

Influenza Pandemic - Providing Critical Care

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Summary This policy provides direction to NSW Area Health Services for the delivery of critical care services during an influenza pandemic. It provides key principles for clinical, operational and organisational aspects of intensive care services to inform health disaster planning and response, and in particular critical care biopreparedness planning in NSW.

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This Policy Directive may be varied, withdrawn or replaced at any time. Compliance with this directive is **mandatory** for NSW Health and is a condition of subsidy for public health organisations.

PROVIDING CRITICAL CARE IN RESPONSE TO INFLUENZA PANDEMIC

PURPOSE

The purpose of this policy is to provide direction to Area Health Services for the delivery of critical care services during an influenza pandemic. It provides key principles for clinical, operational and organisational aspects of intensive care services to inform health disaster planning and response, and in particular critical care biopreparedness planning in NSW.

MANDATORY REQUIREMENTS

- Based on previous influenza pandemics and with consideration given to improvements in healthcare, it is recommended that health services plan for the maximum potential ICU capacity that can be achieved in each appropriate health facility where ICU services exist with the limiting capacity being available ventilation devices and suitable alternative intensive care bed areas.
- A graduated escalation plan is to be developed for surge planning.
- Additional ICU bed capacity will be achieved by:
 - Opening additional beds in existing non-commissioned physical critical care bed spaces.
 - Deferring elective surgery requiring postoperative ICU/HDU care.
 - Progressively converting HDU beds to intensive care.
 - Using available private hospital ICU capacity.
 - An increased threshold for referral of patients for ICU from other hospitals.
 - Suspend elective referrals of patients requiring ICU from outside of NSW (such as those requiring quaternary care, e.g. transplant) when capacity in other states for an equivalent service is available.
 - Maximising the use of non-ventilatory strategies in care of ICU patients freeing up devices for patients for whom mechanical ventilation is essential.
 - Facilitating end of life discussions and decisions in those appropriate ICU patients assessed as not reaching a meaningful recovery.
- Following implementation of these strategies additional bed spaces would then be created in clinically suitable areas including Recovery and Perioperative units.
- The trigger for deployment of the statewide ventilator stockpile is a 20% surge in ICU demand.
- Each hospital must prepare an inventory of physical capacity and equipment to inform the local response.
- The following strategies may be implemented if the surge in demand exceeds 50%:
 - Triage to intensive care will be based on a statewide triage protocol implemented across the system.
 - The model of ICU care will initially focus on stabilisation and safety. Clinical ICU staff will need to be supplemented with a requirement for non-ICU trained staff to work in teams with an ICU experienced clinical practitioner to safely manage intensive care patients. It is expected that existing staffing ratios will not be maintained during the peak surge in demand.

- Neonatal and paediatric intensive care capacity will be rapidly exceeded requiring the need for adult ICUs to manage some critically ill children. Where this occurs a routine consultation process will be established with specialist paediatric and neonatal services to guide clinical management. Consideration should be given to grouping critically ill patients in a single adult unit if warranted by the number of cases.
- Clinical support is to be provided for hospitals within established critical care referral networks.
- Inter-hospital transport and medical retrieval of patients is to be avoided where possible.

IMPLEMENTATION

Area Health Service Executives are responsible for:

- Meeting the critical care and intensive care needs of that Area and linked rural Area Health Services, where specified, including the provision of clinical advice and ensuring access to appropriate treatment.
- Ensuring that local critical care operational plans developed to respond to influenza pandemic are transparent and effectively communicated to all staff. This responsibility lies ultimately with the Area Director of Clinical Operations.

Strategies contained within this policy directive are to be implemented with consideration given to other key influenza pandemic guidelines and policies including:

- *NSW Health Emergency Management Arrangements: NSW Healthplan (PD2009_008)*
http://www.health.nsw.gov.au/policies/pd/2009/PD2009_008.html
- *NSW Health Pandemic Management - Governance Arrangements - Escalation of Health System Response (GL2009_011)*
http://www.health.nsw.gov.au/policies/gl/2009/GL2009_011.html
- *NSW Health Hospital Response to Pandemic Influenza Part 1: Emergency Department Response (PD2007_048)*
http://www.health.nsw.gov.au/policies/pd/2007/PD2007_048.html
- *NSW Health Influenza - Minimising Transmission of Influenza in Healthcare Facilities During the PROTECT Phase (GL2009_013)*
http://www.health.nsw.gov.au/policies/gl/2009/GL2009_013.html
- *NSW Health Critical Care Tertiary Referral Networks & Transfer of Care (Adults) (PD2010_021)* http://www.health.nsw.gov.au/policies/pd/2010/PD2010_021.html
- *NSW Health Influenza - Guidelines for the Intensive Care Unit (GL2010_005)*
http://www.health.nsw.gov.au/policies/gl/2010/GL2010_005.html

REVISION HISTORY

Version	Approved by	Amendment notes
May 2010 (PD2010_028)	Director-General	New Policy

ATTACHMENTS

1. Providing Critical Care in Response to Influenza Pandemic: Procedures.

**PROVIDING CRITICAL CARE IN RESPONSE TO
INFLUENZA PANDEMIC**

NSW HEALTH
PROCEDURES

Issue date: May 2010

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Executive Summary

Statewide Services Development Branch in collaboration with the NSW Intensive Care Taskforce (ICT) has developed this generic pandemic response policy in order to inform Area Health Services, other health services and private hospitals in planning for critical care services, in particular relating to intensive care services.

Both intensive care capacity and ventilation devices are finite resources which in normal periods are in heavy demand. In a health disaster situation, particularly during an influenza pandemic, it has been acknowledged that demand for ICU services will exceed usual capacity.

A range of measures will be required to manage these resources most effectively and equitably. To inform this process the Intensive Care Taskforce, a sub-committee of the Critical Care Health Priority Taskforce, has recommended core principles to be considered in relation to triage for intensive care, models of clinical care and staffing, and have identified the key clinical ethical considerations that would inform pandemic planning for intensive care services.

The Intensive Care Taskforce prepared the *NSW Intensive Care Pandemic Planning Principles Position Paper (2007)*¹, which represents the consensus of the taskforce members and critical care clinicians throughout the system. The agreed core principles inform this policy.

Consultation undertaken to develop the position paper included:

- Intensive Care Taskforce,
- Intensive Care Medical Directors and Nursing Managers
- Paediatric Intensive Care Advisory Group
- Critical Care Health Priority Taskforce
- Rural Critical Care Taskforce
- NSW Medical Retrieval Services (AMRS and NETS)
- Population Health Division, Centre for Epidemiology and Research and Biopreparedness Planning Unit
- Legal and Legislative Services

A staged implementation is required in response to the surge in demand encountered. The key operational processes outlined in the policy directive are aimed at achieving an effective and equitable response to the need for intensive care. The necessary legal framework and clinical ethical principles are provided to support the key operational processes which include:

- Escalation
- Triage
- Alternative models of care
- Staff training and support
- Communication and coordination

This policy is to inform local AHS pandemic response planning. Further detailed advice will be provided to inform the level of response, through the Flu Operational Co-ordination Group, as required.

Acronyms

AHMPPPI	Australian Health Management Plan for Pandemic Influenza
AHS	Area Health Service
CCRS	Critical Care Resource management System
DOH	Department of Health
ECMO	Extra Corporeal Membrane Oxygenation
HDU	High Dependency Unit
ICT	Intensive Care Taskforce
ICU	Intensive Care Unit
PI	Pandemic Influenza
PPE	Personal protective equipment

Glossary of Terms

High Dependency Unit (HDU)	A specially staffed and equipped section of an intensive care complex that provides a level of care intermediate between intensive care and general ward care. ⁶
Influenza pandemic	A global outbreak of influenza due to a novel influenza virus; pertains to the phenomenon e.g. planning for an influenza pandemic. (Note: the term 'pandemic influenza' pertains to the disease itself e.g. a pandemic influenza case.)
Intensive Care Unit (ICU)	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. ⁵

Linkage to other documents and resources

This policy should be read in conjunction with current versions of the following key associated documents:

Australian Health Management Plan for Pandemic Influenza (AHMPPI)(2008)

<http://www.flupandemic.gov.au/internet/panflu/publishing.nsf>

NSW Health Emergency Management Arrangements: NSW Healthplan (PD2009_008)

http://www.health.nsw.gov.au/policies/pd/2009/PD2009_008.html

NSW Health Pandemic Management - Governance Arrangements - Escalation of Health System Response (GL2009_011)

http://www.health.nsw.gov.au/policies/gl/2009/GL2009_011.html

NSW Health Hospital Response to Pandemic Influenza Part 1: Emergency Department Response (PD2007_048)

http://www.health.nsw.gov.au/policies/pd/2007/PD2007_048.html

NSW Health Influenza - Minimising Transmission of Influenza in Healthcare Facilities During the PROTECT Phase (GL2009_013)

http://www.health.nsw.gov.au/policies/gl/2009/GL2009_013.html

NSW Health Critical Care Tertiary Referral Networks & Transfer of Care (Adults) (PD2010_021)

http://www.health.nsw.gov.au/policies/pd/2010/PD2010_021.html

NSW Health Influenza - Guidelines for the Intensive Care Unit (GL2010_005)

http://www.health.nsw.gov.au/policies/gl/2010/GL2010_005.html

NSW Health Influenza - Use of Intravenous Peramivir in Influenza Patients (PD2010_012)

http://www.health.nsw.gov.au/policies/pd/2010/PD2010_012.html

NSW Health Infection Control Policy – May 2007 (PD2007_036) at

www.health.nsw.gov.au/policies/pd/2007/PD2007_036.html

H1N1 influenza 09 and resources at www.health.nsw.gov.au/publichealth/swine_flu.asp

Australian Department of Health and Ageing, PROTECT phase www.healthemergency.gov.au

Australian Department of Health and Ageing & South Australian Department of Health, Safe Use of Personal Protective Equipment (DVD)

www.flupandemic.gov.au/internet/panflu/publishing.nsf/Content/safeuse-dvd-1

Providing Critical Care in an Influenza Pandemic: Summary of Key Operational Issues

- The NSW Intensive Care Taskforce Position Paper on Health Disaster Response by Intensive Care Services (July 2007)¹ provides a basis for the strategies outlined in this document.
- Based on previous influenza pandemics and with consideration given to improvements in healthcare, it is recommended that health services plan for the maximum potential ICU capacity that can be achieved in each appropriate health facility where ICU services exist with the limiting capacity being available ventilation devices and suitable alternative intensive care bed areas.
- A graduated escalation plan needs to be developed for surge planning.
- Additional ICU bed capacity will be achieved by:
 - Opening additional beds in existing non-commissioned physical critical care bed spaces.
 - Deferring elective surgery requiring postoperative ICU/HDU care.
 - Progressively converting HDU beds to intensive care.
 - Using available private hospital ICU capacity.
 - An increased threshold for referral of patients for ICU from other hospitals.
 - Suspend elective referrals of patients requiring ICU from outside of NSW (such as those requiring quaternary care, e.g. transplant) when capacity in other states for an equivalent service is available.
 - Maximising the use of non-ventilatory strategies in care of ICU patients freeing up devices for patients for whom mechanical ventilation is essential.
 - Facilitating end of life discussions and decisions in those appropriate ICU patients assessed as not reaching a meaningful recovery.
- Following implementation of these strategies additional bed spaces would then be created in clinically suitable areas including Recovery and Perioperative units.
- A conservative estimate of the statewide ventilator stock is 1030 devices (2007), including the centrally held stockpile. The demand for ventilation will vary with each influenza type. In practice a proportion of patients in ICU due to an emergency/unplanned admission, not related to influenza, will not be invasively ventilated thereby freeing up ventilation capacity.
- The trigger for deployment of the statewide ventilator stockpile is a 20% surge in ICU demand.
- Each hospital must prepare an inventory of physical capacity and equipment to inform the local response.

