Australasian Health Facility Guidelines

HPU 360 Intensive Care Unit

Part B – Health Facility Briefing and Planning

November 2025

Version 8

AHIA australasian health infrastructure alliance
AusHFG Australasian Health Facility Guidelines

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Australasian Health Facility Guidelines

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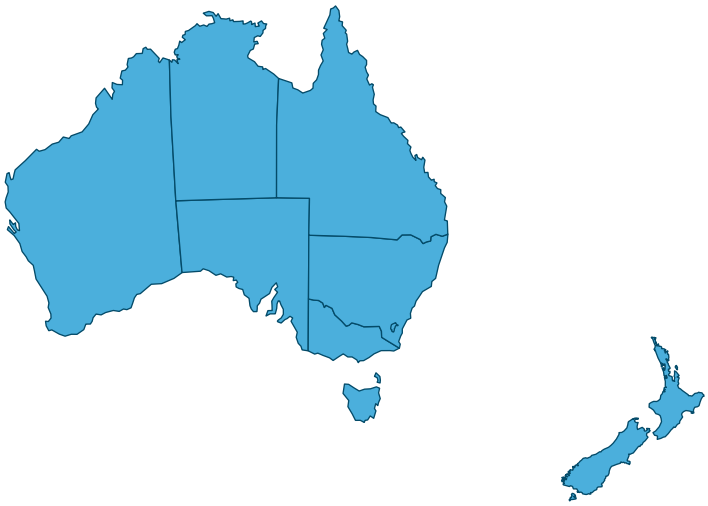
Image cover: Nepean Hospital NSW, NSW Health Infrastructure

Cultural Acknowledgement and Terminology

The Australasian Health Facility Guidelines (AusHFG) are developed in collaboration with stakeholders across Australia and Aotearoa, New Zealand.



Acknowledgement of Country

We acknowledge the Aboriginal people and Torres Strait Islander People as traditional owners and continuing custodians of the land throughout Australia and the Torres Strait Islands.

We acknowledge their connection to land, sea, sky and community and pay respects to Elders past and present.

Acknowledgement of Te Tiriti o Waitangi

We acknowledge Māori as tāngata whenua in Aotearoa New Zealand.

Te Tiriti o Waitangi obligations have been considered when developing the AusHFG resources.

Terminology and Language in the AusHFG

Throughout the AusHFG resources, the term ‘Indigenous Peoples’ is used to refer to both the Aboriginal and Torres Strait Islander Peoples of Australia and Māori of Aotearoa, New Zealand. Where references to specific cultural requirements or examples are described, the terms ‘Aboriginal and Torres Strait Islander Peoples’ and ‘Māori’ are used specifically. The AusHFG respect the right of Indigenous Peoples to describe their own cultural identities which may include these or other terms, including particular sovereign peoples or traditional place names.

Contents

Acronyms

Acronym	Definition
AFFL	Above Finished Floor Level
AHIA	Australasian Health Infrastructure Alliance
ANSI	American National Standards Institute
ANZICS	Australia and New Zealand Intensive Care Society
AS	Australian Standard
ASHE	American Society for Health Care Engineering
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
AS/NZS	Australian and New Zealand Standard
AusHFG	Australasian Health Facility Guidelines
CCON	Critical Care Overbed Network
CCU	Cardiac Care Unit
CPTED	Crime Prevention Through Environmental Design
CICM	College of Intensive Care Medicine
CIS	Clinical Information System
CRRT	Continuous Renal Replacement Therapy
CT	Computed Tomography
DDA	Disability and Discrimination Act
EBM	Expressed Breast Milk
ECMO	Extracorporeal Membrane Oxygenation
EPA	Environmental Protection Authority
FF&E	Furniture, Fittings and Equipment
GHG	Greenhouse Gas
HPU	Health Planning Unit
HVAC	Heating, Ventilation, and Air Conditioning
ICT	Information and Communication Technology
IEEE	Institute of Electrical and Electronics Engineers
IHD	Intermittent Haemodialysis
IPC	Infection Prevention and Control
IPU	Inpatient Unit
ISO	International Organization for Standardization
IV	Intravenous
LED	Light-emitting Diode
NCC	National Construction Code (Australia)

Acronym	Definition
NZBC	New Zealand Building Code
NZS	New Zealand Standard
PA	Public Address
PAA	Peracetic Acid, also known as Peroxyacetic Acid
PACS	Picture Archiving Communication System
PAS	Patient Administration Systems
PD	Peritoneal Dialysis
PICU	Paediatric Intensive Care Unit
PTS	Pneumatic Tube System
PVC	Polyvinyl Chloride
RFID	Radiofrequency Identification
RIS	Radiology Information Systems
RO	Reverse Osmosis
RRT	Rapid Response Team
SC	Standard Components
SC-D	Standard Components - Derived
SLED	Sustained Low-Efficiency Dialysis
SOP	Standard Operating Procedure
TPN	Total Parenteral Nutrition
uPVC	Unplasticized Polyvinyl Chloride
VMO	Visiting Medical Officer
WHS	Workplace Health and Safety
WOW	Workstation on Wheels

1 Introduction

1.1 Preamble

The Australasian Health Facility Guidelines (AusHFG) are freely available resources for health services and project teams across Australia and New Zealand to support better planning, design, procurement and management of health facilities.

