

# Neonatal services guidelines

Defining levels of care in Victorian hospitals





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## Foreword

Provision of newborn care in Victoria is classified into three levels, ranging from community hospitals providing services to women with uncomplicated pregnancies (Level 1) to large metropolitan hospitals offering neonatal intensive care facilities (Level 3).

The *Neonatal services guidelines* (the ‘guidelines’) have been developed to support health services in planning services appropriate to the needs of Victorian newborn infants and their families. This document guides the delineation of levels of hospital neonatal care across Victoria to ensure that the care provided has regard for safe and appropriate practices.

As the title implies, defining levels of neonatal care necessitates reference to the elements that distinguish neonatal care from other care provided by health services. The guidelines provide a framework for assisting health services in determining how best to structure their neonatal service to appropriately meet the needs of their local community, taking into account services that are available both in the immediate area and more broadly.

I thank all those who have contributed to the development of these guidelines, either through providing comment during the consultation process or through their involvement in the working group. Particular thanks are due to Dr Ellen Bowman for her work in developing the guidelines and to the Neonatal Services Advisory Committee for their input throughout the project.

I trust that your health service will find the guidelines of value in the process of planning services appropriate to your local needs.



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# Introduction

## Aim and objective of the guidelines

The aim of the *Neonatal services guidelines* (the ‘guidelines’) is to delineate levels of neonatal care provided in Victoria’s public hospitals.

The objective of delineating levels of hospital neonatal care is to affirm that the levels of neonatal services offered by hospitals are the most appropriate to the newborn infant’s condition. Developing uniform definitions promotes consistency of service provision for each level of care.

The intentions of these guidelines are consistent with the Health Services Act 1988 which promotes:

- orderly development of health services in Victoria
- adequacy of health services in any part of Victoria
- improvement of the quality of health care and health facilities.

## Using the guidelines

These guidelines have been developed to support health services in planning services appropriate to the needs of Victorian newborn infants and their families. They provide health services with a framework for making decisions about delivery of neonatal services within a comprehensive health care system. Implementation of these guidelines will foster the continued development of an integrated neonatal service system.

Every hospital providing services for the care of the newborn should develop policies and procedures regarding:

- newborn infants for whom they can provide continuing care
- and
- relationships with hospitals that provide a higher level of care for infants needing more complex levels of care.

Victoria has a three-tier neonatal service system that is based on service capability to provide increasing complexity of care to newborn infants (see ‘Levels of neonatal care’ below). The guidelines outline the criteria required for providing care at each level, with reference to elements such as personnel, equipment, facilities, support services, staff development and service organisation.

The guidelines provide for some flexibility in service provision to meet local circumstances and requirements. However, where the appropriate level of care is not available to meet the needs of both the newborn infant and the family, health services should have a well-established communication system for the timely referral to a hospital that can provide the required care.

These guidelines focus on levels of neonatal care. They are not intended to prescribe models or levels of care for maternity services. Maternity issues are only included in the guidelines where they are inextricably associated with neonatal care issues. The relevant references for maternity services are *Future directions for Victoria’s maternity services* (Department of Human Services June 2004) and, for rural health services, the *Rural Birthing Services Planning Framework* (Rural and Regional Health and Aged Care Services, Department of Human Services 2005).

## Levels of neonatal care

The concept of levels of care requires:

- definition of relevant areas of responsibility for individual hospitals within a comprehensive health care system
- establishment of referral practices and transport services enabling transfer to different levels of care when appropriate
- establishment of necessary professional and technical infrastructure within hospitals.

Three levels of neonatal care are described. These levels are differentiated by the service capability required to provide a designated level of care for newborn infants. Variations in services may be warranted based on the needs of individual patients, resources and limitations unique to the hospital or type of practice. When present, variations in service provision require documentation and, where relevant, development of an appropriate risk management strategy.

Neonatal services are designated by the highest level of care they provide, even though they may also provide less complex care.

### Level 1

Hospitals with a birthing service that:

- provide services to women with uncomplicated pregnancies and newborn infants without complications
- undertake appropriate management, including consultation with, or transfer to, a higher level of care (if required)
- undertake immediate management of unanticipated complications arising in a newborn baby.

### Level 2

Larger hospitals that, while providing for all Level 1 services, also:

- provide services for the diagnosis and management of selected at-risk pregnancies and neonatal conditions (excluding intensive care)
- participate as a local hub in the network established to provide consultative services and perinatal education.

### Level 3

Large tertiary maternity and children's hospitals that provide neonatal intensive care as well as a broad range of sub-specialty consultative and paramedical services. They may also provide Level 1 and Level 2 neonatal care.



# Guidelines

## General

Hospitals providing neonatal services require organisation, management, staff and equipment to provide:

- optimum care and outcome for babies
- access and support for the family unit
- maximum staff efficiency and satisfaction.

General criteria for the management of all levels of hospital neonatal care include the following elements.

## Organisation of services

- Document the scope and limitations of nursing and medical staff functions.
- Establish clear referral policies and lines of communication.
- Establish clear arrangements for:
  - prompt, safe and effective resuscitation of babies
  - care of babies who require continuing support, either within the hospital or by safe transfer elsewhere
  - immediate availability of a professional who has received training and is skilled in neonatal resuscitation.

