

# DESIGN GUIDELINES FOR NEONATAL UNITS FOR AUSTRALIA & NEW ZEALAND

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## 1. GENERAL PRINCIPLES

### 1.1. Alignment with Unit Mission:

The unit design must be guided by the unit's program goals and practice (Model of Care), including the:

- function within the area health service
  - spectrum of patients treated
  - relationship to other hospitals, including up- and down-transfer
- function within the hospital
  - Maternity Services and Operating Theatres
  - Home Services
  - Follow-up Services
  - Other Departments
  - Infrastructure Departments
  - Relationship with other paediatric services
- role in teaching and training in multiple disciplines
- role in research

### 1.2. Baby-centered Design:

The focus of the design must be on the baby's best outcome in a holistic framework, including:

- facilities for best clinical practice
- an environment that allows optimal development
- family access
- minimization of risk of adverse occurrences
- flexibility for change for future practice changes

### 1.3. Family-centered Design:

The unit design must recognize the central role of the parents and other family members as part of the baby's care team, including provision for:

- a welcoming environment for families
- adequate space for families at the cotside
- privacy
- family amenities that encourage attendance in the unit
- facilitation of communication between staff and family

### 1.4. Staff Orientated Design:

The unit design must provide optimal working conditions for staff, including the provision of:

- a pleasant and supportive working environment
- a layout that allows flexibility in staff allocation
- good patient access
- good occupational health & safety practices
- good information technology and communication systems
- adequate staff amenities
- continuing education facilities

## 2. LOCATION

### 2.1. Dedicated area:

The NNU must be a defined area within the hospital

It must not be a thoroughfare for access to other services or departments.

### 2.2. Relationship to other services:

The NNU must be in the closest proximity to birthing suites (both birth suites and operating suites) as is possible within the architectural confines of the building. If this requires the NNU to be on a separate floor, it must be no more than one floor away, with a lift that can be prioritized for baby transfer.

Other juxtapositions to be considered include:

- Laboratory services, including Blood Bank, Mortuary
- Imaging services
- Maternity Wards – Ante & Postnatal
- Emergency Department
- Ambulance receiving area
- Biomedical Engineering
- Family Accommodation
- Pharmacy
- Medical Records
- Allied Health Services
- Research Area
- Outpatients

### 2.3. Access for Outside Admissions:

There must be ready access to and from the hospital's transport receiving area for the transfer of babies to and from outside hospitals.

### 2.4. Access for Families and Visitors:

There must be clear signage to the NNU for families and visitors, with a secure entry (section 15) and clearly visible reception area. Visitors and families should not be able to access patient care without passing through a clearly marked reception area.

### 2.5. Security and Safety (see also section 15)

There will be a single entry for families and visitors; a separate entry for staff is ideal, but optional. All entries should facilitate security through measures such as controlled access, electronic keycard, or video surveillance. There will be exits for safe emergency evacuation; emergency exits must be fitted with alarms to alert unauthorized exit from the unit.

## 3. CLINICAL AREAS

### 3.1. Neonatal Intensive Care Unit (NICU)

#### 3.1.1. Number and distribution of NICU cots

##### 3.1.1.1. Number of NICU cots:

this will be determined by regional health service and local hospital predictions of demand. A number of guidelines are available (References).

##### 3.1.1.2. Number of NICU cots per room:

the number of NICU cots per working area is a balance of a number of factors, including:

- the need for separation to minimize infection risk
- the need for separation to minimize error risk
- the need for family (especially parent) access for participation in care
- the need for family (especially parent) privacy
- the need for optimal staff allocation and communication
- the need for optimal staff access to patients
- the space available and its configuration
- budget issues

NOTE: Data are accumulating to support the concept of increasing separation of neonatal cots, including the provision of single rooms (Reference).

### **3.1.2 Infant Care Space and Fittings:**

#### **3.1.2.1. Area Requirements:**

to accommodate the baby cot, equipment, space for attending nursing and medical staff and the families, an area of 13.5m<sup>2</sup> (150sq.ft.) is required. This area is exclusive of intervening corridors and sink areas.

The use of pendant arrangement of equipment may require additional space. A discussion of the relative merits of standard cabinet design v. pendant design is given in Appendix 1.

The infant care space should be configured in such a way that all available floor area is able to be utilised (Interpretation: unusable space e.g. due to irregular shape or intrusive support pillars is not part of the space calculation)

#### **3.1.2.2. Electrical Supplies:**

NICU cot spaces require 20 electrical outlets (GPOs), of which at least 1/3<sup>rd</sup> must be connected to the emergency power system.

NOTE: An uninterruptible power supply (UPS) must be installed to provide emergency power to all NICU cot spaces.