The AusHFG are an initiative of the Australasian Health Infrastructure Alliance (AHIA), a cross-jurisdictional collaboration of all health authorities across Australia and New Zealand. Part A of the AusHFG provides further information relating to the purpose, structure and use of these resources. It is acknowledged that the application of the AusHFG varies between jurisdictions across Australia and New Zealand.

This document is intended for new-build projects; however, refurbishment projects should adhere to these guidelines as far as is possible. It is acknowledged that meeting the recommended spatial allocation may not be achievable in a refurbishment project.

This AusHFG Health Planning Unit (HPU) has been reviewed and updated by AHIA following an extensive consultation process completed in 2024.

1.2 Introduction

This HPU outlines the specific requirements for the planning and design of Intensive Care Units (ICU), including Paediatric Intensive Care Units (PICU). The document should be read in conjunction with AusHFG generic requirements described in:

- Part A: Introduction and Instructions for Use
- Part B: Section 80: General Requirements
- Part B: Section 90: Standard Components
- Part C: Design for Access, Mobility, Safety and Security
- Part D: Infection Prevention and Control.

Other critical care services are described within the following AusHFG documents:

- HPU 260 Cardiac Care (Inpatient) Unit – CCU
- HPU 390 Neonatal Care Unit.

The following related AusHFG resources should also be referenced where appropriate:

- Isolation Room - Engineering and Design Requirements
- Pandemic Preparedness - Health Infrastructure Planning & Design Guidance
- Design Guidance: Doors
- Arts in Health Framework
- Culturally Sensitive Planning and Design.

1.3 Policy Framework

The following College of Intensive Care Medicine (CICM) of Australia and New Zealand publications are referenced in this HPU:

- College of Intensive Care Medicine of Australia and New Zealand (CICM), 2016, IC-1 Minimum Standards for Intensive Care Units
- College of Intensive Care Medicine of Australia and New Zealand (CICM), 2021, IC-3 Minimum Standards for Intensive Care Units Seeking Accreditation for Training in Intensive Care Medicine.

Project teams will need to consider local jurisdictional policies as these requirements may vary or differ from the information contained in this HPU. The Further Reading section of this HPU provides some guidance towards jurisdiction-specific policy information.

1.4 Description

Intensive Care Unit

An ICU is a specially staffed and equipped, separate and self-contained area within a hospital for the management of patients with life-threatening or potentially life-threatening, and reversible or potentially reversible organ failure. The ICU provides a concentration of clinical expertise, technology and therapeutic resources for the support of patients and their families, and utilises the specialised skills of medical, nursing and other staff experienced in the management of critically ill patients. These skills and resources, necessary to care for the critically ill, are most efficiently concentrated in one area of the hospital.

The clinical infrastructure and staff profiles reflect the complex nature of the monitoring and therapeutic interventions undertaken to provide the necessary physiological and psychosocial support.

The nature and extent of intensive care services may vary greatly from hospital to hospital and will depend on the operational policies for an individual facility. Increasingly, ICUs have extended roles including rapid response teams, outreach/liaison, retrieval services, management of central venous catheters and Total Parenteral Nutrition (TPN) services. These extended roles, where they exist, need to be considered during planning.

Paediatric Intensive Care Unit

A PICU is a separate and self-contained service provided by selected tertiary referral centres that is capable of providing comprehensive critical care, including complex multisystem life support, for an indefinite period to children under 16 years of age. Generally, patients 16 years and over will be admitted to adult ICU. PICU may be co-located with an adult ICU. Where provided as part of a children's hospital, it will generally be provided as a stand-alone unit.

Levels of Service / Role Delineation

Descriptions of role delineation and levels of service for ICUs vary among jurisdictions. The level of intensive care services available should support the delineated role of the health service. The role of the ICU will vary, depending on staffing expertise, facilities, and support services as well as the severity of illness and activity data of patients being admitted. The level of service is determined by the type and immediacy of clinical presence and hospital resources together with teaching and research activities, not the standard of care. When planning an ICU, the level of intensive care services should be at or above the level needed to support current and future clinical services provided within a particular facility.

Patient Characteristics

General patient characteristics are outlined in the descriptions of service levels. Specific characteristics will vary between individual facilities but may include ventilated and non-ventilated patients; multiple invasive technologies; major surgery such as cardiac, vascular, thoracic and neurosurgery; trauma; organ failure; drug overdose; organ transplantation and other emergency conditions.

Specialised intensive care services may be provided for specialties such as acute spinal injuries, severe burns, neurosurgery, cardiothoracic surgery, obstetrics, liver transplantation and cardiac transplantation. Bariatric patients requiring intensive care intervention constitute another group requiring special consideration when admitted to an ICU.

2 Planning

2.1 Operational Models

2.1.1 Hours of Operation

Intensive Care Units provide a 24-hour, seven day per week service.