## Staff administration

- Provide a staff performance appraisal system.
- Ensure all appropriate industrial agreements are met.
- Undertake workforce planning activities.
- Maintain appropriate levels of suitably qualified nursing and medical staff for babies admitted in the facility.

## Policies and procedures

- Establish policies that ensure the provision of infant and family focused, holistic care.
- Establish policies for admission and discharge criteria as per Appendix 4.
- Establish policies and procedures for transfer and retrieval of babies.

## Clinical protocols

- Establish clinical practice guidelines using appropriate evidence-based tools, such as the *Neonatal handbook* (Neonatal Services Advisory Committee 2004) or the *Guidelines for the development and implementation of clinical practice guidelines* (National Health and Medical Research Council 1999).
- Document medical and nursing protocols.
- Regularly review all procedures and protocols.

## Facilities and equipment

- Provide facilities conforming at least to the minimum standards required by the *Design guidelines for hospitals and day procedure centres* (Department of Human Services).
- Maintain visual, auditory and olfactory privacy.
- Maintain access to appropriate laboratory services, including biochemistry, haematology and microbiology. Ideally, this access would be provided on a 24-hour basis.
- Maintain access to appropriate imaging services.
- Maintain a system for regularly checking the safety of equipment.

## Staff education

- Conduct staff orientation and continuing education programs.
- Provide regular in-service training, which includes neonatal resuscitation.
- Establish a program for annual competency review of neonatal care and practices.

## Quality improvement program

- Maintain a program that is included in the overall quality improvement program of the facility.
- Consider relevant statistics/data provided by the Victorian Perinatal Data Collection Unit.
- Continually monitor and evaluate adequacy of services provided.
- Monitor the routine collection of information about important aspects of service delivery including:
  - referrals
  - transfers, both in labour and after birth
  - neonatal mortality and morbidity
  - high-risk babies (such as babies <2,500 grams birth weight).
- Assess information to identify important problems in delivery of services and opportunities to improve.
- Ensure actions are taken and re-evaluated to ensure long-term improvements when important problems or opportunities to improve are identified.
- Regularly communicate results of activities to staff.
- Maintain appropriate high quality documentation, while ensuring confidentiality of staff and patients is preserved.

## Clinical and support services

### Guidelines for Level 1 neonatal services

All hospitals with a Level 1 neonatal service should follow these guidelines in providing care.

#### Provision of care

- Be capable of assessing, diagnosing and managing uncomplicated pregnancies and:
  - newborn infants without complications
    - gestation 37 weeks or greater
    - birthweight 2,500 grams or greater
  - newborn infants with minor conditions not requiring additional nursing or specialist medical treatment
  - newborn infants requiring phototherapy (in consultation with a specialist paediatrician)
  - simple convalescent infants (for example, infants establishing feeding).
- Provide skilled personnel for perinatal emergencies. At least one person capable of initiating neonatal resuscitation should be at every birth. In the case of unexpected complications, another appropriately trained professional should be available to assist the primary carer.
- Ideally, have the capacity to perform caesarean section. If a caesarean section service is not available, guidelines for management of an emergency caesarean section should be developed.
- Have established links with higher level units regarding:
  - communication
  - referral
  - patient transfer
  - continuing education.
- Have established links and consultation processes with primary health service providers.

## **Staff**

- Provide the following medical staff:
  - suitably qualified and experienced medical officers who will provide a range of obstetric and neonatal services
  - medical officer(s) who are available on a 24-hour basis for consultation, and who will be in the hospital within a time consistent with the health service's risk management protocol
  - practitioners who participate in a structured, periodic medical refresher program, which includes neonatal resuscitation and perinatal emergencies
  - regional medical specialists who are readily available for specialised consultation when required.
- Provide the following nursing staff:
  - suitably qualified and experienced nurses/midwives who have up-to-date qualifications in neonatal resuscitation to provide care in the postnatal and birthing areas
  - staff establishment must include some nurses/midwives with experience in neonatal or paediatric care and/or nurses/midwives undertaking relevant studies.

## **Diagnostic services**

- Provide access to:
  - personnel capable of determining blood type and cross-matching blood. Ideally, this access would be provided on a 24-hour basis.
  - a radiology technician to perform portable X-rays on a 24-hour basis.

## Equipment

- Have equipment as detailed below:
  - equipment for resuscitation
  - incubator
  - venous access and emergency intravenous infusion
  - equipment suitable for hand ventilation
  - oxygen therapy
  - oxygen saturation monitoring with a neonatal probe
  - blood glucose monitoring
  - portable X-ray facilities
  - equipment suitable for drainage of a pneumothorax
  - phototherapy unit (optional).

A baby who has problems identified immediately after birth or who becomes ill subsequently, may require care prior to appropriate transfer, including monitoring of vital signs and fluid and drug treatment. These services should, therefore, be available.

## Facilities

- Preferably, provide infant care where the mother is receiving postpartum care. Where care is provided within a newborn nursery, each infant requires:
  - 2.8 net square metres of floor space
  - 1.0 metre between infant beds
  - one pair of wall mounted electrical outlets for each two infant station
  - one compressed air outlet and one suction outlet for each four infant station.