The equipment connected to a UPS will be determined by a number of factors, including:

- The vital nature of the equipment – e.g. ventilators
- The need for continuous power – e.g. monitor data continuity
- The existence of in-built batteries – e.g. I.V. pumps
- The drain on the UPS – e.g. incubators – high current drain

**3.1.2.3. Gas Supplies:** each cot space requires a minimum of 3 oxygen and 3 medical air outlets; at least 4 suction outlets should be provided to allow for airway suctioning, chest drainage and for nitric oxide (NO) scavenging

**3.1.2.4. Equipment Mounting:** facilities must be designed to allow all equipment to be readily visible and within safe reach of staff. In particular this may require special mounting devices for monitors, rails or shelving at appropriate height and position. The height of monitors and other equipment should be adjustable.

**3.1.2.5. Cotside Storage:** storage is required for:

- disposable equipment – syringes, tubes, needles etc.
- infection control items – gloves, hand-rubs
- linen – small items
- baby cleaning items, nappies etc.
- parent belongings
- patient items – toys, mementos, etc.

NOTE: The storage for disposables, linen, etc. may be fixed or achieved by each cot having an individual mobile trolley with drawers or trays.

### **3.1.2.6. Disposal Bins:**

- sharps container (may be on mobile trolley)
- dirty linen
- rubbish/separate biological waste
- used milk containers

**3.1.2.7. Staff Work area:** the staff work area around the cot must meet local occupational health & safety standards. There must be adequate areas for charting – either written or electronic.

**3.1.2.8. Communications:** there must be systems for optimal fail-safe communications between staff, and for parents to communicate by telephone with cotside staff. This will generally include an emergency call system and/or nurse assist system.

**3.1.2.9. Information Technology:** provision for access to information technology at the cotside is essential. A minimum of 4 data points and space for a computer is required (monitoring network, PC, printer, phone). Installation of fibre optic or data cables for future developments may be considered.

**3.1.2.10. Parent Cotside Facilities:** there must be space for both parents to be at the cotside, with at least one “easy” chair for a parent to participate in baby “kangaroo” care. There should be a designated lockable storage space for parents’ belongings, and a display area for toys and mementos. A personal bulletin board is an option.

**3.1.2.11. Procedure Light:** in addition to general lighting (section 4.2.1.) each NICU cot must have a local light for emergency use, observation and procedures. This light should be adjustable in intensity and area of focus.

**3.1.2.12. Clocks:** at least one clock must be clearly visible from each cot space. This may be a clear time read-out on a cardiorespiratory monitor. All clocks on the NNU must be synchronized.

## **3.2. Special Care Nursery (SCN)**

### **3.2.1. Number and Categories of SCN Cots**

**3.2.1.1. Number of SCN Cots.** The number of cots in SCN is determined by the spectrum of patients managed and the admission and discharge policies of the unit. In particular, the ability to transfer babies to other hospitals with SCNs or to Hospital-in-the-Home (HITH) or other home-supervised care will influence the number of cots required. In general, two to four SCN cots are required for each NICU cot.

### **3.2.1.2. Categories of SCN Cots.**

At least three levels of care within SCN (Level 2 care) can be defined:

- High Dependency Level 2 care – includes:
  - acute care short of life support
  - immediate step down care from NICU, and
  - some babies with chronic conditions with special needs.
- Low Dependency Level 2 care – includes:
  - a variety of mildly to moderately ill babies, and
  - convalescent babies
- Long Term Level 2 care – includes:

babies with chronic conditions not yet suitable for home care – includes long-term oxygen-dependent babies and some with neurological and chronic surgical conditions.

**3.2.1.3. Number of SCN Cots per Room.** The same factors pertain as for NICU (3.1.1.2.) 4 – 8 cots per working area allows maximum working efficiency, but other factors suggest fewer cots per area, even single rooms.

### **3.2.2. Infant Care Space and Fittings in SCN**

#### **3.2.2.1. Area Requirements**

- High Dependency Level 2: requires at least 10m<sup>2</sup> per cot
- Low Dependency Level 2: requires at least 8m<sup>2</sup> per cot
- Long Term Care Level 2: requires at least 12m<sup>2</sup> per cot.

Note: these areas are not inclusive of circulation space and sinks

#### **3.2.2.2. Electrical and Gas Outlets**

- High Dependency Level 2 cots should be supplied with the same number of electrical and gas outlets as NICU so that they can act as NICU cots in the event of a need to close parts of the NICU area (e.g. infection control, other need for evacuation, unit refurbishment).
- Low Dependency Level 2: fittings may vary between areas
  - electrical outlets 2-8 per cot
  - oxygen outlets at least 1 per cot
  - air at least 1 per cot,
  - suction 1 per cot.
- Long Term Care Level 2
  - electrical outlets x 6,
  - oxygen outlets x 2,
  - air outlet x 1,
  - suction outlet x 1.