The following strategies may be implemented if the surge in demand exceeds 50%:

- Triage to intensive care will be based on a statewide triage protocol implemented across the system.
- The model of ICU care will initially focus on stabilisation and safety. Clinical ICU staff will need to be supplemented with a requirement for non-ICU trained staff to work in teams with an ICU experienced clinical practitioner to safely manage intensive care patients. It is expected that existing staffing ratios will not be maintained during the peak surge in demand.
- Neonatal and paediatric intensive care capacity will be rapidly exceeded requiring the need for adult ICUs to manage some critically ill children. Where this occurs a routine consultation process will be established with specialist paediatric and neonatal services

to guide clinical management. Consideration should be given to grouping critically ill patients in a single adult unit if warranted by the number of cases.

- Clinical support is to be provided for hospitals in critical care referral networks.
- Transport and medical retrieval will be avoided where possible.

1. Introduction

The purpose of this policy is to provide direction to NSW Area Health Services (AHS) for the delivery of critical care services during an influenza pandemic. It provides key principles for clinical, operational and organisational aspects of intensive care services to inform health disaster planning and response, and in particular critical care biopreparedness planning in NSW.

Critical care units (intensive care units and high dependency units) have a key role to play in the organised response to an influenza pandemic in NSW. Critical care units have been affected relatively early and more severely than other areas of the hospital. Demand for intensive care services during an influenza pandemic is likely to exceed normal supply. Each facility should have its own plan to ensure that critical care services are able to surge effectively and that equitable access is maintained.

The measures described in this document are based around a graded increase in ICU capacity and triaging critical care resources during a pandemic. The NSW Intensive Care Taskforce *Position Paper on Health Disaster Response by Intensive Care Services (July 2007)*¹ provides a basis for the strategies outlined in this document.

The procedures described in this document apply to critical care units (intensive care and high dependency) within NSW public hospitals. It is acknowledged that during an influenza pandemic certain limitations to normal standards of critical care, as well as changes to the processes for obtaining access to critical care, may be necessary. These changes and limitations need to be implemented progressively as the pandemic progresses.

This policy is a component of the broader NSW Health *Interim Influenza Pandemic Action Plan*,³ and should be read in conjunction with other sections of that document, as well as the Area Health Service Influenza Pandemic Action Plan, the and the NSW *Healthplan*.⁴

1.1 Background

The transmission dynamics of viral diseases spread by the respiratory route lend themselves to spread in the healthcare setting, and influenza is no exception. Influenza pandemics pose particular challenges due to:

- the **potential scale** of the impact
- simultaneous or nearly **simultaneous nature of the event** across the state and across the country
- the **potential duration** of the impact
- the **infectious nature** of the disease
- the impact on the **healthcare workforce** directly and indirectly

Health care systems in the developed world have rarely encountered the level of demand for hospital services that may occur during an influenza pandemic. In a severe influenza pandemic (1918-type scenario), the capacity of NSW public hospitals to meet the demand for health care services, in particular the demand for critical care services, will be limited.

It is estimated that when all age groups are considered together during the peak of a moderate – severe influenza pandemic, 20% of current total public hospital capacity would be taken by pandemic influenza (PI) patients, there would be a substantial increase in demand for intensive care ventilated beds by PI patients to approximately 200% current total public hospital ICU bed capacity. This is in addition to “routine” ICU activity.

For a severe pandemic (1918-type scenario), the peak demand for hospital services would be expected to be substantially greater than that estimated for a moderate pandemic. Again, it is anticipated that critical care capacity will need to be expanded far more than general hospital capacity, particularly for both paediatric and adult patients. In order to meet the demand for healthcare during an influenza pandemic, NSW will need to adopt strategies to efficiently and equitably allocate critical care resources.

2. Providing Critical Care in Pandemic Influenza

2.1 Critical Care Services Response to an Influenza Pandemic

Throughout an influenza pandemic, cases and contacts of influenza will be managed outside of the acute hospital setting as much as possible. Should admission to hospital be required, cases will be admitted to an isolation room where possible or designated “influenza ward” of the hospital.

All hospitals with critical care units will continue to provide critical care services as appropriate, and follow their normal transfer and retrieval protocols for critically ill patients. Where options exist for non-affected retrieval patients to be moved to adjoining states from parts of the state closer to interstate ICUs, opportunities to use those interstate hospitals should be explored.

Influenza patients requiring intensive care will be managed in negative pressure isolation rooms (where available) or single non-pressurised rooms under appropriate isolation and infection control procedures. Once isolation capacity has been exceeded then patients with influenza should be cohorted in a designated clinical area with ongoing application infection control procedures. In particular closed circuit ventilation circuits and non-nebulised pulmonary medication delivery systems should be employed.

As demand for ICU care of patients with influenza rises hospitals will need to substantially expand their ability to provide critical care services, as outlined in their Area Health Service Influenza Pandemic Action Plan, in order to cope with the increased numbers of influenza cases. Some hospital services such as elective surgical procedures may need to be reduced, with hospital resources and staff redeployed from other areas, depending on critical care activity, in order to allow critical care units to meet this demand.

During a severe pandemic, when widespread transmission is occurring in the community, the role of critical care units will be to provide standardised assessment, triage and management of all patients that have been referred for critical care in accordance with clinical management protocols. All patients will be assessed according to their clinical condition, and will be admitted to critical care units, or have

life sustaining therapy withdrawn to allow a natural death, according to the state-wide protocol for the provision of critical care services during an influenza pandemic.

Transfers of affected patients will be avoided as much as possible, as this is a resource-intensive process, and resources will be directed to increasing ICU capacity.

A staged response involving deferring clinically appropriate elective surgery and other elective procedures will need to occur in order to divert resources to the care of influenza cases. Surge response strategies (e.g. limiting elective procedures, opening additional critical care areas, deploying ventilators from the national medical stockpile, and redeploying health service staff and resources) will partially mitigate the sudden demand for critical care during an influenza pandemic.

AHS Chief Executives will have ultimate responsibility for ensuring that their health care facilities are adequately prepared for an influenza pandemic, and for directing the deployment or reallocation of health care resources in a staged process occurs within their AHS during an influenza pandemic.⁴

2.2 Ethical Principles for Resource Distribution

During a pandemic, it will be necessary at some point to begin prioritising limited critical care resources to those with a need for treatment and those who are most likely to survive. Such prioritisation decisions would need to take account of both influenza and non-influenza patients' probability of survival, as well as the availability of limited critical care resources.¹¹

The fundamental principles of healthcare delivery provide the basis for the development of principles to guide the provision of critical care i.e.

- the resource should be **ethically** and **equitably** distributed
- plans for distributing the resource should be **practical**
- overly complex policy has a higher likelihood of failure and is likely to be more resource intensive, therefore the policy should be as **simple** as possible
- the planned use of the resource should have a **scientifically valid** basis.⁸

It is recognised that during an influenza pandemic there may be **competing priorities** between two or more patients requiring critical care, and treating clinicians may be required to make difficult decisions.¹¹ In order to assist clinicians in making such decisions, and in order to facilitate open, transparent, scientifically valid and consistent decision-making, a state-wide protocol for the delivery of critical care resources during an influenza pandemic will be implemented.

This clearly documented and pre-arranged critical care triage protocol will reduce the need for individual clinicians to develop and defend a strategy for resource allocation on a case-by-case basis, and will ensure the fairness, transparency and consistency of resource allocation across the state.¹⁰ These triage criteria must be tiered, flexible, and implementable across an Area Health Service or across the state as required, in order to promote the equitable distribution of scarce resources.

The process for prioritisation of critical care resources during a pandemic should be understood and accepted by the community.^{11,12} Prioritisation strategies should therefore be based on carefully formulated and considered criteria, which are open for discussion and public scrutiny well in advance of a pandemic.¹³⁻¹⁶

Clinicians are likely to be under significant pressure caring for the existing critical care unit patients, and consequently are unlikely to be available to make decisions about which patients should receive critical care, including mechanical ventilation. It is recommended that the majority of decisions relating to the allocation of critical care resources should be made by a collaborative process that involves external clinicians, other than those that will be directly caring for the patient in the critical care units. These decision-making processes will need to be agreed in advance and disseminated to all designated staff for use on a case-by-case basis. The hospital clinicians, ethicists and/or managers that will be responsible for this triage decision-making should be identified at a local facility level.

The collaborative clinical decision-making body should consist of at least two people.

The following principles were developed in consultation with the NSW Health Research and Ethics Branch, Legal Branch and the NSW Intensive Care Taskforce.

- All patients requiring ICU admission whether suffering pandemic influenza or some other condition should be subject to the same ICU triage/admission criteria, which should be the same for all hospitals in the state.
- Resource allocation should be determined through a transparent process, which is made evident to the community prior to the event. Consistency is essential.
- Shift from a focus on individual need to a focus on common good within available resources.
- The level of treatment provided would differ from the level of treatment the community has come to expect in normal conditions.
- Triage, resource allocation and models of care need to be flexible to respond to changes in any pandemic.
- During a pandemic, as under normal circumstances, access to critical care requires patients to have a genuine clinical need and a reasonable prospect of recovery with such treatment. Critical care may reasonably be prioritised to a patient who is:
 - at more immediate risk of death without such care;
 - more likely to benefit from the treatment;
 - likely to suffer greater harm without treatment;
 - likely to suffer less burden or ill-effects from the treatment; or
 - likely to gain the same therapeutic benefit from the treatment more rapidly.¹¹

It is recognised that the above considerations are fundamental to good clinical decision-making at all times, and that critical care clinicians and others allocating critical care resources regularly evaluate them in managing patients and resources. Therefore it is reasonable that these principles would continue to apply during an influenza pandemic.¹¹

The principles underpinning access to, and the delivery of, intensive care services during a pandemic include:

- Giving preferential treatment on social standing grounds will not be permitted.