## Resources for stabilisation

- Provide resources required for stabilisation prior to transport by a specialist team. Where there is a nursery facility available for stabilisation of newborn infants, resources should include:
  - an area that can be made available, when required, of at least 15 square metres
  - an open resuscitation trolley or open care infant care unit with integrated overhead lighting, variable radiant heat source and access for portable X-ray
  - two sources of oxygen (reticulated preferred), two sources of medical grade air (reticulated preferred), two outlets for suction (including one outlet regulated for controlled suction)
  - ten power outlets (at appropriate electrical safety levels to ensure body protection)
  - a wash sink, soap dispenser, paper towelling, waste receptacle, sharps disposal container and procedure trolley
  - a flat surface for documentation purposes
  - a telephone within the resuscitation area from which direct calls can be made (preferably hands free or cordless)
  - additional desirable facilities include a procedure light, wall clock and X-ray viewing board.

**Note:** Where hospitals do not have a designated area specifically available for stabilisation of newborn infants, the above resources should be considered in making planning decisions in regard to a resuscitation area.

### **Additional services**

- Give information, and make it readily accessible, to all women regarding available facilities and procedures established for transfer should complications occur.
- Consider physical safety in order to minimise the risk of infant abduction in all newborn care areas. Intruder alarms are required to external doors or windows of newborn care areas in accordance with the requirements of the *Design guidelines for hospitals and day procedure centres* (Department of Human Services).
- Provide ready access to emergency transport facilities, including road, fixed and rotary wing services, as appropriate.

### **Guidelines for Level 2 neonatal services**

Level 2 services are divided into **Level 2 low dependency care** and **Level 2 high dependency care**, which are differentiated from one another by their capacity to manage newborn conditions appropriate to the level of care capability as detailed in:

- Guidelines for Level 2 low dependency neonatal services
- Guidelines for Level 2 high dependency neonatal services.

All hospitals providing Level 2 neonatal services should accept referred patients to a defined level of care.

## Guidelines for Level 2 low dependency neonatal services

Hospitals providing a Level 2 low dependency neonatal service must comply with guidelines for Level 1 neonatal services and the following guidelines.

### Provision of care

- Be capable of assessing, diagnosing and managing:
  - newborn infants without complications
    - gestation 34 weeks or greater  
The majority of preterm infants born at 35 or 36 weeks gestation are sufficiently mature to maintain their body temperature and feed normally enabling observation to occur in the birthing unit and/or postnatal ward.
    - birthweight 2,000 grams or greater, including growing preterm and convalescing infants
  - newborn infants requiring incubator care for:
    - short-term transition problems
    - mild complications:
      - oxygen requirement (not exceeding 40 per cent)
      - apnoea monitoring
      - blood glucose monitoring
      - short term intravenous therapy
      - phototherapy
      - gavage feeding.
- Ensure all patients receiving Level 2 care are referred for management by the attending paediatrician.
- Document a protocol for communication with Level 3 services and Level 2 high dependency services.
- Give careful consideration to transfers from surrounding Level 1 hospitals as to when direct referral to a Level 3 or Level 2 high dependency service is more appropriate.

## Staff

- Provide the following medical staff:
  - suitably qualified and experienced general practitioners who will provide a range of obstetric, neonatal and anaesthetic services
  - a specialist obstetrician, paediatrician and anaesthetist on the hospital staff to advise on obstetric, neonatal and anaesthetic services and to participate in patient care as appropriate
  - a designated paediatrician with responsibility for the clinical standards of care of newborn babies
  - obstetricians and paediatricians or accredited medical practitioners on-call 24 hours a day
  - a comprehensive anaesthetic service for all elective and emergency services; general anaesthetics given by accredited medical practitioners (anaesthetists) should be available 24 hours a day
  - a radiologist and clinical pathologist should be available 24 hours a day.
- Provide the following nursing staff:
  - the nurse/midwife in charge of the nursery should have a minimum of three years recent full-time or equivalent midwifery or neonatal experience, including some Level 2 high dependency experience
  - at least one registered nurse/midwife allocated to the neonatal area on each shift should have recent Level 2 high dependency neonatal experience, and all staff rostered should preferably be pursuing high dependency neonatal nursing experience and qualification
  - personnel with expertise in lactation should be available
  - the level of staffing should comply with that specified by the relevant enterprise bargaining agreement.

## **Diagnostic services**

- Provide pathology and imaging services as follows:
  - all laboratory and imaging support services should be in-hospital or of equivalent availability
  - blood and specimen collecting services should be available 24 hours a day
  - cross-matched blood should be readily available and blood storage facilities should be on site
  - a range of urgent tests should be available 24 hours a day, including haemoglobin, blood gas analysis and simple electrolytes
  - radiography and ultrasonography should be readily available.

## **Support services**

- Provide access to the following support services:
  - social work
  - infection control
  - clinical educator
  - family services, including:
    - liaison psychiatry
    - spiritual support
    - liaison workers for families from culturally and linguistically diverse backgrounds and Aboriginal and Torres Strait Islander families
  - pharmacy services
  - physiotherapy
  - dietetics
  - technical equipment support services
  - ward clerks, portering and cleaning services.

## Equipment

- Have equipment as per guidelines for Level 1 neonatal services and, in addition:
  - apnoea monitor
  - non-invasive blood pressure monitoring
  - headbox
  - mechanical ventilator
  - oxygen analyser
  - phototherapy unit
  - equipment for gavage feeding
  - camera to provide instant photographs.

