providing the highest level of care including complex multi-system life support for an indefinite period. It must be capable of providing mechanical ventilation, extra-corporeal renal support services and invasive cardiovascular monitoring for an indefinite period. It should have extensive backup laboratory and clinical service facilities. All patients admitted to the Unit must be referred for management to the attending intensive care specialist.

A Level III ICU should be a self-contained area, with easy access to the Emergency Department, operating theatres and organ imaging. It should have:

- 1.1 Defined admission, discharge and referral policies.
- 1.2 At least six staffed and equipped beds
- 1.3 More than 350 mechanically ventilated patients per annum.
- 1.4 A medical director who is recognised by the Joint Specialist Advisory Committee in Intensive Care (JSAC-IC) as a specialist in intensive care.
The medical director must have a clinical practice predominantly in intensive care medicine.
- 1.5 Sufficient supporting specialist(s) so that constant support is always available to the medical staff in the Unit. There should 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.

All attending specialists in the Unit should be recognised by the JSAC-IC as specialists in intensive care.

- 1.6 At least one of the supporting specialists exclusively rostered to the Unit (or to more than one Unit in the same building) at all times. During normal working hours this specialist must be predominantly present in the Unit, and at all other times be able to proceed immediately to it.
- 1.7 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.
- 1.8 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.
- 1.9 A nurse in charge of the Unit with a post registration qualification in intensive care or in the clinical specialty of the Unit.
- 1.10 The majority of nursing staff must have a post registration qualification in intensive care or in the specialty of the Unit.
- 1.11 All nursing staff in the Unit responsible for direct patient care should be registered nurses.
- 1.12 A nurse educator and formal nursing educational programme.
- 1.13 24-hour access to pharmacy, pathology, operating theatres and tertiary level imaging service, and appropriate access to physiotherapy and other allied health service.
- 1.14 Suitable infection control and isolation procedures and facilities including ideally one wash basin per bed, and at least one isolation room with controllable air flow.

- 1.15 Formal audit and review of its activities and outcomes.
- 1.16 Support staff as appropriate eg. biomedical engineer, clerical and scientific staff.
- 1.17 Educational programmes for medical staff.
- 1.18 Adequate office space.
- 1.19 An active research programme.
- 1.20 An orientation programme for new staff.

2. Level II Adult 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 support the hospital's other delineated roles, eg. general medicine, surgery, trauma management, neurosurgery, vascular surgery, etc. It should be capable of providing mechanical ventilation, extra-corporeal renal support services and invasive cardiovascular monitoring for at least several days. All patients admitted to the Unit must be referred for management to the attending intensive care specialist.

A Level II ICU should be a self-contained area with easy access to the Emergency Department, operating theatres and organ imaging. It should have:

- 2.1 Defined admission, discharge and referral policies.
- 2.2 A medical director recognised by the JSAC-IC as a specialist in intensive care. The medical director must have a clinical practice predominantly in intensive care medicine.
- 2.3 At least one other specialist recognised by JSAC-IC as a specialist in intensive care.
- 2.4 The Unit needs 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.
- 2.5 In addition to the attending specialist at least one registered medical practitioner with an appropriate level of experience exclusively rostered to the Unit and immediately available at all times.
- 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.

- 2.7 All nursing staff responsible for direct patient care being registered nurses and the majority of nursing staff having a post registration qualification in intensive care or in the clinical specialty of the Unit.
- 2.8 Nursing staff: patient ratio of 1:1 for all ventilated and other critically ill patients; the capacity to provide greater than 1:1 nursing for selected patients: some patients may require less than 1:1 nursing.
- 2.9 Access to a nurse educator.
- 2.10 Educational programmes for medical and nursing staff.
- 2.11 An orientation programme for new staff.
- 2.12 Formal audit and review of its activities and outcomes.
- 2.13 Suitable infection control and isolation procedures and facilities including ideally one wash basin per bed, and at least one isolation room with controllable airflow.
- 2.14 24-hour access to pharmacy, pathology, operating theatres, basic imaging services and appropriate access to physiotherapy and other allied health services.
- 2.15 Support staff as appropriate, eg. biomedical engineer, clerical staff.
- 2.16 Adequate office space.

3. Level I Adult Intensive Care Unit

A Level I ICU should be capable of providing immediate resuscitative management for the critically ill, short term cardio-respiratory support, and 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.

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.