2.1.2 Operational Service Models

Optimal facility outcomes are dependent on a clear definition of the operational model that will be used in the future ICU. The model chosen will result from a detailed analysis of unit size as well as consideration of service quality, safety and sustainability.

Combined General Intensive Care

Larger hospitals and some tertiary hospitals may combine all patients within a dedicated ICU that will cater for patients with a range of conditions including trauma, neurosurgery, thoracic or cardiothoracic surgery and general medical.

This model offers advantages for hospitals where the sub-specialty case load is limited as it allows staff to gain exposure to a general range of ICU patient conditions. Cross fertilisation of education and protocols allows efficient service provision when caseloads within sub-specialty units are low.

Co-located Sub-Specialty Intensive Care

This model co-locates sub-specialty ICUs under a single operational and management structure. The sub-specialties usually encompass cardiothoracic, trauma, neurosurgical, burns and general intensive care.

This model has the principal advantage of collocating services and avoiding duplication. The single management structure allows for a more efficient medical and nursing cover. This model assumes unit-wide policies and procedures with support services. Most equipment would be standardised.

Combined Critical Care

The combined critical care model co-locates intensive care and cardiac care beds in a single unit. This type of unit is usually located in a rural, regional or smaller metropolitan hospital where flexibility of bed utilisation is important. The acuity of patients managed in this type of unit is generally lower and is reflected in nurse-to-patient ratios.

Paediatric Intensive Care Services

Paediatric patients may be managed in adult ICUs depending on local policies and access to specialised services.

Operational models for PICUs align with those outlined for adult ICUs above, including combined general intensive care and co-located subspecialty intensive care services, typically for specialist paediatric cardiac and neurosurgery services. PICUs will manage children of all ages including neonates where access to specialised services is required.

2.2 Operational Policies

2.2.1 General

Operational policies have a major impact upon the planning and design and capital and recurrent costs of health facilities. Project teams should review their design proposals with these in mind and be able to demonstrate that the capital and recurrent cost implications of proposed operational policies have been fully considered. Operational policies may have hospital-wide application or be unit-specific. A list of general operational policies that may apply can be found in Part B: Section 80 General Requirements.

2.2.2 Visitor Amenities and Access

A range of visitor amenities will be provided to support the needs of families and friends including:

- waiting areas that provide ready access to visitor toilets
- interview rooms for meetings with family members/carers/whānau
- facilities for family members and support people to rest and shower, as well as access to healthy food options and drinks at all hours of the day
- access to health information.

A reception area may be provided depending on the size of the unit and staffing arrangements. Providing a reception point to receive and direct families can assist in managing visitors' expectations and reducing anxiety. For smaller services, consideration may be given to sharing a reception area with other services, e.g., Cardiac Care Unit (CCU) for improved efficiency and staff safety.

Where a reception is not provided, or during hours that it is not operational, a video/intercom system linking the front door to the main ICU staff station with remote door release will assist with ensuring safe entry and exit to the unit by visitors. Visitors with hearing, sight or cognitive challenges and/or language barrier may struggle with video or intercom systems in ICUs without reception areas. Their needs should be carefully considered to ensure accessible communication options.

Operational procedures and guidelines need to be developed regarding visiting hours, on-site and off-site accommodation, and access protocols to the unit.

2.2.3 Information and Communication Technology

Information and Communication Technology (ICT) are key enablers for ICUs to optimise patient care and service efficiencies. ICT systems necessary to support clinical and operational requirements should be assessed during the planning and design process to ensure an appropriate level of capability is provided that also supports security, future flexibility, scalability and availability.

All units should be designed to support electronic intensive care clinical information systems. These systems provide automated monitoring and reporting with integration of patient data from multiple systems to improve patient care and safety and support clinical decision making. The system should have automated audit, data collection and reporting capacity such as the Australia and New Zealand Intensive Care Society (ANZICS) data base submissions.

Consideration needs to be given to the method and location of entering and retrieving patient information. This may occur at the bedside, decentralised workstations, mobile units/devices or at staff stations.

Other key operational considerations include communications systems, wireless network requirements, audiovisual technologies for telemedicine, use of camera in critical care areas, and automated medication dispensing systems. Further detail regarding ICT requirements is included in 3.10.8 Information and Communication Technology.

2.2.4 Staffing

The staff establishment should be identified early in the planning process. This will enable the assessment of workspace, and amenities required to appropriately support staff to deliver services safely and efficiently. Staff may include the following, working as a multidisciplinary team, in either a permanent or visiting capacity.

- medical staff such as staff specialists, visiting medical officers (VMOs), advanced trainees and junior medical staff
- nurses, such as nursing managers, registered nurses, educators and clinical nurse specialists and consultants
- equipment manager
- clinical information system manager
- allied health staff including physiotherapists, social workers, dieticians, and speech pathologists

- pharmacists
- administrative staff
- project officers, e.g., organ and tissue donation coordinators
- rapid response/liaison team members, and other ICU based services, e.g., central venous access service
- wards persons/porters
- research and data management staff
- environmental services staff
- cultural liaison officers
- chaplain/pastoral care providers.

Access to workspace in clinical and non-clinical areas is essential. The allocation of office and workstation areas will require reference to local jurisdictional policies.