- Prioritisation for ICU treatment should not be influenced by a person having dependants.
- Consideration of co-morbidities should not conceal social value judgements.
- Front-line clinical staff in ICU may face a disproportionately high exposure risk in the provision of health care to the community, and may themselves subsequently become critically ill with influenza. Where possible these clinical staff will be afforded rapid access to ICU treatment, should they require it. Clinical assessment, triage and admission will be determined by the designated medical admissions officer in accordance with the protocols contained within this policy. Front-line clinical staff may be defined as those staff routinely required to don personal protective equipment to carry out their normally required duties.
- All patients presenting to NSW hospitals, regardless of visa or residency status, will be subject to the same considerations for access ICU treatment whether or not prioritisation judgements are required.¹¹
- An alternative to ICU treatment must be identified and fast-tracked, i.e. non-invasive support (if appropriate), palliative care etc.
- Intensivists' concerns relating to legal vulnerabilities in withdrawing or withholding treatment in this context need to be ameliorated by providing reassurance regarding indemnity by the employer, provided they practice within agreed operational guidelines and triage criteria that are consistently applied.
- The decision to refuse access to intensive care, or to withdraw life sustaining support, to appropriately manage available intensive care resources, may become increasingly frequent as the pandemic accelerates.
- As in other settings, treatment may be reasonably withheld or withdrawn where:
 - The patient/substitute decision-maker/guardianship board has been consulted;
 - Such treatment is judged to be of minimal or no benefit to the patient. This includes resuscitation or prolonged mechanical ventilation where there is only marginal potential for benefit;
 - Such treatment would be overly burdensome to the patient; and/or
 - It is not reasonably available without disproportionate hardship to others.
- Professional obligation to provide care: the NSW Health Clinical Ethics Advisory Panel at their February 2005 meeting determined that “developing NSW Health policy on (the obligation to treat on the part of health professionals) would be difficult to formulate and inappropriately prescriptive”. The Panel considered that taking on some degree of personal risk should be expected of professional practice but at the same time health professionals should be supported who, in good faith, have moral difficulty in providing care where they may have multiple obligations, such as dependants.
- ICU admission and discharge decisions during this phase will continue to be made on clinical grounds, may be made without patient or surrogate agreement, and can be made despite an anticipated untoward outcome for that patient. However, such decisions should still be discussed with patients/families and agreement sought as much as possible, in line with the NSW Health *End-of-Life Care and Decision-Making – Guidelines (GL2005_057)*²¹:
http://www.health.nsw.gov.au/policies/gl/2005/GL2005_057.html

- It is recognised that, as a pandemic accelerates, time pressure will increase and the time available for reflection, decisions and action diminish.
- Incumbency does not ethically afford a higher priority for intensive care; that is, patients seeking acceptance in an ICU have equal right to ICU as a patient already receiving ICU. The selection of non-infected patients for re-location to another ICUs should be made on clinical safety grounds; without consideration of incumbency.
- Should a pandemic reach extreme levels, military-like triage conditions would likely apply where the locus of control would be outside ICUs and be managed by non-ICU trained personnel. All previous outlined considerations remain relevant, though it is recognised that these will be increasingly difficult to meet.

Smaller facilities may need to be supported in their decision-making by larger facilities. The process of decision-making, and the reasons for the decision, should be clearly documented in the medical records for all patients that are referred for consideration for critical care admission, or for withdrawal of critical care.

2.3 Legal Framework

In all circumstances where referral or triaging decisions differ from normal expectations, there must be clear and agreed methods in place to support staff with the responsibility for such decisions. Staff must be assured that where they act professionally and in accordance with the mandated guidelines, policy or lawful directions of their employer they will be indemnified and supported.

The extent to which such support may be required should be anticipated to vary with the severity of the incident and the clinical pressures that arise from it. However, all clinicians that use the agreed state-wide triage protocols as directed by the NSW Department of Health, are indemnified for the duration of time that these protocols are in use.

3. Increasing Critical Care Capacity

Critical care units should plan for a phased increase in their capacity to at least a doubling of their normal maximum capacity. Planners should take into consideration the need to sustain this increased capacity for a period of three months or more. Methods of accessing and providing care may need to be adapted in order to meet demand. In order to plan an expansion of capacity of this scale, AHS and individual hospitals will need to determine the location and amount of critical care capacity, including capacity in both the public and private hospital systems.

Each hospital must identify potential areas outside the existing designated critical care unit, where critical care could be provided for increased numbers of patients in the event of an influenza pandemic. Consideration should also be given to negotiating access to critical care beds in private hospitals, including private hospitals with existing critical care unit facilities, and those with existing operating theatres and recovery facilities, that could be readily transformed into facilities appropriate for critical care.

AHS should also consider how to cohort infectious and non-infectious patients within the expanded critical care areas. This may include the planned transfer of non-

influenza patients to alternative uncontaminated critical care units in accordance with Area pandemic plans.

Areas should also develop an understanding of the impact on available critical care capacity if some or most elective surgery is discontinued, and ensure that hospital areas that may be used for expansion of critical care services are suitably supplied with resources such as piped oxygen, air, suction, and adequate power outlets etc. Constraints on the expansion of critical care services at any stage will include¹⁰ the:

- infectious nature of influenza virus
- availability of nursing and medical staff trained in critical care
- availability of appropriately trained support staff
- availability of necessary equipment, medication and supplies
- availability of appropriate isolation rooms.
- constraints on transport/retrieval services
- possible need to sustain the enhanced critical care capacity for a prolonged period, possibly for three months or more¹⁰

AHS must consider how to address these potential constraints locally guided by the strategies outlined in this document. Methods to address these potential limitations to expansion of critical care capacity are discussed in the following sections.

Current capacity:

NSW adult intensive care/high dependency services are provided by:

- 38 public general/combined Intensive Care Units (ICUs) with a proportion of units also accommodating high dependency beds and quaternary services beds for severe burns, acute spinal injury and organ transplantation.
- 9 public discrete or stand alone High Dependency Units (HDUs) which are not collocated with an ICU.
- 15 private ICU's a proportion of which also accommodate high dependency beds with 8 providing specialist CICU beds and 1 providing specialist Neurosurgery intensive care beds.
- 2 private HDUs

Statewide Inventory (inc. adult, paediatric & neonatal/public & private healthcare)	Total
Available Adult ICU (ventilated beds) (public n = 310, private n = 98)	408
Available Paediatric ICU (ventilated beds)	29 ³
Available Neonatal ICU (ventilated beds)	82
Total no. of available ventilated beds	519
Available Adult HDU (non-ventilated beds)	282
Available Neonatal (non-ventilated beds)	61
Total no. of available non-ventilated beds	343
Additional physical ⁴ critical care bed spaces not currently in use	131
Total no. of ICU standard invasive ventilation devices (public and private)	600
Total no. of non-ICU ventilation devices e.g. transport + anaesthetic (exc.	300
Total no. of ventilation devices stockpiled at ASNSW	130 ⁷
Total no. of ALL ventilation devices (2007)	1030⁵

Notes:

1. Available bed refers to beds staffed and equipped which are immediately available for use.
2. There are an additional 136 available critical care beds in private facilities of which 98 are for intensive care patients.
3. Notionally there are 33 Paediatric ICU beds however 4 beds are incorporated within an adult unit.
4. Physical bed spaces are non-commissioned critical care bed spaces that have the appropriate utilities and services to accommodate a critically ill patient and would be used as the initial surge response.
5. Inventory undertaken by Counter Disaster Unit/SSDB/ASNSW June 2007.
6. Most ventilator devices in neonatal ICUs not suitable for older children.
7. The state ventilator stockpile consists of Oxylog 3000 x 90 and Oxylog 2000 x 40. While these devices provide additional ventilation capacity for rapid deployment they are not suitable for complex ventilation or for neonates, infants and young children (under age 2 years).

3.1 Escalation Plan

A pre-determined escalation plan is to be devised to facilitate a staged increase in appropriate physical capacity. The Ontario Health Plan for an Influenza Pandemic June (2005)²⁰ provides a comprehensive framework on which to base local surge thresholds and escalation plans, and has been endorsed for use by the NSW Intensive Care Taskforce.

Figure (3) Escalating ICU Capacity during Pandemic Influenza ²⁰

Surge Levels	Strategy		Response Level
Pre-Surge	Normal	<ul style="list-style-type: none"> All funded available ICU/HDU beds operational Some beds restricted due to staffing limitations Case by case triage and admission assessment Verify functional performance of stockpiled devices (e.g. ventilators) 	Hospital/AHS
Minor Surge 5% - 10%	Enhanced	<ul style="list-style-type: none"> Influenza treatment provided early to symptomatic ICU staff. Open additional ICU ventilated beds in existing non-commissioned physical bed spaces. Staff by redeployment and supplementation with additional shifts for part-time staff, pool staff, agency staff and overtime Commence early discharge of patients to home care where appropriate Cohort/isolate influenza patients Liaise with private health care facilities to put cooperative service agreements on alert. 	AHS/Hospital
Moderate Surge 11% - 20%	Augmented	<ul style="list-style-type: none"> Defer complex elective surgery requiring ICU/HDU postoperatively, where no adverse health consequences are anticipated. Consider the private sector for non-deferrable patients Redeploy suitable ventilation devices to ICU from other clinical areas Progressively convert HDU beds into ICU beds Identify potential additional capacity for ICU ventilated beds in alternative clinical areas such as recovery, peri-operative units and respiratory units Deploy state ventilator stockpile by ASNSW in consultation with Statewide Services Development Branch These actions must apply to all facilities in the AHS 	AHS/Hospital
Major Surge 21% - 50%	Max Capacity	<ul style="list-style-type: none"> Open all potential ICU ventilated bed capacity in suitable alternative clinical areas as staff redeployment and dilution of expertise, and stock of ventilation devices allow Defer all treatment for non-life threatening conditions which will not be clinically compromised due the delay Activate private health care facilities cooperative service agreements on alert Apply to all facilities in AHS 	NSW DoH/ AHS /Hospital
Large Scale Emergency > 50%	Exceed Capacity	<ul style="list-style-type: none"> All available ventilation and alternative bed locations used. Staffing at baseline profile. Maintain service for life-threatening only Implement Three Tier Triage for ICU Progress according to NSW HEALTHPLAN Apply equally to all facilities in AHS 	Commonwealth/ NSW DoH/ AHS/Hospital

3.2 Creating ICU Bed Capacity

Additional ICU bed capacity could be made available by:

1. Commissioning additional ICU beds in redundant physical bed spaces:

An additional capacity of **131** available ICU beds would be made available as per appendix 1.

2. Deferring elective complex surgery, where clinically appropriate, requiring postoperative care in ICU (& HDU):

On review of the ICU activity data (not inc. HDU) provided by NSW Health Information Exchange (2007 and 2008) which is attributed to planned activity, the proportion of planned ICU activity is 30% of overall activity. Applying this conservative average to the state **public adult and paediatric ICU bedstock (n = 329/not including neonatal ICU)** indicates that up to **102** ICU beds could be made available by deferring all planned ICU activity. It should be assumed that patients may still require surgery on clinical grounds and meet the triage criteria for admission to ICU therefore some of this capacity will still be utilised for urgent surgical cases.

3. Progressively convert HDU beds into ICU beds as required:

There are **397** HDU level beds in NSW which with additional equipment and resourcing could be progressively converted for ICU patients.

4. Expand into suitable clinical areas such as Recovery and Perioperative units.

ICU activity data from the NSW Health Information Exchange (2007 and 2008) indicates that approximately 70% of ICU activity is unplanned or from Emergency. The existing bed capacity for unplanned (non-influenza) ICU activity would need to be maintained requiring **357** ICU beds

It is estimated that the statewide maximum ICU capacity would be 987 beds to manage the demand for intensive care services from both influenza and non-planned non-influenza activity.