**3.2.2.3. Other Cotside Facilities** The requirements are identical in most respects to those for NICU. These include:

Equipment mounting 3.1.2.4.

Cotside storage 3.1.2.5.

Disposal bins 3.1.2.6.

Staff work area 3.1.2.7.

Communication 3.1.2.8.

Parent cotside facilities 3.1.2.10.

Requirements that vary from NICU include –

- Information Technology: Easy access is required from all cots in SCN. This may vary from one computer per cot to one per work area. Wiring installation should allow for future expansion to at least one computer to 4 cots; 4 data points per computer station are recommended.
- Procedure Lights:
  - High Dependency Level 2 requires 1 procedure light per cot (see 3.1.2.1.).
  - Low Dependency Level 2 cots require access to 1 mobile procedure light per work area.

### **3.3. Isolation Rooms**

- A least one isolation room is required in each NICU\*. A reasonable estimate is one isolation room per 10 NICU cots. Neonatal units that have a high number of admissions from outside hospitals (e.g. NICUs in paediatric hospitals) may require more isolation spaces.
- The isolation room should be away from the entrance of the NICU
- The ventilation system must have negative air pressure with 100% exhaustion to the outside.
- An area for handwashing and gowning should be positioned so that staff and visitors cannot access the baby without first undertaking appropriate infection control precautions.

\* Note again the evidence in favour of all single rooms.

- Removal of soiled materials must avoid contact with and contamination of other areas of the nursery.
- All room exit doors require self-closing devices.
- All walls, windows, ceilings and floors must be sealed to avoid infiltration of air from the outside and other air spaces.
- All surfaces should be composed of materials that facilitate cleaning.
- An emergency communication system must be provided.
- Isolation rooms should have the ability to provide support to the most complex patients that the NICU would care for.

### **3.4. Parent-Infant Accommodation Rooms**

#### **3.4.1. Rationale**

Live-in rooms on the unit are required for multiple purposes:

- care-by-parent prior to going home
- accommodation for parents whose baby is extremely ill in NICU
- parents of dying babies
- acute stay accommodation following admission for parents who live a long distance away, prior to establishing other arrangements

The rooms must be within the secure area of the nursery and adjacent to the clinical areas.

#### **3.4.2. Number of Rooms**

A reasonable minimum is one parent room per 10 beds (combined NICU and SCN). This number depends on the unit's practice pattern, the size of the region served and other available options.

#### **3.4.3. Fittings and Furnishings**

- The parent-infant rooms require twin bed accommodation for the parents (convertible to a double/ queen bed), plus space for baby cots (including twins/ triplets).
- The rooms require direct access to sink, toilet and shower facilities, which may be shared between rooms.
- The infant area requires access to four GPOs, one oxygen, and one suction outlet
- Telephone and emergency call facilities are required.
- Other furnishings should create a homely, private environment.

### **3.5. Transitional Care Ward (TCW)**

A spectrum of infant conditions that previously required admission to the SCN are now managed at the mothers' bedsides. Examples are phototherapy, IV antibiotics for prophylaxis against infection. Practices vary widely, and thus the number of such beds required is difficult to estimate.

The TCW may be seen either as an extension of the neonatal unit or as a section of the maternity/obstetric service.

An extensive TCW requires neonatal nursing supervision.

Facilities at the baby cot area include:

- Four GPO's
- One oxygen and one suction outlet

### **3.6. Treatment/ Procedure Room**

The requirement for such a room will be determined by the unit's practice pattern.

The provision of electrical outlets, gas supplies and lighting facilities will be determined by the spectrum of procedures to be performed.

Procedures performed may include:

- minor procedures – e.g. IV insertion, lumbar puncture, suprapubic aspiration
- minor surgery

- major surgery – e.g.
  - PDA ligation
  - abdominal surgery
  - reduction of gastroschisis, exomphalos
- laser therapy

Laser therapy requires special facilities, including blackout facilities and a warning light beside the entry door (at normal visual height).

### **3.7. Neonatal Transport Team**

#### **3.7.1. Intra-hospital transport**

Provision must be made for storage and recharging of equipment for intra-hospital transfers from delivery areas.

#### **3.7.2. Regional Neonatal Retrieval Team**

The area required for the neonatal retrieval team clearly depends on the size of the team, quantity of equipment and the role of the team within the region.