2.2.5 Rapid Response Teams (RRT)

RRT that serve the whole hospital, are commonly located, and managed by the ICU. This service requires additional staff, workspace, and facilities for equipment storage.

2.2.6 Education, Training and Research

Requirements for education, training (including access to advanced clinical simulation) and research will depend on the overall policies of the health service, the level of service and the need to obtain professional accreditation.

The provision of multi-professional training and education facilities in close proximity to the ICU is essential to support accreditation for training in intensive care medicine.

Refer to CICM (2021) IC-3 Minimum Standards for Intensive Care Units Seeking Accreditation for Training in Intensive Care Medicine which outlines the requirements of hospitals seeking and maintaining accreditation for training in intensive care medicine.

2.3 Planning Models

2.3.1 Unit Size

There is no international consistency regarding the recommended size of an ICU. CICM (2016) noted that large ICUs should be divided into pods of 8 to 15 patients. An optimal unit/pod size is considered to be approximately 12 beds (including isolation capacity) which allows for suitable staffing and a sufficient staff casemix to develop expertise, gain experience and undertake training. The actual number of beds adopted should be determined through consideration of the patient casemix, clinical service planning projections and the ICU bed occupancy rate.

Larger units will likely require two or more clusters/pods of beds. Each pod will require access to a range of support spaces that minimises staff travel, supports infection prevention and reduces the potential for cross-infection.

2.3.2 Acuity Adaptable Patient Bed Spaces

The provision of acuity adaptable bed spaces is recommended so that each space can be flexibly used regardless of the level of care required. These may be provided as 100% enclosed single rooms or a mix of enclosed single rooms and open bed bays depending on the patient cohort and IPC considerations.

There is an emerging trend of providing open ICU bays as part of the planning and design for the management of patients with no infection or patients with anticipated short admission. In some ICUs, based on infection prevention and control (IPC) and other risk assessments, doors between pair of enclosed ICU bedrooms may be provided to support of the care of two patients by a single nurse such as

during staff meal breaks. Refer to 2.3.3 Bedroom Configurations for sample illustrations of this bedroom configuration.

There are advantages and disadvantages associated with designing for open and single bedrooms in ICU which are noted below:

	Advantages	Disadvantages
Open Plan	• Better visibility of patients especially during staff breaks • Staffing levels can be adjusted based on patient stability, e.g., allowing one nurse to care for two non-intubated stable patients if supported by operational model • Allows for better staff communication • Younger children within a PICU may benefit from having connection with other children.	• Can be noisy contributing to patient sensory overload and overstimulation • Less privacy and confidentiality for patients and visitors • More difficult to prevent cross-infection between patients • Potential for visitor overcrowding which may impact other patients' bed area and staff workflow.
Single Bedrooms	• Quieter as able to separate patients and their visitors • Enhanced privacy and confidentiality • Easier separation for IPC • Supports accommodation of a range of patients such as PICU beds within an adult ICU rather than requiring a stand-alone paediatric pod that would limit flexible bed utilisation • When included a door between 2 rooms can support flexible staffing and staff break coverage.	• Reduced staffing levels may lead to challenges in maintaining clear visibility of patients • Requires more staff for 1:1 care and staff break coverage • Potential for staff isolation • Reduced staff communication, support, and supervision of junior staff.

The bed space will be planned to provide clear zones for the patient, staff and visitors. This will ensure that staff can deliver care unimpeded while providing a good level of amenity for family/whānau and visitors.

Refer to AusHFG standard components:

- Patient Bay – Intensive Care
- 1 Bed Room – Intensive Care.

2.3.3 Bedroom Configurations

ICU bedrooms may be configured in a number of ways to provide high level care and monitoring of patients with life-threatening illnesses, injuries and complications based on the models of care and operational policies of the facility. The below indicative scenarios relating to ICU bedroom configurations are based on general and common layouts found in recently delivered ICU. The diagrammatic visual representations below (in Figure 1 and 2) are for illustrative purposes only to assist project teams when considering ICU bedroom layouts. The final configuration of an ICU will be on a project-by-project basis.