Further supplementation of equipment and workforce may be required from external sources. Consideration may be given to accessing additional resources held by manufacturers and interstate jurisdictions. The Australian Defence Forces (Army, Navy and Air Force) is unlikely to be able to provide resources due to the need for those resources to be immediately available for deployment as a consequence of normal operations.

These strategies would be implemented in collaboration with AHS Chief Executives to determine the appropriate distribution of additional ventilated ICU bed capacity.

NSW adult critical care services are networked in accordance with the *NSW Health Critical Care Tertiary Referral Networks & Transfer of Care (Adults) (PD2010_021)*

http://www.health.nsw.gov.au/policies/pd/2010/PD2010_021.html

Once these resources have been exceeded then consideration will be given to implementing a state-wide process for adjusting standards of care and instituting a standard process for the triage of critical care resources.

The web based NSW **Critical Care Resource management System (CCRS)**. CCRS is a statewide web based information system that assists the coordination and decision making for the referral and placement of critically ill patients to the appropriate level of definitive care. CCRS informs the availability of neonatal, paediatric, high risk maternity and adult critical care beds across NSW. CCRS enables users see available ICU and HDU beds in all facilities and provides communication details to support the negotiation of critically ill patient transfers.

Consideration should be given to adding capacity to the CCRS to list potential temporary ICU beds in areas not currently listed on CCRS. These pages would only be made visible if those resources were called into service to supplement the 'static' ICU bed census.

The CCRS Perinatal and Paediatric website will assist the coordination and decision making for the referral and placement of critically ill neonatal and paediatric patients. CCRS can be accessed via the NSW Health intranet and is password protected.

Log on via the NSW Health Intranet at <http://ccrs.health.nsw.gov.au>

Username: CCRS_ED Password: ED

3.3 Creating Ventilation Capacity

A conservative statewide estimate of suitable ventilation devices is 1030. Utilisation of available ventilation devices for influenza patients is estimated to peak at 86% assuming the deployment of the NSW ventilator stockpile (Oxylog 3000) and suitable ventilation devices used elsewhere in the hospital.

Additional ventilation capacity will be required for normal emergency/unplanned ICU activity not generated by influenza patients. Paralleling the ICU bed requirement is the requirement for ventilation devices. At the peak of the pandemic and including the normal emergency/unplanned activity the estimated requirement ventilation devices is approximately 1250. A conservative estimate of the state ventilation stock is 1030. Based on this estimate additional ventilators would need to be sourced from manufacturers or interstate (this will be facilitated centrally by NSW Health).

As mentioned the estimate of state ventilation stock is conservative and not all normal emergency/unplanned ICU patients will be ventilated with many receiving non-invasive ventilation. It can be assumed therefore that additional ventilation capacity will be made available.

As per the ICU escalation strategy the trigger for the deployment of the (Oxylog 3000) ventilator stockpile should occur at the 20% surge level. The stockpile includes appropriate ventilation tubing/consumables with regular testing and calibration of the ventilators undertaken whilst in storage by the manufacturer, coordinated by ASNSW.

Distribution of the ventilator stockpile will be advised by Statewide Services Development Branch in consultation with AHS, and in collaboration with the ASNSW. Allocation will be based on the additional bed capacity to be established in each

facility. In preparation AHS should identify suitable clinical areas and the potential number of additional ICU ventilated beds that can be achieved as a key component of planning for pandemic influenza.

Prior to this threshold each hospital will redeploy suitable ventilators held outside the ICU, including transport ventilators, to designated critical care areas. It is acknowledged that non-ICU ventilation devices and transport ventilators are suitable for short term ventilation only in adults, and cannot be used in neonates and children under 12-15 kg (2 – 3 years). Regular reassessment of all patients requiring ventilation in regards to the need for an ICU standard ventilator will be required to ensure those patients requiring complex ventilation regimes receive the appropriate respiratory support.

Closed ventilation suction circuits are to be employed and routine ventilation tubing changes kept to a minimum. Nebulisation of medications is to be avoided.

Physiological monitoring will be required for all patients requiring intensive care. The level of monitoring will depend on the status of the patient and the clinical management regime determined by the ICU clinical team. **At a minimum continuous oxygen saturation (SpO₂) monitoring will be required for all ventilated patients.** Equipment held outside the ICU, including transport monitors, will need to be redeployed to designated critical care areas. In preparation AHS should identify physiological monitoring equipment that exists outside of the ICU that may be redeployed as a key component of planning for pandemic influenza.

3.4 Critically Ill Influenza Patients Requiring Extra Corporeal Membrane Oxygenation (ECMO) and Medical Retrieval

An increasing demand for ECMO support has been observed for patients with severe respiratory failure who are at the limits of conventional therapy. Improving survival rates of patients treated with ECMO have led to an increased demand for this support. Often these patients present to hospitals which do not have ECMO facilities and expertise resulting in a tertiary referral service performing an ECMO medical retrieval mission.

Patients who may be considered for ECMO are often too sick to safely transport with conventional equipment therefore the need arises to establish the patient on ECMO and stabilise their condition prior to transport. The safe management of an ECMO retrieval patient requires a coordinated response by the referring and receiving hospitals, ECMO team, Ambulance and the medical retrieval services.

For children in NSW, ECMO is provided at the Sydney Children's Hospital and the Children's Hospital at Westmead. Both these centres may also refer patients to the Royal Children's Hospital in Melbourne most commonly for non-cardiac patients where extended therapy is anticipated. The medical retrieval of paediatric and neonatal patients on ECMO is performed by the staff from the Royal Children's Hospital in Melbourne and transportation by Air Ambulance Victoria in collaboration with CHW and/or SCH and NETS. Early notification of NETS is essential to ensure appropriate support is available. Clinical and logistic support may be provided by the Ambulance Service of NSW and the NSW adult ECMO medical retrieval service as required.

For adults ECMO is provided at tertiary facilities in NSW with level 6 Cardiothoracic and ICU services including:

- John Hunter Hospital
- Liverpool Hospital
- Prince of Wales Hospital
- Royal North Shore Hospital
- Royal Prince Alfred Hospital
- St Vincent's Hospital
- St George Hospital
- Westmead Hospital

The primary reason for ECMO in these facilities is for cardiac surgery in adults however there has been an increasing incidence of ECMO being required to support adult patients in refractory respiratory failure.

Increasingly in adult cases, ASNSW is being called upon to transport an ECMO clinical team plus necessary equipment to metropolitan and rural based hospitals to stabilise patients on ECMO. St Vincent's Hospital and Royal Prince Alfred Hospital, in collaboration with AMRS, provide the ECMO referral and transfer service and ECMO retrieval team on alternate weeks. AMRS is notified of the active ECMO referral service.

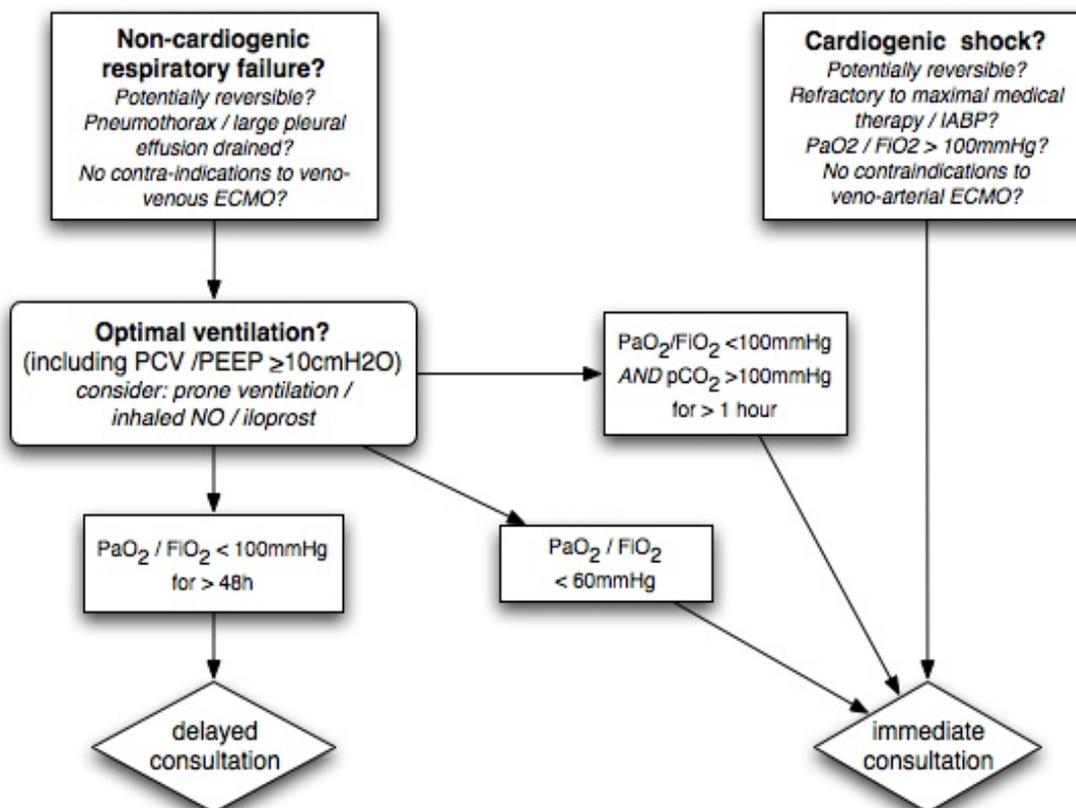
To organise the referral and transfer of a patient requiring rescue ECMO the following steps and conditions must be adhered to:

1. Early notification of a patient potentially requiring referral for ECMO is essential and should be undertaken in accordance with the "Indications for ECMO Referral" Guideline (page 21).
2. Initial contact is with AMRS who will then contact the active ECMO service (either the on-call General Intensive Care consultant at RPAH or the Cardiac Intensive Care consultant at SVH). The receiving hospital's ICU consultant would then discuss the case with the referring clinician, on-call cardiac surgeon and medical perfusionist.
3. The destination hospital (either SVH or RPAH) will be determined according to the patients underlying condition, required clinical/surgical intervention and access to an available ICU bed. Additional ICUs may be designated to create capacity for ECMO medical retrieval according to demand. AMRS will inform the referring clinicians of the designated ICU to receive the patient requiring ECMO support.

**AMRS is to be contacted to facilitate all adult ECMO referrals and
transportation Phone: 1800 650 004**

Case selection and treatment protocols used during ECMO are now well defined by the international Extracorporeal Life Support Organization (ELSO). The NSW ECMO Medical Retrieval Services Expert Steering Group developed the following "Indications for ECMO Referral Guideline" which is to be used by all referring clinicians.