Factors to be considered include:

- the relationship of the transport team and its personnel to the NNU
- the existence of separate personnel dedicated to transport
- the speed of response expected
- the need for administrative offices
- the extent of the communication system
- the quantity and type of equipment used
- the ownership of dedicated vehicles
- access to the emergency vehicle bay
- the role of the transport team in regional education

## **4. ENVIRONMENTAL DESIGN**

### **4.1. Rationale**

Increasing evidence (Reference) is accumulating to suggest that the nursery environment of light and sound as well as temperature has significant short and long-term effects on babies.

### **4.2. Lighting**

#### **4.2.1. Ambient lighting**

- General ambient lighting must be adjustable in the range of at least 10 – 600 lux (convert to ANZ units) as measured at the cotside (Reference).
- Electrical light sources must have a colour rendering index of 80 or above and avoid unnecessary ultraviolet or infra-red radiation by the use of appropriate lamps, lens or filters. (Reference).
- General ambient lighting must be indirect. Any direct ambient lighting outside the baby care area must be located and directed to avoid a direct line of sight to any baby.
- Lighting fixtures must be easily cleaned.
- At least one source of daylight should be visible to each baby care area. The NICU should be situated to minimize heat gain and glare (e.g., the NICU should be south facing)
- External windows require design to minimize heat gain or loss, and must be situated at least 60cm away from any part of a baby's cot to minimize radiant heat loss.
- External windows require shading devices that are neutral in colour or opaque to minimize colour distortion from transmitted light.
- Both natural and artificial light sources must have controls that allow immediate darkening of any bed position to permit transillumination.

- A range of window treatments are available which allow for transmission of light yet reduction of glare and heat gain.

#### **4.2.2. Individual Cot Lighting**

Separate lighting must be available to each individual cot area for close observation and procedures. This lighting should minimize shadows and glare; it must be adjustable in intensity, and be highly framed so as not to increase illumination in adjacent cots.

#### **4.2.3. Lighting for Support Areas**

Lighting of support areas such as charting, reception and other work areas must conform to national standards (Reference). Lighting for staff recreation areas should preferably have a source of natural light but must have bright illumination (Reference) for staff, especially at night for those working in dimmed nursery areas.

### **4.3. Noise Levels**

#### **4.3.1. Noise Levels**

Cot spaces and adjacent areas must produce minimal background noise and absorb the maximum possible of noise produced in the cot and nursery area. Ambient noise should not exceed an hourly  $L_{eq}$  of 50dB and an hourly  $L_{10}$  of 55dB, both A-weighted slow response. Transient levels or  $L_{max}$  must not exceed 70dB A-weighted slow response.

Notes:

- Excess noise adversely affects the babies (Reference) families and staff (Reference)
- Local noise is generated by equipment (including telephones, alarms) and especially by staff (talking and activity)
- The building itself generates noise – e.g. heating, ventilation, plumbing
- External noise may contribute – e.g. traffic, industry.

#### **4.3.2. Ceiling finishes**

- Ceilings must have a noise reduction coefficient (NRC)(Reference) of at least 0.9
- Ceilings must be easily cleanable and prohibit the passage of particles from the ceiling cavity into the environment below.

#### **4.3.3. Walls, Partitions, Windows and Other Vertical Surfaces**

- Upper sections of walls and partitions may be covered with sound-absorbent material
- Hanging baffles covered with sound-absorbent material may further reduce noise transmission, and may be so designed and coloured as to add a decorative effect to the area
- Glass windows are reflective of sound, but may be partly covered by blinds or curtains of a sound-absorbent material
- Patient privacy curtains have no significant role in noise reduction
- Wall surfaces must be easily cleanable
- Walls should have protective strips at points where contact from moving equipment may occur

#### **4.3.4. Mechanical Sources of Noise**

**4.3.4.1.** Equipment should be selected by a noise criteria (NC) of 40 or less (Reference).

**4.3.4.2. Telephones and paging systems:** communications systems in close proximity to cot areas should use a visual or vibratory alert system in the first instance.

**4.3.4.3. Monitor alarms:** alarms should use visual alerts or quiet tones in the first instance.

## **4.4. Flooring**

### **4.4.1. Principles**

Floor surfaces must have the following properties:

- be easily cleanable
- minimize colonization and growth of microorganisms
- minimize sound reflection
- provide a surface that provides maximum foot comfort for staff
- durability against wear and tear from equipment and footwear and from frequent cleaning

In addition floor surfaces should:

- minimize resistance to movement of equipment across the surface
- provide an attractive appearance

### **4.4.2. Choice of Floor Surface**

**FLOORING** (Reference Philbin MK)

Appendix 2 summarises the relative merits of 4 types of flooring – standard vinyl, special vinyl, special rubber and carpet.