ICU Configuration With / Without Staff Write Up

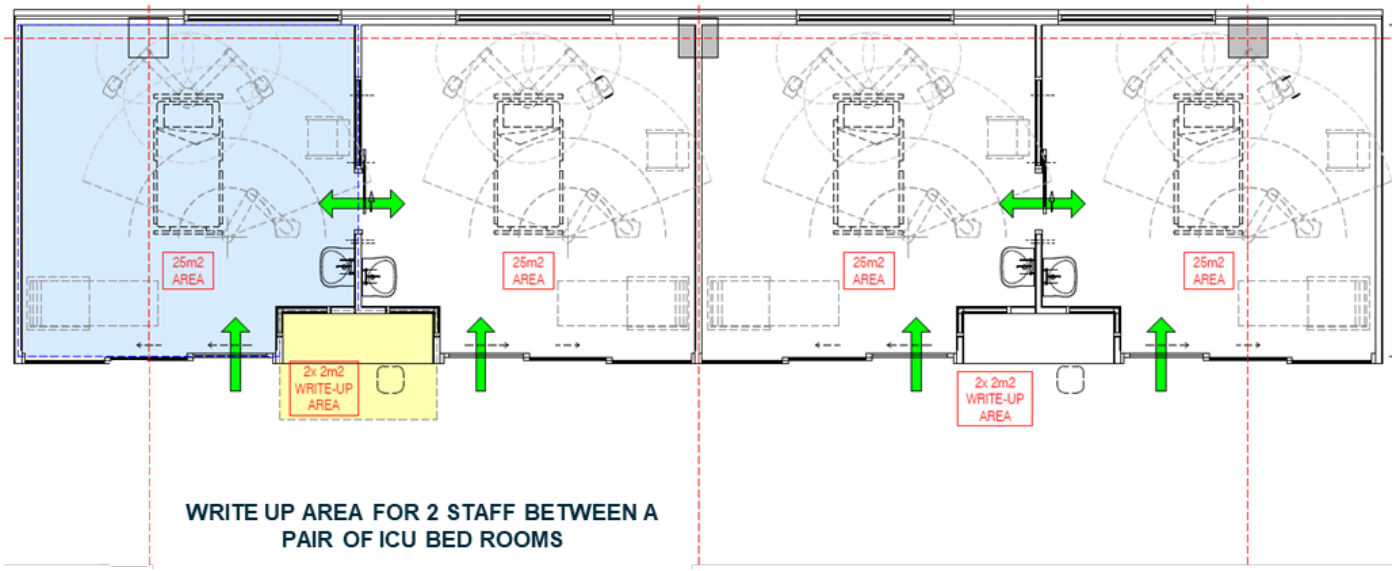
The provision of a write up area directly outside the two bedrooms for up to two staff is dependent on the models of care of the ICU. The write up area between two ICU bedrooms is optional and should not affect the overall size of the ICU bedrooms. Where write up desks outside the bedrooms are not provided, consider an alternative location for a fixed computer workstation, ceiling mounted workstation or workstation on wheels (WOW) for staff observation of patients within the bedroom.

When a write-up area for up to two staff members is provided directly outside the bedrooms, the height of the write-up desk (nominally recommended at 900AFFL), the height and positioning of the observation

window, the placement of computer screens, and the inclusion of a height-adjustable staff chair should be optimised to ensure clear visualisation of the patient over any equipment stored on the desk.

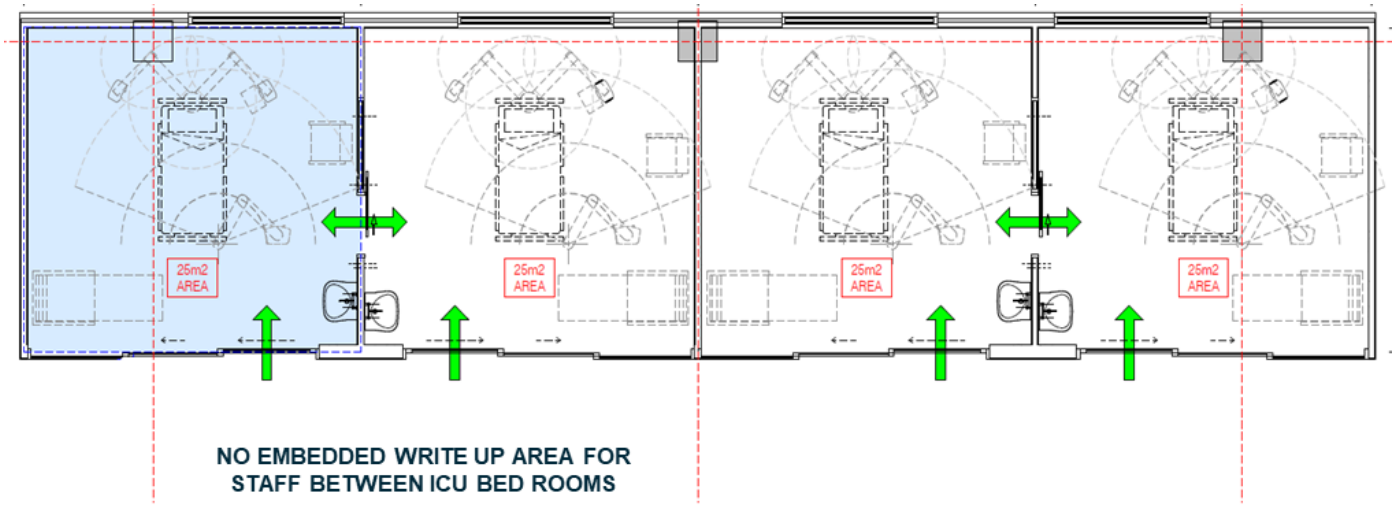
The doors between two adjacent ICU bedrooms shown in the illustrations are optional and for illustrative purposes only. They are discussed in more detail in 2.3.2 Acuity Adaptable Patient Bed Spaces.

Figure 1. ICU Bedrooms with staff write up area for two.



** Note: Doors between two adjacent ICU Bedrooms are optional and for illustrative purposes only.*

Figure 2. ICU Bedrooms without staff write up area.