INDICATIONS FOR ECMO REFERRAL



- Absolute contraindications to all forms of ECMO**
- * Significant pre-existing co-morbidity, such as irreversible neurological condition, cirrhosis with ascites, encephalopathy, history of variceal bleeding, active malignancy with predicted limited survival, HIV.
 - * Weight > 120kg
- Relative contraindications to all forms of ECMO**
- * Age > 65
 - * Multiple trauma with uncontrolled haemorrhage
 - * Multiple organ failure
- Absolute contraindications to veno-venous ECMO (for respiratory failure)**
- * Pulmonary hypertension (mPAP > 50mmHg)
 - * Severe right or left heart failure (EF < 25%)
 - * Cardiac arrest
- Relative contraindications to veno-venous ECMO**
- * High pressure, high FiO2 IPPV for > 1 week
- Absolute contraindications to veno-arterial ECMO (for cardiac failure)**
- * Severe aortic valve regurgitation
 - * Aortic dissection
- Relative contraindications to veno-arterial ECMO**
- * Severe peripheral vascular disease

3.5 Hospital Inventory

Each facility must take an inventory of the following resources to inform their local critical care surge response i.e.

- available ICU beds and additional non-commissioned ICU bed spaces;
- available HDU beds and additional non-commissioned HDU bed spaces;
- potential suitable bed spaces in non-critical care areas which may be used for intensive care patients e.g. Recovery, Perioperative Units, Respiratory Units;
- equipment and consumables required to set-up and sustain a typical ICU bed space;
- negative pressured isolation rooms (suitable for intensive care patients);
- non-pressurised isolation rooms (suitable for intensive care patients);
- ICU standard ventilation devices;
- other ventilation devices including transport ventilators and those located outside the ICU e.g. Anaesthetics/OT;
- physiological monitoring devices including stand alone Oxygen Saturation monitors, inside the ICU and in external clinical areas;
- ventilators suitable for children under 15 kg.

4. Triage Critical Care

The process of triaging critical care resources includes both the process of allocating resources, and the process of withdrawal of resources, for both influenza and non-influenza patients that may require critical care during an influenza pandemic.

Assessment of patients being triaged for critical care should ideally be undertaken prior to the patient being transported to the ICU. Triage should occur in the Emergency Department or referring unit/ward where possible which underpins the need for an effective collaboration between ED/specialty and ICU clinicians.

A state-wide NSW process for adjusting standards of care and instituting process for triage of critical care resources during an influenza pandemic will need to progress through the following steps²:

1. The NSW Department of Health convenes the Pandemic Operational Coordination Group to determine the stage and response required to guide triaging for critical care resources, and for limiting or adjusting standards of care for the relevant influenza pandemic scenario.
2. An influenza pandemic occurs, and the DoH recognises that available health care resources are insufficient to allow patient care to be provided according to usual standards of care.
3. All available resources are used to allow the health care system to meet demand, possibly including patient redistribution, redeployment of staff and resources within Areas, limitation or ceasing elective procedures, with the adoption of a process for triage of critical care resources and adjustment of standards of care

- considered as a last resort when no further resources can be obtained, and resources remain insufficient to meet demand.
4. The DoH reconvenes the predetermined guideline development group to assess the situation and refine triage and treatment criteria based on the epidemiology of the virus involved (attack rate, risk-groups, responses to interventions such as antiviral medication and mechanical ventilation etc.
 5. Baseline triage criteria are to be modified based on the specific pandemic scenario, and recommends a new standard of care appropriate to the resources available.
 6. The DoH guideline review group will review the guidelines and provide feedback, modifications, and endorsement of the determined process.
 7. The DoH will negotiate with private hospital facilities regarding support and access to services, based on the pandemic scenario and the available critical care capacity within the public hospital system.
 8. On instruction from the Director-General of Health, AHS make the recommended changes to the triage and withdrawal of care process and adjust standards of care as outlined by the statewide policy guideline within 12 hours. Ideally, all intensive care units and high dependency units will make the changes simultaneously across the state (even in areas remote from the initial outbreak). The stage of the triage directive will be dependent on the phase of the pandemic (early containment, later containment, or maintenance), the severity of illness of patients, and the overall demand for critical care unit care.
 9. The guideline development group continues to meet regularly and update its recommendations based on the pandemic scenario and evolving knowledge of the virus, and its response to medical management.

State-wide processes and protocols for clinicians regarding triaging and managing phased responses to an influenza pandemic should also consider:^{10, 1}

- provision for variation in admission thresholds according to local and state pressures, with mechanisms to communicate revisions to local clinicians (including emergency departments and primary care providers).
- encouraging collaboration with other critical care services to facilitate consistency in clinical practice, sharing of essential resources and co-ordinated transfer of patients where appropriate. Critical care clinical networks may play an important role in developing transport arrangements, and encouraging resource sharing.
- developing effective step-down facilities from critical care in order that bed availability is maintained for new admissions.
- providing palliative care support for patients and their families, where demand for critical care exceeds even expanded capacity, and where there are patients dying from their illnesses without receiving critical care.¹⁰ Wherever possible, the reasons for such a decision should be discussed with the patient, and the

¹ This list of steps and considerations was largely drawn direct from the UK consultation document: Critical care contingency planning in the event of an emergency where the number of patients substantially exceeds normal critical care capacity: best practice guidance. Available at <http://www.dh.gov.uk/Consultations/ClosedConsultations/>

patient's family, carer or guardian beforehand, and where relevant, an opportunity to obtain further advice or additional opinions should be provided.

A decision to refuse critical care unit admission, or to discharge a patient from a critical care unit in order to allow the admission of a different patient, according to the triage protocols, requires that appropriate alternative treatment is provided. Non-invasive forms of respiratory support (for non-influenza patients), palliative care and pain management, as appropriate, must be provided somewhere other than the critical care unit for those patients deemed to be less severely ill, or alternatively, too sick for admission to a critical care unit.

4.1 Triage Tool

The ideal characteristics of the tool for triaging patients referred for critical care during an influenza pandemic include:^{12,2}

- The tool will apply equally to all patients, including those infected with influenza, and those requiring critical care for other conditions.
- The tool should be constructed in a tiered or stepwise fashion, so that as resources are exhausted, another stricter tier of exclusion criteria is available for use. Any of the tiers may be modified during the event to account for disease-specific prognostic information.
- Whenever possible, tiers should be based on objective determinations of the effectiveness of care, and of the anticipated level of resource utilisation, rather than subjective determinations regarding the value of either the intervention or the value of the patient's life.
- The final tier should provide a numeric assessment of survival probability. This figure may be then compared within and between institutions and regionally to allow resources to be provided in a consistent fashion, and also to provide a "sliding scale" of care guidelines that may be adjusted depending on the demand on the resources (e.g., unable to provide mechanical ventilation to patients with score > X, tomorrow may change to score > Y).
- The numeric scoring system should rely on as many clinical variables (rather than laboratory) as possible. It should be easily correlated with survival. It should be available in the public domain (e.g., non-proprietary). It should be easily adapted to Internet or personal digital assistant calculation programs. Ideally, it should involve simple calculations and few variables.¹²

To ensure the triage tool is effective the following conditions apply:

- Aside from disease specific criteria restrictions should apply equally to all patients, i.e. both those infected and those hospitalised for other reasons.
- Intensive Care and Emergency Department Physicians need to work closely on a unified approach to triage for critical care resources.

² These characteristics were discussed with all groups during the consultation process, but this list of ideal characteristics also draws heavily from reference 12. Hick D, O'Laughlin D. Concept of operations for triage of mechanical ventilation in an epidemic. *Academic Emergency Medicine* 2006;13 (2):223-29.

- All available resources are used to mitigate stress on the health system including patient redistribution. Implementation of local surge escalation plan. Triage and adjusting models of care only applied when no further resources can be obtained.
- Augmentation of equipment (ventilators/monitors/infusion devices) is required within 12-24hrs from alternate facilities, stockpile and vendors.
- Standardised criteria are applied for resource allocation or withdrawal supported with legislation to avoid locally developed strategies and to promote consistency across the system.
- 24/7 security presence needs to be guaranteed at access points and in the ICU.

The triage process developed by Hick and O’Laughlin from Minnesota in the United States, has been endorsed as appropriate for use in an influenza pandemic, by the NSW Intensive Care Taskforce and is described in Figure (4). The three tier system has not been specifically validated for paediatric patients but has previously been applied to all age groups. Its application in paediatrics and neonates has been supported by clinical stakeholders but where time permits further validation in the paediatric population may be beneficial.

The three tier system (**Figure 4 page 27**) progresses from Tier 1 based primarily on the presence of respiratory failure associated with a poor prognosis based on current and underlying disease to Tier 3, which uses a quantitative process. Age alone is not to be used as triage criteria.

The first and second tiers require no familiarity with scoring systems and depend mainly on respiratory failure and poor prognosis based on current and underlying disease.

Tier 3 involves the use of the Sequential Organ Failure Assessment (SOFA) which is an evidence based system used to generate a numeric score that offers good predictive accuracy and can be used over time to evaluate prognosis and response to therapy. The use of a predictive survival instrument standardises assessments and allows numeric comparisons of patients both within the institution and between institutions. This allows more efficient allocation of available resources to institutions in greatest need and provides as consistent a level of care (as possible) across the community and region. It also provides the physician with guidance for clinical care that is rational and quantitative rather than qualitative.

It is essential in the application of this triage tool that:

- There are two triage officers (1 ICU Consultant + 1 other medical officer) to perform triage together; and
- There needs to be a dispute resolution process to manage conflicting opinions between the triage officers and the clinicians, patients, families and community. This support should be provided centrally at the Area or state level to provide consistency and equity.

Figure (4) Three Tier ICU Triage Tool

(Hick & O’Laughlin 2006 Academy of Emergency Medicine)¹²

<p>Tier 1</p>	<p>Do not offer (AND withdraw) life-sustaining therapy from patients with any of the following:</p> <ol style="list-style-type: none"> 1. Respiratory failure requiring intubation with persistent hypotension (SBP<90 adults), unresponsive to fluid therapy after 6-12hours AND signs of additional end-organ dysfunction (e.g.. Oliguria, decreased mental status, cardiac ischaemia) 2. Failure to response to mechanical ventilation (no improvement in oxygenation or lung compliance) and antibiotics after 72hrs of treatment for a bacterial pathogen (?organism) 3. Laboratory or clinical evidence of ≥ 4 organ systems failing: <ol style="list-style-type: none"> a. Pulmonary (ARDS, respiratory failure, refractive hypoxia) b. Cardiovascular (LVF, hypotension, new ischaemia) c. Renal (hyperkalemia, oliguria despite fluid resuscitation, increasing creatinine) d. Hepatic (transaminase > x 2 normal upper limit, increased bilirubin or ammonia levels) e. Neurological (altered mental status not related to fluid volume status, metabolic, hypoxic or stroke) f. Haematological (clinical or laboratory evidence of DIC) g. Cirrhosis with ascites, history of variceal bleeding, fixed coagulopathy, or encephalopathy h. Irreversible neurological impairment that makes the patient dependent for personal care (e.g. Severe stroke, congenital syndrome, persistent vegetative state)
<p>Tier 2</p>	<p>Do not offer (AND withdraw) life-sustaining therapy from patient’s in respiratory failure, requiring intubation with the following conditions, in addition to those in Tier 1. Patients with pre-existing system compromise or failure including:</p> <ol style="list-style-type: none"> 1. Known congestive cardiac failure with EF<25% (or persistent ischaemia unresponsive to therapy and pulmonary oedema) 2. Acute renal failure requiring haemodialysis 3. Severe chronic lung disease requiring home oxygen 4. Immunodeficiency syndromes at a stage where the patient is susceptible to opportunistic pathogens 5. Active malignancy with poor potential for survival 6. Acute hepatic failure with hyperamonemia
<p>Tier 3</p>	<p>Specific triage protocols developed centrally and advised by specialist clinical groups</p> <ol style="list-style-type: none"> 1. Restriction of treatment based on disease specific epidemiology and survival data for patient subgroups 2. Expansion of pre-existing disease classes that will not be offered ventilatory support 3. Applying a Sequential Organ Failure Assessment scoring to the triage process, establishing a cut off score.