## Facilities

- Have newborn nursery standards which conform to the requirements of the *Design guidelines for hospitals and day procedure centres* (Department of Human Services) and have capacity to accommodate up to 25 per cent of babies on the unit at any given time.
- Ideally, have natural and artificial lighting in the nursery, colour corrected to natural.
- Ideally, meet the following requirements for each infant care space:
  - 4.7 net square metres of floor space for each infant station
  - approximately 1.2 metres between incubators or infant cots
  - six electrical outlets, one oxygen outlet, one compressed air outlet and one suction outlet.

- Provide other areas such as:
  - discreet rooms appropriately equipped for expressing breast milk and breast pumps available for home-loan
  - a comfortable waiting area for parents which includes sleeping accommodation, a quiet room, bathroom, a telephone and facilities for making drinks
  - allocated space for staff station, storage, linen bay, formula preparation, feeding area and infant examination and bathing, as specified by the *Design guidelines for hospitals and day procedure centres* (Department of Human Services).

### **Additional Services**

- Have a detailed plan in the event of emergency evacuation, specifying equipment and personnel requirements.
- Provide 24-hour access to appropriate manuals, clinical guidelines and textbooks for use by staff within the clinical setting.

## Guidelines for Level 2 high dependency neonatal services

Hospitals providing a Level 2 high dependency neonatal service must comply with all preceding guidelines in this document, as well as the following guidelines.

### Provision of care

- Be capable of assessing, diagnosing and managing:
  - newborn infants without complications
    - gestation 32 weeks or greater
    - birthweight 1,300 grams or greater
  - newborn infants requiring:
    - incubator care, either because they are sick or preterm
    - oxygen therapy (not exceeding 60 per cent)
    - cardiorespiratory monitoring
    - short-term, intra-arterial blood gas monitoring
    - non-invasive blood pressure monitoring
    - close observation (for example, neonatal abstinence syndrome)
    - short-term ventilator care pending transfer (less than six hours)
  - newborn infants requiring specialty services:
    - exchange transfusion
    - nasal continuous positive airway pressure (CPAP).

Availability will vary between hospitals. Not all units will have protocols established to provide all services. Protocols developed must be consistent with relevant guidelines (for example, *Administration of nasal CPAP in non-tertiary Level 2 nurseries*, developed by the Neonatal Services Advisory Committee, Victoria). Where provided, these services should be undertaken following consultation with a tertiary centre.

- Document a protocol for communication with Level 3 neonatal services.
- Give careful consideration to transfers from surrounding Level 1 and Level 2 low dependency units as to when direct referral to a Level 3 service is more appropriate.
- Ensure all babies admitted to the newborn nursery are referred for management by the attending paediatrician.

## **Staff**

- Provide the following medical staff:
  - specialist obstetric, paediatric and anaesthetic staff on-call 24 hours a day
  - a designated paediatrician to have responsibility for development of clinical guidelines, maintenance of professional standards and the overall functioning of the unit
  - pre-registration house officers should not provide resident medical cover for the high dependency care area
  - 24-hour availability of a consultant doctor with neonatal training who should maintain professional development in the care of newborn babies, including regular revalidation in newborn life support
  - a resident doctor must be available. If a paediatric service and a neonatal high dependency service co-exist, staffing arrangements should ensure the immediate availability to the neonatal unit of a professional competent to manage a neonatal emergency when the paediatric service is busy.

- Provide the following nursing staff:
  - a designated senior nurse/midwife with neonatal experience and managerial responsibility
  - a designated nurse/midwife responsible for further education and training, including in-service experience in resuscitation of neonates
  - a sufficient number of experienced staff to supervise and educate staff, as required by their level of practice
  - a registered nurse/midwife should be in charge of the neonatal area if it is continuously occupied. This person should have extensive experience in neonatal high dependency Level 2 care and/or qualification or experience in neonatal and/or paediatric intensive care
  - a registered nurse/midwife in charge of the nursery on each shift. This person should have a midwifery or paediatric qualification and should have high dependency Level 2 experience, and preferably be pursuing further qualification in neonatal high dependency care
  - other registered nurses/midwives should have some neonatal high dependency experience and/or have completed the Level 2 course.

### **Diagnostic services**

- Provide pathology services as per guidelines for Level 2 low dependency neonatal services and, in addition:
  - on-site departments of pathology and imaging services with a medical director
  - a blood bank with on-site cross-matching
  - a 24-hour, on-call pathology service.

### **Support services**

- Provide access to:
  - speech and language pathology
  - ophthalmology (highly desirable).

## Equipment

- Have neonatal equipment as per guidelines for Level 2 low dependency neonatal services and, in addition:
  - radiant heater with servo-control
  - facilities for heater humidification of gases
  - cardiorespiratory monitoring
  - intra-arterial blood gas monitoring
  - equipment for safe infusion of intra-arterial fluids.

## Facilities

- Provide each infant care space as per guidelines for Level 2 low dependency neonatal services and, in addition:
  - for infants requiring at least six hours of nursing time per day:
    - 9.5–11.5 net square metres per infant station
    - 1.2 metres between infant stations
    - aisles 1.5 metres in width
    - eight electrical outlets, two oxygen outlets, two compressed air and two suction outlets
  - isolation facilities as specified in the *Design guidelines for hospitals and day procedure centres* (Department of Human Services).
- Provide other areas such as:
  - a quiet conference room containing appropriate written, audiovisual and electronic reference materials
  - staff facilities sited close to the patient area and in adequate communication with it.