## **4.5. Benchtops, Cupboards and Shelving**

Benchtops, cupboards and shelving in the baby care areas must:

- have the fewest possible seams and avoid crevices
- be easily cleanable
- be of sufficient durability to withstand impact of equipment and normal wear and tear
- avoid sharp corners and edges
- be of sufficient moisture resistance to prevent deterioration

## **4.6. Handwashing Sinks**

### **4.6.1. Number and Distribution of Sinks:**

- In the baby care areas
  - individual rooms must each have a sink
  - in multiple cot rooms, every cot must be within 6 meters of a handwashing sink
  - in the NICU there should be one sink per two cots
  - in the SCN there should be one sink per four cots
- The requirement for a handwashing area at the entrance to the NNU is not mandatory (further discussion required).
- There must be at least one sink each in the NICU and SCN areas that are usable by children and people in wheelchairs.
- Pictorial and written handwashing instructions are required at all sinks.

### **4.6.2. Handwashing Sink Design**

#### **4.6.2.1. Handwashing Sink Materials**

Ceramic or other composite material is preferred over stainless steel for noise reduction.

#### **4.6.2.2. Design**

- Minimum dimensions are 60cm wide x 40cm across x 25cm deep; deeper sinks are preferable to minimize splashing.
- The bottom of the sink should be curved to ensure total emptying into the drain
- The piping below the drain should be at least 15cm to the “u-bend” to ensure that bacteria growing in the u-bend do not splash back into the sink.
- there should be no flat surfaces surrounding the sink that may accumulate moisture.

#### **4.6.2.3. Taps**

- The minimum standard is elbow-operated taps. Preferred taps are remotely operated by:
  - foot operation
  - knee operation
  - electronic (photosensitive) automatic operation
- Faucets should direct the water stream directly downwards.
- The water stream should be controlled to minimize splashing.

#### **4.6.2.4. Soap, Skincare and Towel Dispensers:**

- Dispensers should be durable, quiet and of easy operation
- Soap and other liquid dispensers should be designed and positioned to ensure that drips fall into the sink (dispensers may need to be attached to the wall by an extension bracket to accomplish this).

### **4.7. Ambient Temperature and Ventilation**

- The neonatal unit must provide an ambient air temperature of 23 – 26°C
- A relative humidity of 30-60% (Reference) is required
- A minimum of 6 air changes per hour is required (Reference) with a minimum of 2 changes being outside air
- Intake and Exhaust vents must be situated to minimise draughts around baby cots
- Ventilation air delivered to the NICU must be filtered with at least 90% efficiency (Reference)
- Fresh air intakes must be located at least 7.6m from exhaust outlets of ventilation systems or other systems that may collect noxious fumes
- The ventilation system must meet noise standards outlined in 4.3.1.

## **5. ACCESS, TRAFFIC, WORK PATTERNS AND SECURITY**

### **5.1. Entry**

- the NNU must have a clearly identified entrance with clear signage leading to it
- signage within the NNU should be clear
- the reception area should be at the entry or clearly visible from it
- the entry must be wide enough to allow entry of a mother on a postnatal bed
- the entry door and entry corridor should provide a welcoming ambience
- a separate secure entry for staff may be considered

### **5.2. Corridors**

- corridors must be a minimum width of 2.4m (Reference)
- all doors leading off corridors into patient-care areas must allow entry of a postnatal bed
- in patient-care areas in multiple cot rooms there must be an aisle between cots of 2.4m minimum width.
- Sufficient storage should be available in the NNU for corridors to be free of equipment.

### **5.3. Emergency Exits (see also section 15)**

- All routine exiting from the unit must be through the designated entry/exit door(s)
- sufficient emergency exits must be provided for evacuation of staff, families and patients in case of fire or other emergency
- emergency exits must be armed with alarms to prevent unauthorized use (especially baby abduction).

## **5.4. Workflow Patterns**

Extensive consideration must be given to the layout of the unit to optimize workflow patterns for the NNU staff, for support staff visiting the unit and for families.

### **5.4.1. NNU Staff Workpatterns**

#### **5.4.1.1. Nursing Staff Allocation.**

The unit design must consider the work allocation of nursing staff. Factors to be considered include:

- spectrum of patients managed – hence the number of patients allocated per nurse in each room
- the need for communication, including emergency calls, between staff
- the needs for staff in training/orientation
- availability of individual paging/locator systems

#### **5.4.1.2. Nursing Staff Access to Unit Facilities**

Points of access for NNU nursing staff include:

- on-site laboratory
- storage areas
- clean (storage) and dirty utility areas
- milk room
- staff amenities
- interview room
- workstations
- linen storage

#### **5.4.1.3. Medical Staff Work Patterns**

Considerations include:

- adequate area for patient discussions/ward rounds – either cotside or in a central location
- adequate charting areas – written or electronic – cotside or central
- clustering of patients if a team structure of medical and/or nursing care exists
- other (see Section 11).