The Sequential Organ Failure Assessment (SOFA) score is considered to be an appropriate scoring system for use in a triage protocol given its basis on physiologic parameters, ease of calculation, requirement for simple laboratory tests and its validation for use in patients with a wide variety of conditions requiring critical care.¹⁷

The scoring criteria for the SOFA score are provided in Figure 5 below.

Figure (5) Scoring criteria for the Sequential Organ Failure Assessment (SOFA) Score¹⁷

Variable	Score				
	0	1	2	3	4
PaO ₂ /FIO ₂ , mm Hg	> 400	≤ 400	≤ 300	≤ 200	≤ 100
Platelet count, × 10 ⁶ /L	> 150	≤ 150	≤ 100	≤ 50	≤ 20
Bilirubin level, mg/dL (μmol/L)	< 1.2 (< 20)	1.2–1.9 (20–32)	2.0–5.9 (33–100)	6.0–11.9 (101–203)	> 12 (> 203)
Hypotension†	None	MABP < 70	Dop ≤ 5	Dop > 5 Epi ≤ 0.1 Norepi ≤ 0.1	Dop > 15 Epi > 0.1 Norepi > 0.1
Glasgow Coma score	15	13–14	10–12	6–9	< 6
Creatinine level, mg/dL (μmol/L)	< 1.2 (< 106)	1.2–1.9 (106–168)	2.0–3.4 (169–300)	3.5–4.9 (301–433)	> 5 (> 434)

Note: PaO₂ = partial pressure of arterial oxygen; FIO₂ = fraction of inspired oxygen; MABP = mean arterial blood pressure, in mm Hg;
 *Adapted, with permission, from Ferreira FL, Bota DP, Bross A, et al. Serial evaluation of the SOFA score to predict outcome in critically ill patients. *JAMA* 2001;286:1754-8. Copyright © 2001, American Medical Association. All rights reserved.
 †Dop (dopamine), epi (epinephrine) and norepi (norepinephrine) doses in μg/kg per min.

For ease of use, the colour scheme (blue or black, red, yellow, green) commonly used in civilian and military disaster triage protocols has been adopted i.e.

Figure (6) Prioritization tool used in triage protocol for the initial assessment of patients' needs for critical care during an influenza pandemic.

Triage code	Criteria	Action or priority
Blue	Exclusion criteria met or SOFA score > 11*	<ul style="list-style-type: none"> • Manage medically • Provide palliative care as needed • Discharge from critical care
Red	SOFA score ≤ 7 or single-organ failure	Highest priority
Yellow	SOFA score 8–11	Intermediate priority
Green	No significant organ failure	<ul style="list-style-type: none"> • Defer or discharge • Reassess as needed

Note: SOFA = Sequential Organ-Failure Assessment.
 *If an exclusion criterion is met or the SOFA score is > 11 anytime from the initial assessment to 48 hours afterward, change the triage code to Blue and proceed as indicated.

SOFA scoring can be repeated over time and is described in Appendix (2).

SOFA triage in summary:

- Blue (or black) category patients are those who should not receive critical care. Depending on their condition and medical issues, patients may either continue to have curative medical care on a ward or palliative care.
- Red category patients have the highest priority for ICU admission and mechanical ventilation, if required. In selecting the patients for this category, the aim is to find those who are sick enough to require the resource and whose outcome will be poor if they do not receive it but are not so sick that they will not recover even if they do receive ICU care. Patients with single organ failure, particularly those with respiratory failure due to influenza who otherwise have a low SOFA score, are included in the red category assuming they have no exclusion criteria. These patients will derive the maximum benefit from ICU care and mechanical ventilation. The goal is to optimize the effectiveness of the triage protocol so that every patient who receives resources will survive. Although this is unlikely to be completely successful, it can be used as a target to guide modification of the triage protocol based on patient outcomes during a pandemic.”¹⁷
- Yellow category patients are those who, at baseline, are very sick and may or may not benefit from critical care. They should receive care if the resources are available but not at the expense of denying care to someone in the red category. At the reassessment points, patients who are improving are given high priority (red) for continued care, while those who are not showing signs of improvement are classified as yellow.
- Green category patients are those who should be considered for transfer out of the ICU because they are well enough to be cared for without mechanical ventilation or other ICU-specific interventions.”¹⁷

Area Health Services and Intensive Care staff should familiarise themselves with the three tier triage tool and prepare for its application at the local level.

5. Models of Care During Influenza Pandemic

Hospitals and the community should recognise that it will be necessary to adjust clinical guidelines and protocols according to the severity of an influenza pandemic. Tiered critical care provision may be most appropriate, with critical care interventions being progressively limited as demand escalates. The goal is to adjust standards of clinical care to a level appropriate to the resources available and to do so in as smooth, transparent, consistent, and incremental a fashion as possible.

Critical care may also be inappropriate in circumstances where accumulated evidence suggests that there is little or no chance of survival and infectivity risks to staff cannot be justified. In circumstances short of this ‘worst case’ scenario it is likely that the most sustainable level of critical care will be the provision of mechanical ventilation, circulatory support, intravenous sedation/analgesia, enteral nutrition, and antibiotics; the use of insulin therapy, deep venous thrombosis prophylaxis and H2 receptor antagonist or proton-pump inhibitor therapy may also be feasible.¹⁰ Local adjustments to these guidelines may be appropriate depending on circumstances such as the

severity of disease, anticipated course of the disease, and the level of staff and other resource availability.¹⁰

Key assumptions:

- Current staff ratios in terms of physical numbers and expertise is considered in terms of a minimum safe standard in a disaster situation. The Intensive Care Taskforce acknowledges that in an extreme situation during a major pandemic that this minimum standard may require further review.
- In a full pandemic ICU resources will not be adequate therefore plan to use the hospital's maximum physical capacity to provide ventilation. Determine the total number of potential bed spaces in the hospital that are equipped to provide safe ventilation and the number of ventilation devices.
- The standard of care will reflect essential interventions only and prophylactic measures to prevent complications where possible, e.g. DVT, gastric ulceration, and pressure care.
- Critical care units that do not normally treat children may be required to treat and ventilate children with suitable devices and appropriate clinical support. In cases where critically ill paediatric patients are required to be clinically managed in an adult critical care service then access to paediatric critical care clinical resource staff will be provided to guide and advise on clinical management. Where there are a number of children in separate adult units then consideration may be given to cohort these patients and concentrate expertise.
- The movement of critically ill influenza patients is to be kept to an essential minimum.

5.1 Neonates, Paediatrics and High Risk Obstetrics

NSW neonatal and paediatric intensive care services are provided by:

- 9 public neonatal intensive care units (NICU); and
- 3 public paediatric intensive care units (PICU),

In addition to the increased number of sick children and neonates, there may also be a greater number of premature infants than normal, owing to illness in pregnant women. Hospitals that do not normally look after sick children may be asked to treat children, and to avoid the transfer of children infected with influenza where appropriate, in order to allow the children's hospitals to maintain their other essential medical services for complex and seriously ill children. During pandemic influenza those patients requiring admission to hospital for general care should be managed locally at hospitals close to home. Only those patients in respiratory failure and those at high risk with prematurity, underlying respiratory or other disease should be transferred to specialist paediatric services.

Critical care units that do not normally treat children may be required to treat and ventilate children with suitable devices and appropriate clinical support. Some children and neonates however, may require transfer but it must be acknowledged that medical retrieval services are unlikely to respond to any significant surge requirement

for patients that require retrieval and transfer. Should transfer of the child to the specialist paediatric facility be required then this would occur at the earliest opportunity if no improvement in their condition is observed or where recurrent clinical instability occurs.

There is a limited number of negative pressure isolation paediatric ICU beds and neonatal ICU cots. Cohorting patients affected by influenza in open ward areas may be required.

Emphasis should be on preserving specialist paediatric ICU beds for younger critically ill patients. Older children and teenagers (6 to 16 yrs) may be considered appropriate to be managed in adult ICU units, subject to their height and weight, and underlying condition.

Where critically ill children are required to be managed in an adult ICU then if possible a paediatric trained nurse will be redeployed to the adult unit for clinical support. A consultation process for routine patient review will be established between the adult ICU and specialist paediatric services to undertake routine and urgent clinical review/assessment and guide clinical management.

Where a number of young children are being managed individually in separate adult ICU's then consideration should be given to co-locating these children into one adult unit with additional paediatric support/resourcing.

AHS should establish formal communication links with tertiary paediatric centres; including contact telephone numbers - in advance of clinical consultation processes being required.

For obstetric patients with influenza who are at risk of premature delivery then early transfer of the patient to a facility with both adult and neonatal ICU beds is essential.

5.2 Stockpiling Physical Resources and Equipment

A good understanding of the numbers and locations of critical care equipment will allow the most equitable, ethical and efficient use of these resources during an influenza pandemic. The NSW Department of Health is currently preparing an inventory and recording the location of the critical care equipment that may be required in the event of an influenza pandemic, including the numbers and types of mechanical ventilators. A state-wide inventory of other essential critical care unit equipment, such as intravenous fluid pumps, transport monitors, pulse oximeters, and renal replacement therapy machines may be required.

The NSW Department of Health is also giving consideration to the additional equipment and supplies that may be needed to sustain a response, including oxygen, surgical masks, P2 masks, impermeable gowns and other Personal Protective Equipment (PPE), and essential medications and disposables. A list of PPE available from the state medical stockpile will be disseminated to Area Health Services as soon as it is available.

Given the current reliance on 'just-in-time' supply and distribution of stock, Area Health Services will need to give consideration to plans for the storage of equipment that

would be essential to expand critical care capacity, to how such equipment will be accessed, and to the maintenance of supply and delivery chains.¹⁰

6. Workforce Strategies

The rate-limiting step in mounting any coordinated response to a surge in demand for critical care will most likely be the sustained availability of staff. An infectious disease such as pandemic influenza may in addition create the need for staff members to remain at home to care for their dependants, and may also reduce the numbers of staff that attend work, due to fear of the disease, or an unwillingness to place themselves (and by extension, their families) at risk of infection.

The most likely scenario is that 20% of staff will be affected by influenza resulting in 5 days of sick leave per staff member. An additional percentage may choose not to attend due to family and potential health concerns.

NSW Department of Health and Area Health Services must develop contingency plans for expanding the workforce available to support additional critical care capacity.