** Note: Doors between two adjacent ICU Bedrooms are optional and for illustrative purposes only.*

ICU Configuration of Negative Pressure Bedroom

ICU should be capable of isolating infectious patients, including the provision of negative pressure isolation rooms for patients requiring respiratory isolation. When provided, a negative pressure isolation room should have an attached anteroom and ensuite. The final configuration of isolation rooms and the location of the anteroom will be based on specific project and jurisdictional requirements.

Also refer to 4.2.1 1 Bed Room – Intensive Care (Class N isolation) for additional planning and design considerations.

ICU Bedroom Configuration with Family / Whānau Space

Some ICU patients experiencing prolonged ventilation or requiring end-of-life care, especially paediatric patients, may need family/whānau amenities adjacent to the ICU bedroom. Although not typically provided in adult ICU, it may be considered in some PICU if it is supported by their models of care and the whole of facility operational model for family/whānau spaces. The extent of provision, risk management, operational management, overall capital and operational costs implications of the added areas should be highly considered when planning and designing these spaces.

2.3.4 Patient Visibility

Ideally, a direct line of sight of the patient's head and/or torso should be maintained from a workstation within the room/bay or from decentralised staff workstations outside single and isolation bedrooms. This permits the monitoring of patient status under both routine and emergency circumstances. Glass doors or door observation panel at the entry to enclosed rooms and windows between adjacent rooms optimise observation of patients.

If direct line of sight is obstructed by a fixed element, the design should integrate alternative solutions - such as mirrors or cameras - to maintain clear patient visibility while adhering to jurisdictional requirements and local operational policies.

2.3.5 Outdoor Areas

Outdoor areas play a pivotal role in patients' recovery and are highly recommended in new ICU developments. Outdoor spaces may assist with delirium prevention and contribute to the general wellbeing of patients especially those who are in the ICU long term.

Units need to consider equipping an outdoor space, for example a terrace, balcony or courtyard, with a medical services panel including gases, suction and power points to support a ventilated patient. Access to an outdoor area is particularly valuable for patients experiencing prolonged ventilation, end of life care and for the provision of family-centred care in PICU. Sufficient area should be provided for patient on a bed or chair, staff, and family/visitors. Weather proofing should be considered for seating/chair areas for the patient, family, visitor and staff comfort.

Emergency and staff assist call button locations should be considered to enable rapid responses during emergencies. Easy access to hand hygiene facilities including bed/chair mounted alcohol-based handrub dispenser and handwash basin (e.g. located inside the unit near the access to the outdoor areas) should also be considered.

Where outdoor space is not a viable option, access to an enclosed atrium should be considered. Refer to 4.2.3 Outdoor Area for additional information regarding Outdoor Areas in ICU.

2.3.6 Cultural Considerations

Ensuring culturally sensitive planning and design that aligns with the local community values and practices will assist to optimise the patient and family/whānau experience in ICU. Local cultural requirements will need to be considered regarding the configuration of the unit, for example gender separation may be a consideration.

For Aotearoa New Zealand health facility projects, consultation with local iwi is also important to ensure units are designed to be welcoming and adhere to local kawa and tikanga. Specific guidance to supplement the AusHFG for Aotearoa New Zealand health facility projects can be found in Te Whatu Ora – Health New Zealand Health Facility Design Guidance Note.

2.3.7 Future Expansion

Consideration should be given to future proofing the ICU to enable expansion of ICU beds if required. This may be achieved through future delivery of additional ICU pods with consideration of shared support requirements. Where substantial ICU expansion is anticipated in the future, shell spaces or soft spaces (e.g., temporary offices or storage areas) may be built adjacent to the unit to enable future ICU expansion without displacing other patient and clinical spaces.

2.4 Functional Areas

2.4.1 Functional Zones

Functional zones will include:

- entry, waiting and visitor support areas
- patient care areas
- support areas
- staff areas.

2.4.2 Entry, Waiting and Visitor Support Areas

This area provides the public entry point to the unit and support facilities for families such as waiting areas, interview rooms, beverage bays and family rest areas.

A reception area may be provided to direct visitors and assist in managing expectations and reducing anxiety. The safety of staff working in reception requires consideration given this area can be isolated. Access to duress alarms is essential in this area and consideration may be given to sharing the reception with other units.

Other considerations relating to this area include:

- separation of visitor flows to the unit from patient transfers in and out, 'back of house' flows, e.g., transfer of waste, and staff access points
- provision of privacy in the waiting area, e.g., having seated areas arranged so people do not have to sit and face each other
- access to a children's play area for larger units and PICU
- access to parenting rooms including for breast-feeding
- provision of facilities for family members/whānau to rest, shower and access toilets; as well as access healthy food options and drinks at all hours of the day
- consideration of multi-function rooms for use as both overflow interview rooms during the day and overnight family rooms
- inclusion of dual egress within interview rooms and access to duress alarms
- access to health information and health promotion advice
- implementation of appropriate signage for visitors
- inclusion of calming artworks integrated with the interiors scheme
- provision of signage and information relating to closest spiritual care/prayer/meditation or multifaith room.