#### **5.4.1.4. Other NNU Staff Work Patterns**

Other staff work patterns to be considered include:

- nursing managers
- social workers
- care managers
- environmental staff
- others

### **5.4.2. Family Movement Patterns (see also Section 9)**

The “flow” of family movement within the unit takes into consideration:

- clear entry and reception area
- waiting area conveniently located close to reception (preferably in sight of reception)
- child play area – requiring parent/other adult supervision
- adequate bedside space and privacy
- clear signage within the unit
- family facilities convenient to the patient areas, but private from them
- family live-in rooms (Section 3.4) as part of the continuum of care within the unit

The design should balance the competing needs for privacy in all areas, the desire for other family/friend support, social communication with other parents and communication with staff.

## 6. SUPPORT AREAS

Provision in the NNU design should consider the requirements of the following support areas:

- on-site laboratory, including
  - blood gas machine
  - other local biochemistry and haematology
  - temporary incubator for microbiology specimens
  - source of ice for transportation of specimens
  - a pneumatic tube system for transfer of specimens to the main laboratory
- on-site pharmacy satellite
  - storage cupboards for medications (including secure storage for restricted drugs)
  - refrigerator for medications and IV fluids
  - separate Vaccine refrigerator
  - workstation and computer for pharmacist
- Imaging
  - ultrasound
  - radiology, including:
    - fluoroscopy
    - access to MRI
      - storage for imaging machines
      - x-ray development
      - storage and reading of images
- nutrition areas
  - milk preparation and/or storage room
  - breastmilk expressing – either at cotside or in separate area
  - breastmilk storage
  - milkbank (where applicable)
- interview room(s)
  - interview room(s) should accommodate at least 6 people with adequate
  - there must be auditory and visual privacy
- hospice/grieving room
- outpatient assessment and treatment room – where applicable
- biomedical engineering support area
- central work station(s): this is a multifunction area, which may encompass the following functions:
  - ward clerking area
  - admissions/discharge charting
  - central charting area for medical and nursing staff
  - may include imaging viewing
  - may be used as central ward round area
  - storage for stationery
  - photocopy, fax, communications centre

## 7. STORAGE AREAS (Clean utility)

Total storage requirements will vary by unit size, equipment usage system and storage system. Storage space should be efficiently managed.

### 7.1. Cotside Storage

Storage at the cotside and within nursery areas are described in 3.1.2.5. Recommended volume of storage space is 0.67m<sup>3</sup> for each NICU cot and 0.45m<sup>3</sup> for each SCN cot. A system for disposable and other small items of linen and equipment to the cotside storage area is required.

An alternative to cotside storage for disposable items of equipment is the provision of distribution trolleys for each group of cots.

## **7.2. Storage of Disposable Equipment**

The recommended volume of central storage of disposable equipment – including syringes, needles, infusion sets, ventilator circuits, tubing for feeding and suctioning, sterile trays for procedures – is 0.22m<sup>2</sup> per cot in the NICU and SCN.

## **7.3. Small Items of Equipment**

### **7.3.1. Rechargeable equipment**

An area is required with adequate shelving and GPOs for the storage and recharging of small items of equipment not in use – e.g. syringe infusion pumps, pulse oximeters.

### **7.3.2. Other Small Items**

Storage, e.g. compactus – is required for all other small items of equipment – including gas flow meters, suction control gauges, etc. etc. (to be added).

## **7.4. Floor Storage for Large Equipment**

Equipment in this category includes incubators and radiant warmers, ventilators, phototherapy units. Recommended floor storage space is 2.8m<sup>2</sup> per NICU cot and 1.78m<sup>2</sup> per SCN Cot (Reference).

# **8. DOMESTIC AREAS**

## **8.1. Dirty Utility/Equipment Cleaning Rooms**

Dirty/soiled equipment requires an area for deposition prior to cleaning. The cleaning area must contain a sink with hands-free controls (see Section 4.6.2.), and a foot-operated waste receptacle. The ventilation system requires negative air pressure with 100% ventilation to the outside. Other items in the equipment cleaning area may include a clothes washer and a dryer for baby clothes. Infection control standards should be met for local laundry facilities.

## **8.2. Waste Disposal**

### **8.2.1. Cotside waste disposal.**

Each NICU cot must have its own sharps disposal bin and a hands-free operated waste receptacle with a silent-closing mechanism. SCN cots may share one set of disposal bins between two cots.