Issues to be considered during planning and preparation include:¹⁰

- Assessment of what might constitute acceptable minimum staffing arrangements under different pandemic scenarios, including acceptable combinations of skilled and experienced staff, with less skilled and experienced staff.
- Administrative processes including organisational and workplace orientation (fire training, working with children, OH&S, etc) which may be a barrier to workforce flexibility.
- Determine the circumstances under which staff may be asked to undertake responsibilities which exceed their normal experience and skill levels, and identifying what additional resources may be required, e.g. training, debriefing, psychological support for staff and their families etc.
- Determine the changes that might be made to shift patterns (e.g. duration of shifts, staffing ratios, changes in staff assigned to critical care units) and the period of time over which such changes might be sustained. It is recognised that rostering staff for longer shifts during an influenza pandemic may be detrimental, as staff may fail to adhere to infection control and personal protective equipment protocols when fatigued.
- Assuring clinicians and volunteers of their indemnity when working under the agreed state protocols and providing the agreed minimum standard of care.
- Planning for the necessity to treat hospital staff and other healthcare workers who have been exposed to influenza in the course of their duties identifying the numbers of staff with carer responsibilities (for children, parents etc.), as this may impact on their availability, and affect staff rostering.
- Consideration of limiting staff to one workplace for the duration of the influenza pandemic, and the use of private hospital staff in public hospital facilities (and vice versa).
- Assessment of the impact of the closure of schools, child care centres, day hospitals etc. on contingency arrangements for staffing.

- Identification of other barriers to staff attendance and remaining on site for prolonged periods, and exploring potential solutions, e.g. arrange for care for children or parents by the non-healthcare provider partner.
- Consider the impact of distances travelled and methods of travel used by staff.
- Determine arrangements for accommodation for those staff unable or unwilling to travel home, and for those who might be reluctant to attend work unless hospital accommodation is provided (in order to avoid disease transmission to their family).
- Establish procedures and protocols for segregation of staff, including ensuring that wherever possible staff caring for influenza patients do not care for uninfected patients.
- Establish mutual aid arrangements with neighbouring hospitals, including arrangements for staff unable to travel to their normal place of work, but who may be more able to attend workplaces closer to their homes.
- Determine how support services, such as physiotherapy, pathology, pharmacy, catering, housekeeping and cleaning services, ward orderlies, administrative support, and information technology support, will be maintained or escalated to match the expanded critical care capacity.

6.1 Staff Supplementation

In preparation for staff shortages then the AHS must identify the numbers of existing staff with critical care skills and experience. These staff may be working in existing critical care units, working in other hospital areas, such as operating theatres and respiratory wards, working in health-related areas outside the hospital, or may be retired.

Alternative staff to be considered for bedside clinical care, under supervision, include: non-ICU medical and nursing staff from non-active clinical areas, medical and nursing students, nursing/medical education/research/administrative staff, allied health, ancillary staff and volunteer organisations.

Medical staffing are to be supplemented by anaesthetic, surgical and physician medical staff.

Health care workers with minimal critical care training or experience, but that could be used in support roles in critical care units during an influenza pandemic, need to also be identified and should include staff working in other areas of the hospital, community health care workers, medical students, nursing students and volunteers.

Clinical staff from staffing agencies and private hospitals will also be considered though it is essential that staff work in their principle place of employment to minimise cross infection and provide a sustained workforce.

Staff not normally working with children and therefore not necessarily cleared by background checks for working with children may need to be identified for screening as a matter of priority.

6.2 Minimum Standard for Clinical Staffing in Critical Care

The NSW Intensive Care Taskforce has determined the baseline clinical bedside staffing model which represents the **maximum dilution of expertise** each hospital should allow for patients requiring intensive care i.e.

- 1 experienced ICU Nurse to 4 non-ICU trained carers (pods of 4 patients)
- 1 senior nurse coordinator per 6-8 patients to support ICU nurses and the non-ICU trained staff (each shift)
- 1 overall unit clinical coordinator (each shift)
- **1 unit infection control officer to enforce PPE and isolation protocols (each shift). This is not necessarily health trained personnel as the primary task is surveillance and ensuring compliance with protocol.**
- 1 unit CNE/clinical support position to orientate/train new staff to basic safe standards using established fast-track orientation program (ventilation + monitoring + fluid administration competency) to be available 7 days/week

Once this level of staffing is reached patients should be distributed across facilities to maintain the baseline dilution of trained vs. non-trained staff. In extreme situations when this level of staffing has been reached in each facility at a statewide level, and there is continued demand for intensive care, then this staffing profile may need to be reviewed centrally to determine a new benchmark for all facilities within the statewide jurisdiction.

Strategies should be developed for de-escalation as the emergency subsides. These should include the progressive, planned release and support of staff that may have been working under stress, and possibly continuously on site, for a prolonged period.

There needs to be an emphasis on the importance of maintaining staff safety, confidence and morale. Experience from previous events suggests that these are crucial issues in preserving workforce commitment and availability, and that staff absence is likely to increase if there are valid concerns about their safety or the safety of their families.¹⁰

6.3 Training and Support

To meet the demand for health human resources during a pandemic, a skills-based approach is required to provide safe clinical care, with consideration given to:

- The basic skill sets required for safe practice and which personnel have them.
- What is the baseline experience/inexperienced clinician ratio to meet a safe standard of care?
- What clinical support is required?

Additional training and support will be required for existing critical care staff to enable them to respond appropriately when critical care capacity is expanded as a result of an influenza pandemic. This should include education on the generic plans for opening additional beds, expanding into other clinical areas, departures from normal patient/

staffing ratios, the inclusion/supervision of nursing assistants and volunteers, working with relatively inexperienced medical/nursing/allied health staff, triaging protocols, and restrictions on visiting.

Training in infection control measures should be a priority, particularly in the use of PPE equipment. For further information on infection control in health care facilities, refer to the *Health Care Facility Response to an Influenza Pandemic Part 3: Keeping health care facilities safe and influenza free*.

Support and training programs must be developed for other members of staff that do not usually work in critical care units (but who may be reallocated to such care in appropriate circumstances) to enable them to function appropriately in the event of an emergency where the number of patients substantially exceeds normal critical care capacity.

It is recognised that it may be essential to provide ‘off the shelf’ training at short notice.¹⁰ It may be possible to develop a basic training program for nursing and medical staff for the purposes of expanding critical care capacity, and to make this available over the internet. It may also be possible to provide a training program for refreshing the skills of doctors and nurses with previous critical care experience.

A skills based basic orientation package targeting the delivery of safe fundamental critical care needs to be developed.

Paediatric services should consider a similar “off the shelf” product to provide to adult services required to care for paediatric patients.

7. Transport and Medical Retrieval

An influenza pandemic may lead to a significant increase in the number of adults, children and neonates requiring critical care and existing tertiary referral centres may be unable to accommodate all referrals despite increasing their capacity. In such circumstances it may be inevitable that hospitals that normally routinely transfer patients that require critical care will be expected to provide some level of critical care, including mechanical ventilation.

Alternatively, the numbers of patients requiring transport and retrieval for critical care services may overwhelm the capacity of these services to transport patients to the referral centres, again leading to the need for hospitals to provide care to patients that would normally be referred on. This may pose particular difficulties with children and neonates, where local hospitals may be required to provide care to these patients within their existing adult critical care units, with or without the support of tertiary referral services.

The NSW Aeromedical and Medical Retrieval Service (AMRS) provides statewide coordination of adult medical retrieval services for critically ill patients in collaboration with the Regional Retrieval Services. Similarly the Regional Retrieval Services liaise with AMRS regarding all retrieval activity. The AMRS is the central point of contact for the medical retrieval of critically ill adult patients.

AMRS contact no. 1800 650 004

The Newborn and paediatric Emergency Transport Service (NETS - NSW) provides 'mobile' intensive care and retrieval services in NSW and the ACT for neonates, infants and children. NETS provides a 24-hour, seven day service which includes telephone clinical consultation and conferencing, liaison with specialists in the tertiary hospital system and a bed-finding service.

NETS also will assist in the transfer of at-risk mothers by arranging conference link ups with feto-maternal specialists through the Perinatal Advice Line (PAL).

NETS contact no. 1300 36 2500

8. Communication and Co-ordination

Arrangements should be made to ensure that all staff members are fully informed about planning and preparation for an emergency where normal critical care capacity is likely to be significantly exceeded. This should include:⁸

- informing existing critical care staff of the planned increase in capacity, and arrangements for the provision of critical care during an influenza pandemic
- communication with staff in other areas such as operating theatres, recovery rooms, day surgical units, and coronary care units, which may be included in expansion plans or by limitation of elective services
- communication with other hospital staff, including medical consultants and emergency department physicians in order that they are aware of likely restrictions on critical care, and hence may encourage the appropriate referral of patients
- communication with primary care services in order that GPs and front-line practitioners are aware of likely restrictions on hospital care, and hence may encourage the appropriate referral of patients
- raising awareness of the problems of providing critical care services during an influenza pandemic with the community, and encouraging appropriate discussion of the issues and proposed process for fair and transparent allocation of these resources.¹⁰

All staff are to be familiarised and educated with critical care triage protocols in advance of a pandemic, and must be made aware that the triage tier will be modified as information becomes available during a pandemic.¹⁷ The resource infrastructure required to support effective triage must also be planned, established and tested before a pandemic.¹⁷ The NSW Department of Health has commenced discussions regarding the best method for collection of information of health care facility physical resources, and for maintaining these data systems to ensure that the required information will be available for use during an influenza pandemic. NSW healthcare facilities will be provided with further information once the optimal method for collection and maintenance of this data has been agreed upon. A system for establishing the available human resources across NSW has yet to be developed, but will also be necessary to ensure the best use of available resources.

It is important that local communication structures are linked to formal state communications processes, through the Incident Control System, Emergency

Management committees and formal Emergency Management communication tools such as situation reports.

The NSW Department of Health will provide a website specific to pandemic influenza, and situation updates and other resources will be placed on this website as they become available. This will help ensure that local responses are integrated with the state or national progress of the pandemic, and allow local responses to be refined or adjusted appropriately.

Although this document focuses on planning, preparing, and responding to an influenza pandemic in NSW, the need for a high level of networking and cooperation between surrounding states and territories, including the ACT, Queensland, Victoria and South Australia, as well as with the Commonwealth is also recognised, and should be planned for.

An event that places critical care resources under significant extra pressure is likely to produce similar problems for many other clinical hospital specialties, and to reduce opportunities for communication between practitioners.¹⁰ This may result in missed opportunities for collaborative research/learning about the event and its effects on patients, staff, and resource consumption. Consequently there may be added value in establishing a local coordinating committee to pull together important information and support learning processes during the course of the response.¹⁰

8.1 Research

The pressures that critical care services may be under during a pandemic will reduce or eliminate the opportunity for researchers to plan or develop useful scientific research into the event or its effects.¹⁰ It is however crucially important that information-gathering takes place during the early stages of any incident where national progression is likely to occur in a time-staged manner, since lessons learned from clinical practice in the areas first hit may contribute to saving lives and reducing risks to staff in areas that are subsequently affected.¹⁰ NSW Department of Health will therefore encourage local Area Health Services, individual hospital facilities and professional colleges to consider plans for data collection or research studies in advance of such an event, and provide all reasonable support for projects that may be beneficial for other patients and staff.