It is recommended that consultation with consumer representatives is undertaken during the planning and design of ICUs. This will mitigate overprovision of spaces that may not be used or under provision of spaces that are required based on the population needs of the area.

2.4.3 Patient Care Areas

Patient care areas form the core area of the unit with all other zones radiating off and supporting this clinical space.

The central staff station will provide space for charting, central cardiac monitoring, resuscitation equipment, mobile equipment and PACS viewing facilities including several high-resolution diagnostic monitors. The central staff station may also provide a private space for informal multi-disciplinary meetings and some areas for clerical work. Where a pneumatic tube system is proposed, to deliver pathology and/or pharmaceuticals, early planning will ensure it is located within the central staff station area for easy staff monitoring.

Each pod of beds will have access to essential support facilities including staff station and a patient bathroom and/or ensuites, with access to shared support areas between pods, e.g., disposal rooms.

Paediatric patients within adult ICUs should be accommodated in single bedrooms with access to their own bathroom facilities and separation from adult flows. Access to both baths and showers is required in PICUs to support both younger and older children.

Rooms to be used for palliative care should be located in a quieter area of the unit with provision of comfortable, less clinical furnishings and appropriate artwork. Consider locating the beverage bay or tea point in proximity to a patient room designated for palliative care.

Procedures are usually undertaken at the patient bedside to minimise patient movement. A dedicated procedure room is not usually required within the ICU; however, this should be confirmed to ensure alignment with local operational policies.

For Aotearoa New Zealand health facility projects, consult with local iwi to ensure the ICU design adhere to local kawa and tikanga. Also refer to 2.3.6 Cultural Considerations.

2.4.4 Support Areas

The ICU should provide adequate storage space for the equipment and services required to support patients with increased acuity, complex conditions and the increasing clinical diagnostic and therapeutic interventions that occur simultaneously at the point of care. Equipment storage to support a Rapid Response Team for the hospital may also be required if based in ICU.

A range of support areas will need to be located within the patient care area to minimise staff travel time.

2.4.5 Staff Areas

The staff areas will be located within proximity to the patient care areas, while still providing staff with privacy from patient and public areas. The staff areas should be located and designed to promote wellness, allow them to disconnect from the high stress clinical environment and provide the ability to be by themselves or come together with the team. This may include a quiet space equipped with comfortable furniture and natural or room light which can be controlled for staff requiring a private space to rest and re-energise.

Adequate meeting and education spaces are to be provided which are separate from the family interview spaces.

Staff work areas, staff amenities including change rooms, toilet and shower facilities, meeting and reception facilities should be provided in line with local jurisdictional guidelines.

The provision of staff only outdoor spaces which may be dedicated or shared with other units will be based on whole of facility planning.

2.5 Functional Relationships

2.5.1 External

The ICU should be a separate unit within the hospital with direct (rapid horizontal or vertical adjacency), non-public, access to the:

- emergency unit
- operating unit
- interventional radiology suite (including cardiac catheter laboratories).

The achievement of ‘direct’ relationship between ICU and the services above are essential to ensure that care requirements, particularly relating to critical care events, can be optimally met.

Ready access, 24 hours per day is also required between the ICU and:

- other inpatient units (IPU)

- medical imaging unit (CT is the priority modality within an imaging unit that requires proximal access from ICU, other modalities are frequently provided via mobile imaging units that are transported to the patient)
- helicopter landing site
- birthing unit
- ancillary services including
  - pathology
  - pharmacy
  - allied health.

A 'ready' relationship reflects the requirement for proximal (but not adjacent) access due to a potentially high volume of patient transfers, ease of access for staff moving between services and transfer of samples and supplies.

Easy, proximal, discrete access are required:

- between a PICU and neonatal intensive care services where they are co-located on the same site for access to subspecialty services e.g., cardiac, and neurosurgery services.
- between ICU/PICU and undercover and discrete access to the mortuary ensuring privacy from public view (consider cultural requirements for deceased care and transfer).

'Easy' relationship reflects the need for private, convenient and minimally complicated access between services.