A desirable waste removal system allows removal of the waste from the disposal bins from outside the nursery; this presumes a corridor outside each nursery space.

### **8.2.2. Waste Disposal Holding Area**

Each NNU must have a holding area for contaminated waste prior to its final removal from the unit. This area/room should be situated to allow removal of the contaminated waste without passing through the infant care area.

## **8.3. Cleaners' Rooms**

Cleaning staff from the hospital's Environmental Services Department require rooms equipped with:

- appropriate sinks for supply and drainage of cleaning liquids
- storage for cleaning equipment and materials
- each room should measure a minimum 4m<sup>2</sup>
- toilets

#### **8.4. Sufficient toilets must be provided for:**

- parents and visitors, including
  - nappy-changing facilities
  - facilities for children
  - facilities for handicapped visitors
- staff – separate from visitors (see Section 10.5).

### **9. FAMILY FACILITIES**

#### **9.1. At Cotside:**

Described in 3.2.1.10.

#### **9.2. Waiting Area**

There should be a welcoming area for waiting families and visitors, with the following suggested features:

- adequate space to allow separation of different waiting groups
- direct vision of/from the reception area
- an attractive ambience
- comfortable, durable furnishings
- a play area with durable toys – for use of waiting siblings under the supervision of a parent or designated adult.

NOTE: The provision of a separate playroom supervised by hospital staff must meet all local government regulations. Such an area may be best provided as part of the hospital's overall provision of child-care facilities.

#### **9.3. Family Lounge**

An area close to but separate from the clinical areas should be provided for families. Suggested features include:

- comfortable, durable lounge chairs
- table and chairs for self-prepared snacks/meals
- kitchenette with sink, boiling water dispenser, microwave, toaster,
- television
- basic crockery and cutlery

NOTE: It is suggested that this area be for families only and not for other visitors.

#### **9.4. Resource Station**

Provision of information for parents may include:

- information leaflets clearly displayed
- parent information books/booklets
- computer intra/internet facilities

This may be situated in the family lounge.

#### **9.5. Workstation**

Visiting parents may benefit from having access to a workstation that may include a data point for lap-top computer access.

#### **9.6. Parent Lockers**

In addition to cotside lockers (3.1.2.10) the provision of secure lockers for coats and bags should be considered.

## **10. STAFF FACILITIES**

### **10.1. Principles**

Provision of attractive staff amenities is essential for enabling staff to work to their maximum capacity, as well as aiding staff retention.

### **10.2. Staff Lounge/Dining/Kitchen Area**

Suggested features of the staff amenities area include:

- the space should be clearly separate from the clinical area, and clearly separate from family/visitors access
- generous space to allow staff of all disciplines to be accommodated (nursing, medical and ancillary staff)
- an area designated as a quiet zone
- comfortable, attractive lounge furnishings
- dining table(s) and chairs
- kitchenette with
  - sink(s)
  - boiling water dispenser
  - refrigerator(s)
  - microwave(s)
  - toaster(s)
  - sandwich maker(s)
  - dishwasher
- basic crockery and cutlery
- pantry

### **10.3. Lockers**

Sufficient lockers for all staff on duty concurrently must be provided. Individual lockers for all staff members is an option.

### **10.4. Shower and Change Facilities**

These facilities must be available within the hospital.

### **10.5. Staff Toilets**

Sufficient toilets for staff must be available, separate from toilets for families and visitors.

## **11. MEDICAL STAFF FACILITIES**

In addition to staff amenities described in Section 10, medical staff require the following:

### **11.1. Clinical Workroom (see also Section 6).**

A separate area within the clinical areas is required for charting, discharge and summary generation, communications with other practitioners and viewing of imaging (see 11.2.). This area may also be used for ward rounds/handovers, depending on the unit's model of care. This area must be private from families and visitors.

### **11.2. Imaging Viewing**

Depending on the imaging viewing facilities available, this area may be part of the clinical workroom or may require a separate area. Storage of images is required.

### **11.3. On-call Rooms**

Sufficient on-call facilities accessible to on-call staff must be available within the hospital. Their proximity to the NICU will depend on the expectations around the response time required. They should be quiet, private from other staff and visitor areas, and have ensuite shower and toilet facilities.

## **12. OFFICES.**

### **12.1. Office site and Design**

Office spaces must be provided to meet the professional requirements for specialized staff. Factors that determine the site and design of offices include:

- the professional activities of the staff member(s) in relation to the unit's activities
- need for privacy
- ability to share office space
- need to be in the unit precinct
- local government standards
- Offices where staff spend much of their working day should have access to external light sources.