The Australian and New Zealand Intensive Care Society (ANZICS) Clinical Trials Group and Infectious Disease Society of Australia are developing an application to the NHMRC for two projects related to H1N1 Influenza focusing on ICU activity and demand, and an observational study to allow comparison of ICU and hospitalised cases with community controls who only get mild disease. ANZICS CTG will be responsible for this project and should be contacted directly for further information.

8.2 Security

An influenza pandemic is likely to have pronounced effects on the community as well as the hospital system. It is possible that there may be supply line disruptions, infrastructure damage, and community unrest. Resources in short supply may be subject to hoarding or theft (e.g. vaccines, antibiotics, antivirals). Any changes in usual clinical care that result in resources not being available to all patients who may need them may increase the potential for violence against health care facilities and providers.

NSW Health is working with other government agencies, including NSW Police to develop a plan for augmenting hospital security during a pandemic. For details of the general security strategies to be employed within health care facilities during an influenza pandemic, refer to *Health Care Facility Response to an Influenza Pandemic Part 3: Keeping health care facilities safe and influenza free*.

9. Conclusion

An influenza pandemic may test the health care system and the community in ways that have not been seen since at least the second world-war. The likely impact of a pandemic on the demand for critical care resources necessitates a thoughtful and considered approach to the allocation of these resources, in order to ensure the equitable, ethical and efficient use of these resources during such an event. This document provides the basic framework to support these processes which need to be prepared and tested in the context of local conditions.

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Appendix (1) Distribution of critical care beds and additional physical capacity.

NSW PUBLIC HOSPITAL ICU AND HDU BED CAPACITY JUNE 2009																
Area Health Service	Hospital		Role	Unit Type	Adult Beds				Paediatric Beds				Neonatal Cots			
					ICU Available	ICU Additional Physical Spaces	HDU Available Beds	HDU Additional Physical Spaces	PICU Available	PICU Additional Physical Spaces	PHDU Available Beds	PHDU Additional Physical Spaces	NICU Available	NICU Additional Physical Spaces	Neon Non-vent Available Beds	Neon Non-vent Additional Physical Spaces
NSCCAHS	RNS	B218	6	Cardiothoracic	4	0	4	0	-	-	-	-	-	-	-	
	RNS	B218	6	Neurosurgical	5	0	3	0	-	-	-	-	-	-	-	
	RNS	B218	6	General	13	5	4	0	-	-	-	-	-	-	-	
	RNS	B218	6	Neonatal	-	-	-	-	-	-	-	-	9	8	5	
	Gosford	B202	5	General	10	2	4	0	-	-	-	-	-	-	-	
	Gosford	B202	5	Neonatal	-	-	-	-	-	-	-	-	-	-	-	
	Hornsby	B210	5	General	8	0	6	0	-	-	-	-	-	-	-	
	Manly	B212	5	General	3	0	5	1	-	-	-	-	-	-	-	
	Ryde	B224	3	General	0	0	6	0	-	-	-	-	-	-	-	
	Mona Vale	B214	4	General	2	0	3	1	-	-	-	-	-	-	-	
	Wyong	B206	3	General	0	0	4	4	-	-	-	-	-	-		
SWAHS	Westmead	D224	6	Cardiothoracic	6	0	6	0	-	-	-	-	-	-	-	
	Westmead	D224	6	Neurosurgical	0	0	12	1	-	-	-	-	-	-	-	
	Westmead	D224	6	General	21	5	0	0	-	-	-	-	-	-	-	
	Westmead	D224	6	Neonatal	-	-	-	-	-	-	-	-	11	5	8	
	Nepean	D210	6	General	13	1	5	0	-	-	-	-	-	-	-	
	Nepean	D210	6	Neonatal	-	-	-	-	-	-	-	-	10	4	10	
	Blacktown	D203	5	General	10	0	6	0	-	-	-	-	-	-	-	
	Auburn	A201	3	General	0	0	8	2	-	-	-	-	-	-	-	
	Mt Druitt	A218	3	General	0	0	5	2	-	-	-	-	-	-		
CHW	CHW	D224	6	Paed/Neonatal	-	-	-	-	19	4	0	0	7	4	16	

NSW PUBLIC HOSPITAL ICU AND HDU BED CAPACITY JUNE 2009																
Area Health Service	Hospital		Role	Unit Type	Adult Beds				Paediatric Beds				Neonatal Cots			
					ICU Available	ICU Additional Physical Spaces	HDU Available Beds	HDU Additional Physical Spaces	PICU Available	PICU Additional Physical Spaces	PHDU Available Beds	PHDU Additional Physical Spaces	NICU Available	NICU Additional Physical Spaces	Neon Non-vent Available Beds	Neon Non-vent Additional Physical Spaces
HNEAHS	John Hunter	Q230	6	Cardiothoracic	2	3	0	0	-	-	-	-	-	-	-	
	John Hunter	Q230	6	General	15	2	4	0	-	-	-	-	-	-	-	
	John Hunter	Q230	6	Paed/Neonatal	-	-	-	-	4	0	0	0	12	0	5	
	Calvary Mater	Q211	5	General	5	0	1	0	-	-	-	-	-	-	-	
	Tamworth	J216	5	General	7	2	4	0	-	-	-	-	-	-	-	
	Armidale	J201	4	General	1	0	4	0	-	-	-	-	-	-	-	
	Maitland	Q206	4	General	0	0	4	0	-	-	-	-	-	-	-	
	Manning	J225	4	General	2	0	8	0	-	-	-	-	-	-	-	
NCAHS	Lismore	H214	5	General	5	0	8	0	-	-	-	-	-	-	-	
	Port Macquarie	H272	5	General	4	1	6	0	-	-	-	-	-	-	-	
	Tweed Heads	H223	5	General	5	0	2	0	-	-	-	-	-	-	-	
	Coffs Harbour	H208	5	General	4	0	6	0	-	-	-	-	-	-	-	
	Grafton	H210	4	General	0	0	5	5	-	-	-	-	-	-	-	
	Kempsey	H212	3	General	0	0	6	0	-	-	-	-	-	-	-	
	GSAHS	Albury	M201	5	General	5	4	4	1	-	-	-	-	-	-	
	Bega	N202	4	General	2	0	4	0	-	-	-	-	-	-		
	Goulburn	N209	4	General	2	0	4	0	-	-	-	-	-	-		
	Griffith	R205	4	General	2	0	4	0	-	-	-	-	-	-		
	Wagga	R219	5	General	5	0	3	0	-	-	-	-	-	-		
GWAHS	Bathurst	L201	4	General	1	1	5	0	-	-	-	-	-	-		
	Broken Hill	S201	4	General	2	0	3	0	-	-	-	-	-	-		
	Dubbo	K211	4	General	4	4	4	0	-	-	-	-	-	-		
	Orange	L216	5	General	4	1	4	1	-	-	-	-	-	-		
Total additional physical beds spaces to be commissioned = 127					310	64	282	29	29	11	0	0	82	27	61	0

NB. The Canberra Hospital (ACT) capacity = NICU (4) NICU additional (0), Non-vent (4) NHDU additional (0)

NSW PRIVATE HOSPITAL ICU AND HDU BED CAPACITY JUNE 2009														
Area Health Service	Hospital	Unit Type	Adult Beds				Paediatric Beds				Neonatal Cots			
			ICU Available	ICU Additional Physical Spaces	HDU Available Beds	HDU Additional Physical Spaces	PICU Available	PICU Additional Physical Spaces	PHDU Available Beds	PHDU Additional Physical Spaces	NICU Available	NICU Additional Physical Spaces	Neon Non-vent Available Beds	Neon Non-vent Additional Physical Spaces
NSCCAHS	Brisbane Waters	General	6	0	0	0	-	-	-	-	-	-	-	
	Dalcross	General + Neuro	4	0	2	0	-	-	-	-	-	-	-	
	Mater Nth Sydney	General	4	0	4	0	-	-	-	-	-	-	-	
	North Shore Private	General + CICU	9	0	2	0	-	-	-	-	-	-	-	
	North Gosford	General + CICU	2	0	2	0	-	-	-	-	-	-	-	
	Sydney Adventist	General + CICU	10	0	2	0	-	-	-	-	-	-	-	
SWAHS	Baulkham Hills	General + CICU	8	0	1	0	-	-	-	-	-	-	-	
	Westmead Private	General + CICU	8	0	4	0	-	-	-	-	-	-	-	
SSWAHS	Strathfield	General + CICU	10	0	0	0	-	-	-	-	-	-	-	
SESAHS	Illawarra	General + CICU	2	0	4	0	-	-	-	-	-	-	-	
	POWP	General + CICU	8	0	0	0	-	-	-	-	-	-	-	
	St George Private	General + CICU	6	0	4	0	-	-	-	-	-	-	-	
	St Vincent's Private	General + CICU	12	0	0	0	-	-	-	-	-	-	-	
GSAHS	Albury Wodonga	General + CICU	0	0	6	0	-	-	-	-	-	-	-	
	Calvary	General + CICU	2	0	2	0	-	-	-	-	-	-	-	
HNEAHS	Lake Macquarie	General + CICU	5	0	1	0	-	-	-	-	-	-	-	
	Lingard	General + CICU	2	0	4	4	-	-	-	-	-	-	-	
Total additional physical beds spaces to be commissioned = 4			98	0	38	4	-	-	-	-	-	-	-	

Appendix 2

Prioritization tool used in triage protocol for the assessment of patients' needs for critical care during an influenza pandemic¹⁷

Initial assessment

Triage code	Criteria	Action or priority
Blue	Exclusion criteria met or SOFA score > 11*	<ul style="list-style-type: none"> • Manage medically • Provide palliative care as needed • Discharge from critical care
Red	SOFA score ≤ 7 or single-organ failure	Highest priority
Yellow	SOFA score 8–11	Intermediate priority
Green	No significant organ failure	<ul style="list-style-type: none"> • Defer or discharge • Reassess as needed

48-hour assessment

Triage code	Criteria	Action or priority
Blue	Exclusion criteria met or SOFA score > 11 or SOFA score stable at 8–11 with no change	<ul style="list-style-type: none"> • Provide palliative care • Discharge from critical care
Red	SOFA score < 11 and decreasing	Highest priority
Yellow	SOFA score stable at < 8 with no change	Intermediate priority
Green	No longer dependant on ventilator	• Discharge from critical care

120-hour assessment

Triage code	Criteria	Action or priority
Blue	Exclusion criteria met or SOFA score > 11 or SOFA score < 8 with no change†	<ul style="list-style-type: none"> • Provide palliative care • Discharge from critical care
Red	SOFA < 11 and decreasing progressively	Highest priority
Yellow	SOFA < 8 with minimal decrease (< 3-point decrease in past 72 h)	Intermediate priority
Green	No longer dependant on ventilator	• Discharge from critical care

Note: SOFA = Sequential Organ-Failure Assessment (see Appendix 1, available at www.cmaj.ca/cgi/content/full/175/11/1377/DC1).

*If an exclusion criterion is met or the SOFA score is > 11 anytime from the initial assessment to 48 hours afterward, change the triage code to Blue and proceed as indicated.

†If an exclusion criterion is met or the SOFA score is > 11 anytime from 48 to 120 hours afterward, change the triage code to Blue and proceed as indicated.