## Guidelines for Level 3 neonatal services

Level 3 programs need to be located at academic institutions due to the complexity of the clinical, educational and research services provided.

The neonatal intensive care unit (NICU) should be a distinct area within the health care facility, with controlled access and a controlled environment. Traffic to other services should not pass through the unit. In order to be able to admit infants to the neonatal unit and to maintain safety, services should be planned for at least an average minimum occupancy of 70 per cent. Access to other hospital services is required as follows:

Direct access	Ready access	Access
<ul style="list-style-type: none"> <li>- Delivery suites</li> <li>- Operating theatre</li> </ul>	<ul style="list-style-type: none"> <li>- Emergency department</li> <li>- Maternity wards (AN &amp; PN)</li> <li>- Medical records</li> <li>- Pathology/blood bank</li> <li>- Transport receiving area to receive outborn transfers</li> <li>- Education resources</li> </ul>	<ul style="list-style-type: none"> <li>- Allied health services</li> <li>- Biomedical engineering</li> <li>- Family accommodation</li> <li>- Imaging</li> <li>- Mortuary</li> <li>- Outpatients</li> <li>- Pharmacy</li> </ul>

Hospitals providing a Level 1 and Level 2 neonatal service as well as a Level 3 neonatal service, must comply with all preceding guidelines in this document. In addition, they should comply with the following guidelines.

## Provision of care

- Be capable of assessing, diagnosing and managing all newborn infants requiring neonatal intensive care including infants:
  - requiring continuing assisted ventilation via an endotracheal tube, and for the 24 hours following endotracheal tube removal
  - requiring oxygen therapy (more than 60 per cent) for more than four hours
  - with tracheostomies requiring intermittent positive pressure ventilation (IPPV) or CPAP
  - requiring a nasopharyngeal tube (without CPAP) to maintain airway patency
  - requiring an arterial line for continuing blood gas and/or blood pressure monitoring
  - having frequent seizures
  - undergoing major surgery, on the day of the procedure and for 48 hours postoperatively, including:
    - any procedure where a body cavity is opened
    - repair of neural tube defect
    - placement of a ventriculoperitoneal shunt or temporary ventricular drainage device
  - undergoing tracheostomy on the day of the procedure and for five days thereafter
  - with long gap oesophageal atresia awaiting definitive/palliative surgery
  - requiring 1:1 nursing care.
- Conduct a formal neonatal training program for junior doctors as well as continuing education and recertification programs for all medical and nursing staff.

- Have defined lines of communication and access to specialist advice from:
  - obstetrics/feto-maternal medicine
  - neonatal surgery and anaesthesia
  - paediatric cardiology
  - imaging, including ultrasound, computed tomography (CT), magnetic resonance imaging (MRI)
  - ophthalmology
  - laboratory services (including clinical biochemistry, microbiology, haematology, transfusion)
  - perinatal pathology (including autopsy)
  - clinical genetics (including dysmorphology)
  - paediatric endocrinology
  - paediatric neurology and neurophysiology
  - paediatric nephrology
  - audiology
  - other surgical specialists – ears, nose and throat (ENT), orthopaedics, neurosurgery, plastic surgery.

## Staff

- Provide the following medical staff:
  - the unit should be staffed by consultants whose duties are to provide care to newborn infants in the delivery units, postnatal wards, special care nursery (SCN) and NICU
  - there should be 24-hour resident cover by an appropriately trained doctor who should be available for the intensive care unit at all times and not be required to cover any other service
  - at least one doctor who is experienced to deal with all emergencies should be on site 24 hours a day
  - at least one consultant should be predominantly present during working hours and exclusively rostered to be available, and able to proceed immediately, to the unit at all times
  - at least one registered medical practitioner with appropriate level of experience in the hospital should be predominantly present in the unit
  - sufficient supporting specialists should be provided so that consultant support is always available to the medical staff in the unit. There should be sufficient specialist staff to provide for reasonable working hours and leave of all types, and to allow the duty specialist to be available exclusively to the unit.
- Provide the following nursing staff:
  - the nurse/midwife in charge should hold an appropriate postgraduate qualification
  - at least one nurse/midwife with a postgraduate qualification should be on duty at all times
  - there should be a nurse educator and formal nursing education program.

## **Diagnostic services**

- Have access to pathology (including clinical biochemistry, microbiology, haematology, transfusion) and tertiary imaging services on a 24-hour basis.

## **Support services**

- Have access to:
  - occupational therapy and play therapy
  - pharmacy services and sub-specialist paediatric advice on a 24-hour basis
  - secretarial services to support educational and administrative activities which are separate from ward clerk duties
  - biomedical, scientific staff and audit assistants
  - staff responsible for liaison with primary care teams.

## **Equipment**

- The unit should have a relationship with the biomedical engineer (BME) and conjointly agreed policy and budget for equipment purchase, maintenance, replacement and upgrading.
- Equipment for assisted ventilation must include alarm systems to monitor gas supply failure and breathing system disconnection and humidification with monitoring of inspired temperature and high temperature alarms.
- An intra-hospital transport system is required, including mechanical ventilation.
- Equipment for specialised diagnostic or therapeutic procedures should be available for times when clinically indicated and to support the delineated role of the unit.