### **12.2. Office Personnel**

**12.2.1.** Offices should be provided within the unit precinct for:

- senior nursing manager(s)
- associate nursing unit managers ("charge nurses")- shared
- junior and middle grade medical staff – shared
- care managers (parent support) – shared
- hospital-in-the-home staff – shared
- clinical audit staff – shared

**12.2.2.** Offices that may be either in the unit precinct or apart from the unit include:

- Consultant medical staff
- Senior administrator – if applicable
- Administrative secretarial staff – shared
- social support services (medical social worker) – shared.

## **13. EDUCATION FACILITIES**

Hospitals with NICUs must provide education facilities for continuing education of all clinical staff. Those with university affiliation must also provide the facilities for under and post-graduate training.

Education facilities required include:

- teaching/seminar room(s)

NOTE: A single large seminar room may be divisible into two or three smaller teaching/ tutorial rooms.

- An area suitable for practical demonstrations
- library/computer room
- educators' office

## 14. RESEARCH FACILITY

The extent of the research facilities will be determined by the research activities of the unit; most research facilities will be provided elsewhere on the hospital campus; basic requirements in close proximity to the NNU include:

- clinical research area
- offices/workstations for research scientists and nurses

## 15. SECURITY

The NNU must be designed with a security program that protects the physical safety of the babies, their families, visitors and staff. The NNU must be designed to minimize the risk of baby abduction.

Security considerations include:

- Minimal entry points: only one entry for families and visitors; staff may use the same entrance or there may be a second entry for staff.
- Appropriate flows that facilitate visible movement of visitors past staffed areas
- Controlled by key card (or similar device) for staff.
- Entry for families and visitors:
  - controlled by reception staff
  - visible from reception area
  - under video surveillance
- Minimal exits within regulations, preferably visible from clinical areas
- Emergency exits for emergency use only, clearly marked as such, and armed with alarms and under video surveillance
- Emergency evacuation routes clearly marked
- Fire extinguishers and instructions clearly marked
- Staff duress alarms at the cotside (at least one per 2 beds) one per bed in NICU or portable
- Anti-kidnap devices on babies

The security design should be balanced with the needs for a welcoming environment and privacy for families and their babies.

**4.4.2. FLOORING** (Reference Philbin MK) – **APPENDIX 1**

	Cost	Installation	Cleaning	Infection Control	Sound	Staff Foot Comfort	Durability	Equipment Movement	Appearance (Pattern etc.)
Vinyl	++ Cheapest ↓ Moderate	+ Easy	+ Easy	0 Tiles – poor Sheet – good	- Fully reflective	- Poor	0 Variable	+ Good	+ Good possibilities Increases expense
Special Vinyl	0 Moderate ↓ Highest	0 Special Needs	0 Requires Surface Finish	+ Good (Not tiles)	0 Impact noise reduced Reflective	+ Moderate	0 Requires good quality and good installation	+ Good	+ Good possibilities – increases expense
Rubber	0 Moderate ↓ Highest	- Special Needs	+ Easy	+ Good	+ Good impact noise reduction Reflects sound	+ Good	++ Very good	+ Good	+ Good possibilities – increases expense
Special Carpet	0 Moderate ↓ Highest	+ Easy	- Specific issues of vacuuming, spot-cleaning surface and deep cleaning	0 Specific anti-bacterial carpet is satisfactory	++ Good impact noise reduction. Absorbs sound. Best for sound.	+ Good	0 Varies with quality. Generally good	- Small increase in resistance	++ Very good

## NICU COT SPACE DESIGN – APPENDIX 2

### CABINETS OR PENDANTS?

#### Custom-built cabinets

##### Advantages

- Ability to create an attractive environment for families and staff – fitting with “theme” of unit.
- Ability to design for staff requirements – to fit local work practices and OH & S issues.
- Ability to incorporate family needs – e.g. locker, display shelves.
- Significant cost, but less than pendants.
- Careful design can hide cords.

##### Disadvantages

- Limited flexibility for change once installed.
- Future access for repairs required in design.
- Care required to avoid OH & S issues, particularly access to gas outlets, power points and shelf height.
- Care required to avoid infection hazards.
- Cost variable.

#### Pendant Systems

##### Advantages

- Flexibility in arranging equipment for individual baby/individual nurse.
- Ability to add/subtract/change equipment.
- Potential for equipment at variable height.
- Everything off floor – good access for cleaning.

##### Disadvantages

- Clinical/mechanical appearance daunting for some parents.
- May partially obstruct views/natural lighting.
- Can be difficult to fit equipment.
- Significantly more space required depending on system.
- Extra cost of system.
- Extra cost and work for ceiling reinforcements.