Plan Plan Plan Plan Plan Plan

A Level I ICU should be a self-contained area with easy access to the Emergency Department, operating theatres and organ imaging. It should have:

- 3.1 Defined admission, discharge and referral policies.
- 3.2 A medical director who is recognised by JSAC-IC as a specialist in intensive care.
- 3.3 Consultant support always available.
- 3.4 At least one registered medical practitioner who is available to the Unit at all times.
- 3.5 A nurse in charge of the Unit who has a post registration qualification in intensive care or in the clinical specialty of the Unit.
- 3.6 All nursing staff of the Unit responsible for direct patient care being registered nurses; and the majority must have a post registration qualification in intensive care or in the clinical specialty of the Unit.
- 3.7 A nursing staff:patient ratio of 1:1 for all critically ill patients.
- 3.8 A minimum of two registered nurses present in the Unit at all times when there is a patient admitted to the Unit.
- 3.9 Educational programmes for both medical and nursing staff.
- 3.10 An orientation programme for new staff.
- 3.11 Audit of its activities and their outcome.
- 3.12 24-hour access to pharmacy, pathology, operating theatres and basic imaging services and appropriate access to physiotherapy and other allied health services.
- 3.13 Support services, eg. technical, clerical.
- 3.14 Adequate office space.

Appendix 6

Proposed planning methodology

Overview:

- for each Area demand for all intensive care services will be projected on an age specific weighted population basis.
- for each Area adjustments will be made to the projected bed numbers on the basis of existing or planned services.
- where relevant, to allow for combined CCU/ICC services, CCU demand will be taken into account.

Steps:

1. *Basic Population based Model*

- Apply the weighted population based formula to intensive care utilisation by Area of Residence.
- Include: all cardiac diagnoses with intubation.
- Exclude: neonates (qualified baby flag + neonatal ANDRGs), episodes in paediatric specialty hospitals, non ventilated coronary care ANDRGs, episodes in non acute, psychiatric and community hospitals.
- Identify separately: quaternary (liver, heart, multiple organ transplant; burns – extensive burn SRG), superspecialty (neurosurgery and cardio thoracic surgery), tertiary (HCC ANDRGs in principal referral hospitals).
- Report by 'in Area' or 'out of Area' provision by total and SRGs.
- This gives the basic population based model for all Areas plus some additional information to be used in later steps.

2. *Adjustment for rural Areas*

Option A

- Assume that rural – metropolitan transfers are for higher levels of care and that the current proportion of 'in Area' and 'out of Area' provision will continue. Therefore, future demand is: - total Area demand minus 'out of Area' flow.

Option B

- Assume greater self sufficiency over time and discount the outflows eg. 20%.
- 3. ***Coronary Care adjustment to Rural Areas and small metropolitan hospitals***
 - Add in the unintubated cardiac projections (as reported in Step 1).
- 4. ***Networking adjustment to small Metropolitan Areas***
 - It is assumed that most metropolitan Areas are or are planned to be self sufficient in tertiary services. Where an Area is known or planned to be deficient in a particular SRG at tertiary level such as cardiothoracic or neurosurgery, subtract the bed demand attributable to those SRGs.

Steps 2 – 4 give the local demand that is projected to be able to be met locally during the planning period.

The next steps distribute the activity removed during Steps 2 – 4 to other Area Health Services.

5. *Quaternary adjustment*

- Add quaternary beds and their forward projections to the relevant Area Health Services.

6. *Networking adjustment*

- This adjustment will be based according to the share of the State's tertiary activity. This is compatible with the principles of networking and responsibility promoted by the Plan.
- Activity identified above should be transferred from the linked Area (A) to the metropolitan Area (B).
- It should be noted that a number of patients are appropriately transferred for clinical reasons out of the State including:
 - Far West to Adelaide
 - Northern Rivers to Brisbane
 - Greater Murray to Melbourne
 - Southern to Canberra

Endnotes

- 1 *Treatment of stroke on an intensive stroke unit.* Int Care Med (2000) 26:1598-1611.
- 2 *Terms of Reference*, Metropolitan Services Implementation Group (July 2000).
- 3 *'Guide to the Role Delineation of Health Services 2000'* (draft), NSW Health 2000.
- 4 *NSW Intensive Care Services Survey – A Basis for Review.* NSW Health, 1998.
- 5 Australian and New Zealand College of Anaesthetists – Faculty of Intensive Care. Minimum Standards 1997.
- 6 *Intensive Care Strategic Direction – A Framework for the NSW Health System*, 1999.
- 7 NSW Metropolitan Critical Care Plan (1996).
- 8 It should be noted that the Inpatient Statistics Collection has not been tested for unreliability; however, the data have been used in the absence of an alternative. It is recommended that an improved data collection and verification process be implemented.

These comparisons are taken from: Angus DC, Sirio CA, Clermont G, Bion J International Comparisons of Critical Care Outcomes and Resource Consumption Critical Care Clinics 1997; 13.2:389 – 407. Scheinkestel C The evolution of the intensivist: from health care provider to economic rationalist and ethicist Med J Aust 1996;164:310-312. Figures for England and Wales relate to 1998 and are quoted in Lyons RA, Wareham K, Hutchings HA et al Population requirement for adult critical care beds: a prospective quantitative and qualitative study Lancet 2000;355:595-98.

- 9 ANZICS Intensive Care Survey 1998: An Overview of Australian and New Zealand Critical Care Resources, ANZICS Research Centre for Critical Care Resources, 1998.

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