## Facilities

- Ideally, meet the following requirements for each infant care space:
  - a minimum of 12 square metres, with more space required in chronic care areas
  - each family care space should be designed to include privacy for the baby and family
  - in multiple bed rooms, a minimum of 2.4 metres is required between infants' beds
  - the aisle between single rooms should be no less than 2.4 metres; the aisle in a multiple bed room should be a minimum of 1.2 metres
  - each intensive care position requires a minimum of 20 simultaneously accessible electric outlets; three air, three oxygen and three vacuum outlets; four data transmission points are required at each bed
  - adjustable lighting should be available within clinical areas with separate procedure lighting provided at each care site; direct ambient lighting should not be used in the infant care space; and all general lighting should be colour corrected
  - clinical care areas should be designed to minimise the transmission of sound between adjacent treatment areas and sound levels to conform to Australian Standards
  - medical gases should be internally piped to all patient care areas
  - electricity supply should be surge protected to protect electronic and computer equipment and the electricity supply to patient care areas should be in accordance with Australian Standards of cardiac or body protection
  - emergency power – uninterrupted power supply (UPS) and generator – should be available to all lights and general power outlets (GPOs) in resuscitation and acute care areas; emergency lighting should be available in all other areas; and all computer terminals should have access to emergency power

- the unit requires an isolation room (type N) as specified by the *Design guidelines for hospitals and day procedure centres* (Department of Human Services)
- where an individual room concept is used, a hands-free, hand-washing sink is required within each infant care room
- in a multiple bed room, every bed position should be within 6 metres of a hands-free, hand-washing sink (61 cm x 41 cm x 25 cm)
- provision for charting space at each bedside is required as well as an additional separate area or desk for tasks, such as compiling more detailed records, completing requisitions and telephone communication
- all doors through which patients may pass should be of sufficient size to accommodate a full hospital bed with attached intravenous flasks
- wall surfaces in areas that may come into contact with mobile equipment should be reinforced and protected with buffer rails or similar
- stops should be fitted to the floor to stop equipment from coming into contact with, and damaging, fittings, monitors, etc.
- all surfaces in high-risk treatment areas should be smooth and impervious
- where intensive care infants are nursed within the same area as infants requiring lower intensity care, all infant stations must be maintained at the standard required to provide the maximum level of care offered.
- Provide other facilities as follows:
  - point of care access for electrolyte and blood gas analysis are highly desirable
  - the intensive care unit should be adjacent to perinatal services (where present)
  - a dedicated elevator should be provided when perinatal and neonatal services are on separate floors
  - clinical care areas should have exposure to daylight, wherever possible, to minimise patient and staff disorientation and lighting should conform to Australian Standards

- a wall clock should be visible in all clinical areas and waiting areas, with times displayed in all areas synchronised
- service organisation should ensure maintenance of visual, auditory and olfactory privacy
- a separate area should be available for departmental, secretarial assistance and computerised, patient data entry and analysis, with confidentiality built into any system
- a tutorial room should be provided in a quiet, non-clinical area near the staff room and offices, with appropriate resources available (for example, video cassette player, television, slide projector, overhead projector, whiteboard, GPOs, projection screen, liquid crystal display (LCD) projector, X-ray viewing facilities, telephone, storage cupboard)
- pictorial hand-washing instructions should be provided above all sinks, as well as space provided for soap and towel dispensers and appropriate rubbish receptacles
- separate receptacles for biohazardous and non-biohazardous waste should be available
- hand-washing facilities that can be used by children and people in wheelchairs should be available
- facilities for families should include:
  - at least one separate interview room
  - a separate area for distressed relatives
  - overnight rooms for relatives
  - lockable storage facilities for family's personal belongings
- clearly identified entrance and staffed reception area are required for contact between families and staff and also to enhance security for infants in the NICU

- space is required within the NICU to meet the professional, personal and administrative needs of nursing and medical staff and rooms sized to provide privacy and to satisfy their intended function
- facilities are required for the following essential functions and should conform to the standards of the *Design guidelines for hospitals and day procedure centres* (Department of Human Services):
  - teaching
  - research (medical and nursing)
  - administration
  - staff amenities (for example, locker, lounge and on-call rooms)
  - reception/waiting area
  - pharmacy/drug preparation
  - isolation room(s)
  - support services (for example, storage, clean and dirty utility, linen trolley bay, mobile equipment bay, mobile X-ray equipment bay, cleaner's room)
  - diagnostic area (for example, medical imaging area, laboratory area)
- telephones should be available in all offices, at all staff stations, in the clerical area and in all consultation and other clinical rooms. The use of multifunction, wireless communication devices should be considered. Additional phone points should be available for the use of facsimile machines and computer modems where required.
- direct telephone lines bypassing the hospital switchboard should be available
- sufficient computer terminals should be available to ensure that queuing does not occur, even at peak times.

## Appendix 1: Neonatal conditions managed according to level of care

Three levels of care are described. Variations in services may be warranted based on the needs of individual patients, resources and limitations unique to the hospital or type of practice. When present, variations in service provision require documentation.

### Level 1

- Uncomplicated:
  - gestation 37 weeks or greater
  - birthweight 2,500 grams or greater.
- Emergency resuscitation and stabilisation.
- Minor conditions not requiring additional nursing or specialist medical treatment.
- Phototherapy (in consultation with a specialist paediatrician).
- Simple convalescent babies (for example, infants establishing feeding).

### Level 2 low dependency

As above, and in addition:

- Uncomplicated:
  - gestation 34 weeks or greater  
The majority of preterm infants born at 35 or 36 weeks gestation are sufficiently mature to maintain their body temperature and feed normally enabling observation to occur in the birthing unit and/or postnatal ward.
  - birthweight 2,000 grams or greater, including growing preterm and convalescing infants.

- Infants requiring incubator care for:
  - short-term transition problems
  - mild complications:
    - oxygen requirement (not exceeding 40 per cent)
    - apnoea monitoring
    - blood glucose monitoring
    - short-term intravenous therapy
    - phototherapy
    - gavage feeding.

## Level 2 high dependency

As above, and in addition:

- Uncomplicated:
  - gestation 32 weeks or greater
  - birthweight 1,300 grams or greater.

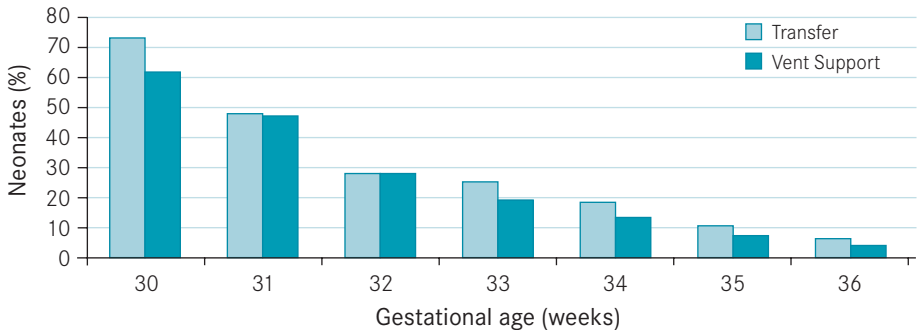
**Note:** The more immature the infant, the greater the complexity of care required and the higher the risk for assisted ventilation. The following graph shows:

- the percentage of outborn infants transferred to Level 3 units in Victoria
- the percentage of inborn infants receiving assisted ventilation (IPPV or CPAP) at the Royal Prince Alfred Hospital in New South Wales.

Risk for assisted ventilation also increases with:

- absence of labour
- multiple birth.

## Transfer and ventilator support by gestational age



- Infants requiring:
  - incubator care either because they are sick or preterm
  - oxygen therapy (not exceeding 60 per cent)
  - cardiorespiratory monitoring
  - short-term intra-arterial blood gas monitoring
  - non-invasive blood pressure monitoring
  - close observation (for example, neonatal abstinence syndrome)
  - short-term ventilator care pending transfer (less than six hours).
- Specialty services:
  - exchange transfusion
  - nasal CPAP

Availability will vary between hospitals. Not all units will have protocols established to provide all services. Protocols developed must be consistent with relevant guidelines (for example, *Administration of nasal CPAP in non-tertiary Level 2 nurseries*, developed by the Neonatal Services Advisory Committee, Victoria). Where provided, services should be undertaken following consultation with a tertiary centre.

## Level 3

As above, and in addition:

- All newborn infants requiring neonatal intensive care including infants:
  - requiring continuing assisted ventilation via an endotracheal tube, and for the 24 hours following endotracheal tube removal
  - requiring oxygen therapy (more than 60 per cent) for more than 4 hours
  - with tracheostomies requiring IPPV or CPAP
  - requiring a nasopharyngeal tube (without CPAP) to maintain airway patency
  - requiring an arterial line for continuing blood gas and/or blood pressure monitoring
  - having frequent seizures
  - undergoing major surgery, on the day of the procedure and for 48 hours postoperatively, including:
    - any procedure where a body cavity is opened
    - repair of neural tube defect
    - placement of a ventriculoperitoneal shunt or temporary ventricular drainage device
  - undergoing tracheostomy on the day of the procedure and for five days thereafter
  - with long gap oesophageal atresia awaiting definitive/palliative surgery
  - requiring 1:1 nursing care.

## Appendix 2: Diagnostic and support services required according to level of care

### Level 1

Should have:

- Access to personnel capable of determining blood type and cross-matching blood, ideally on a 24-hour basis
- Access to a radiology technician to perform portable X-rays on a 24-hour basis
- Bedside blood glucose monitoring equipment
- Oxygen saturation analyser with neonatal probe.

### Level 2 low dependency

As above, and in addition:

- All laboratory and imaging support services to be in-hospital or of equivalent availability
- Blood and specimen collecting services available 24 hours a day
- Cross-matched blood readily available and blood storage facilities on site
- A range of urgent tests available 24 hours a day, including haemoglobin, blood gas analysis and simple electrolytes
- Access to radiography and ultrasonography
- Access to support services including:
  - clinical educator
  - dietetics
  - family services including:
    - liaison psychiatry
    - spiritual support
    - liaison workers for families from culturally and linguistically diverse backgrounds and Aboriginal and Torres Strait Islander families

- infection control
- pharmacy services
- physiotherapy
- social work
- technical equipment support services
- ward clerks, portering and cleaning services.

## **Level 2 high dependency**

As above, and in addition:

- On-site departments of pathology and imaging services with a medical director
- Blood bank with on-site cross-matching
- 24-hour, on-call pathology service
- Access to support services including speech and language pathology.

## **Level 3**

As above, and in addition:

- 24-hour access to pathology (including clinical biochemistry, microbiology, haematology, transfusion) and imaging services
- Point of care access for electrolyte and blood gas analysis (highly desirable)
- 24-hour access to pharmacy services and sub-specialist paediatric advice
- Space within the department for:
  - pharmacy/drug preparation
  - diagnostic area for medical imaging
  - biomedical, scientific staff and audit assistants
- Access to support services from staff responsible for liaison with primary care teams.

## Appendix 3: Neonatal equipment required according to level of care

### Level 1

Should have:

- Equipment for resuscitation
- Incubator
- Venous access and emergency intravenous infusion
- Equipment suitable for hand ventilation
- Oxygen therapy
- Oxygen saturation monitoring with a neonatal probe
- Blood glucose monitoring
- Portable X-ray facilities
- Equipment suitable for drainage of a pneumothorax
- Phototherapy (optional).

### Level 2 low dependency

As above, and in addition:

- Apnoea monitor
- Non-invasive blood pressure monitoring
- Headbox
- Mechanical ventilator
- Oxygen analyser
- Phototherapy unit
- Equipment for gavage feeding
- Camera to provide instant photographs.

## Level 2 high dependency

As above, and in addition:

- Radiant heater with servo-control
- Facilities for heater humidification of gases
- Cardiorespiratory monitoring
- Intra-arterial blood gas monitoring
- Equipment for safe infusion of intra-arterial fluids.

## Level 3

As above, and in addition:

- Equipment for assisted ventilation must include alarm systems to monitor gas supply failure and breathing system disconnection and humidification with monitoring of inspired temperature and high temperature alarms
- An intra-hospital transport system, including mechanical ventilation
- Equipment for specialised diagnostic or therapeutic procedures to be available when clinically indicated and to support the delineated role of the unit.

## Appendix 4: Admission/discharge/transfer criteria

The purpose of developing admission/discharge/transfer criteria guidelines is to provide a reference for admitting and subsequently discharging infants. The guidelines should be adapted and modified for each hospital's policies and procedures after consideration of the nature and range of conditions encountered at that hospital. Physiological parameters should be assigned wherever possible in preparing admission and discharge policies.

Infants should be evaluated and considered for discharge/transfer on the basis of:

- reversal of the disease process that prompted admission
- resolution of the unstable physiologic condition that prompted admission
- resolution of the need for intervention or monitoring greater than that available at the next lower level of care.

### Guidelines for admission to Level 2 nurseries

#### Infants inborn and <4 weeks of age

- Prematurity <37 weeks
- Birthweight <10 per cent for gestational age
- Birthweight >90 per cent for gestational age and inconsistent with family context (for example, ethnicity, size, obstetric history)
- Infants requiring significant resuscitation:
  - Apgar <5 at 5 minutes
  - meconium aspirated from below the vocal cords
  - delivery room intubation and assisted ventilation
- Infants at risk of hypoxic ischaemic encephalopathy
- Persistent hypothermia (<36.0°C) unresponsive to simple measures
- Hypoglycaemia (<2.6mmol/l) unresponsive to feeds

- Respiratory distress (not resolved within the first hour of delivery)
- Apnoea
- Cyanosis
- Seizures
- Vomiting:
  - persistent (not regurgitation)
  - bile stained
  - associated with abdominal distension
- Bleeding from any site including umbilical cord stump
- Suspected or proven neonatal infection
- Jaundice:
  - early onset (less than 24 hours)
  - pathological hyperbilirubinaemia requiring specific treatment
  - rhesus isoimmunisation
  - bilirubin levels nearing exchange transfusion range
- Infants of a diabetic mother (insulin dependent)
- Infants of chemical dependent mothers (requiring treatment or observation)
- Jittery or irritable baby – not settling with adequate feeds
- Major congenital anomalies
- Unwell infant with uncertain diagnosis

- Infants whose medical condition requires intense nursing care or close observation
- Infants requiring more care than able to be provided by the midwifery team
- Infants for adoption
- Infants for routine care if mother unwell, such as:
  - inpatient in adult intensive care unit
  - inpatient in psychiatric service
- Security considerations.

### **Infants transferred from Level 1 nurseries**

- Preterm infants >32 weeks gestation requiring gavage feeding
- Respiratory distress, stable and requiring <40 per cent oxygen
- Hypoglycaemia requiring intravenous glucose infusion
- Sepsis, with stable cardiorespiratory state, requiring intravenous antibiotic therapy.

### **Infants transferred from Level 3 nurseries**

- Preterm infants no longer requiring assisted ventilation or parenteral nutrition
- Infants requiring supplemental oxygen
- Term infants following major surgery for establishment of feeding and parenting skills
- Infants requiring palliative care.

## **Infants discharged from hospital care and readmitted from home**

After discharge home, infants requiring further hospital care should be readmitted to a paediatric ward unless care unavailable in the paediatric ward is required.

Examples may include infants who require:

- monitoring of home oxygen therapy
- elective surgery (for example, herniotomy for infant born preterm)
- specialised care (for example, <2,500g or below birthweight).

All infants admitted from home with a possible infectious diagnosis require isolation nursing for a minimum of three days.

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