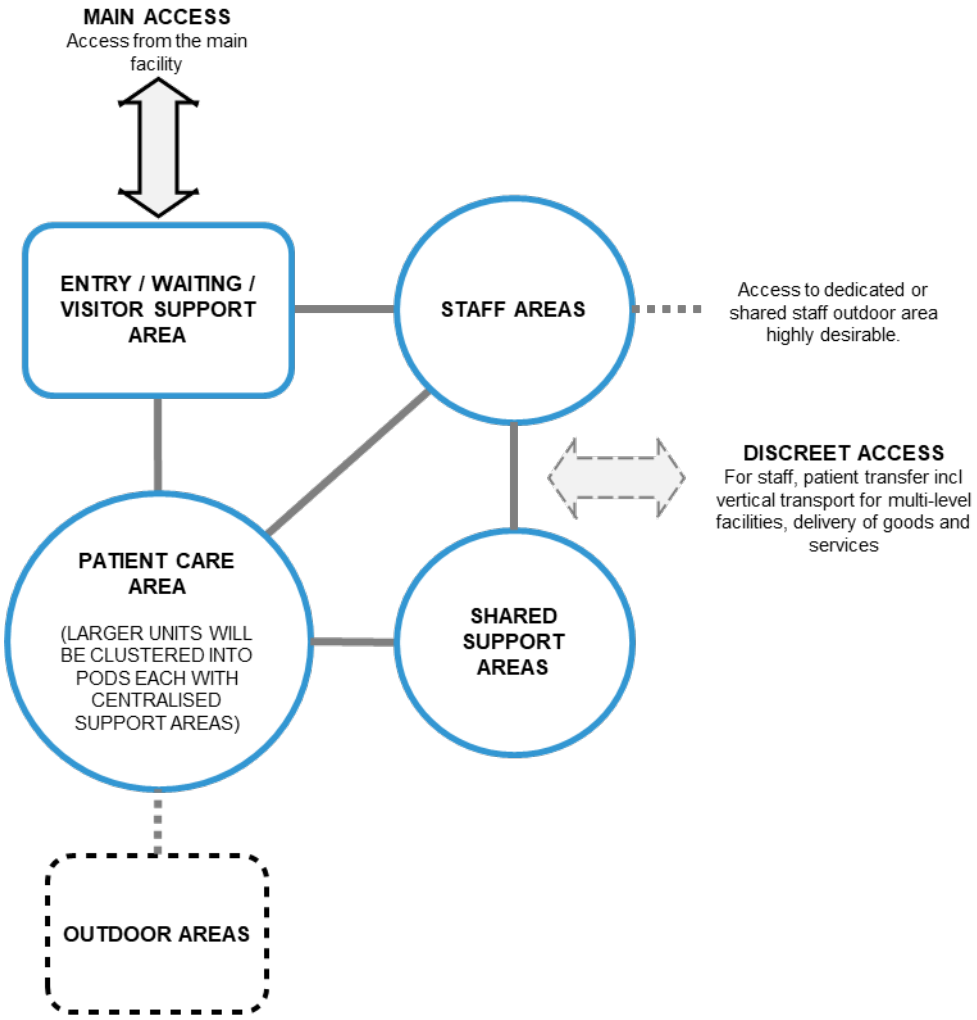
2.5.2 Internal

Planning of the ICU is complex and requires the correct relationships to be achieved between the functional zones described above.

Refer to the functional relationship diagram below.

2.5.3 Functional Relationship – Diagram

The following diagram sets out the functional relationships between zones in an ICU.


MAIN ACCESS
Access from the main facility
ENTRY / WAITING / VISITOR SUPPORT AREA
STAFF AREAS
Access to dedicated or shared staff outdoor area highly desirable.
DISCREET ACCESS
For staff, patient transfer incl vertical transport for multi-level facilities, delivery of goods and services
PATIENT CARE AREA
(LARGER UNITS WILL BE CLUSTERED INTO PODS EACH WITH CENTRALISED SUPPORT AREAS)
SHARED SUPPORT AREAS
OUTDOOR AREAS

3 Design

3.1 Access

The following movements of patient, staff and visitors into and out of the unit should be considered:

- the ICU is a discrete stand-alone unit that will not be used as a through-traffic area
- circulation routes for the transfer of critically ill patients in and out of the unit should be separate from public circulation routes for visitors. This route may also be used as alternate travel route for staff and the movement of goods and waste.

3.2 Parking

There are no specific parking requirements for ICUs.

Parking arrangements for on-call staff need to be considered to ensure that delays do not occur.

For additional information relating to staff parking, refer to AusHFG Part C: Design for Access, Mobility, Safety and Security.

3.3 Disaster Planning

The planning team will consider the role of the unit in any local, regional, or statewide disaster management plans.

Each unit will have operational plans and policies in place detailing the response to a range of internal and external emergency situations. This will include consideration of pandemic containment requirements.

For further information refer to:

- Part B: Section 80 General Requirements
- Part C: Design for Access, Mobility, Safety and Security.

3.4 Infection Control

3.4.1 General

The following aspects contribute to effective infection prevention and control (IPC), and are relevant within the context of this service:

- hand hygiene facilities
- provision for the isolation of infectious patients
- separation of clean and dirty workflows
- air volume management/mechanical ventilation
- storage
- waste management
- surface finishes.

An IPC risk assessment should be undertaken prior to concept design planning.

Refer to individual jurisdiction policies and guidelines, and to Part D: Infection Prevention and Control.

3.4.2 Isolation Rooms

Requirements for isolation rooms will need to be confirmed through a risk assessment process which will include consideration of the role delineation of the health service and patient profile. All ICUs must be capable of isolating infectious patients, including the provision of respiratory isolation through negative pressure isolation rooms. The provision of positive pressure rooms is only required in specialised units, in particularly those that support major transplant services. Consideration should be given to the location of negative and positive pressure rooms to ensure optimal observation and access to these patients who are often extremely unwell. The overall consideration of room pressurisation and control to achieve appropriate patient isolation will be dependent on the recommendation of the IPC team for the facility.

Also refer to AusHFG Project Resource Isolation Room - Engineering and Design Requirements.

3.4.3 Hand Hygiene

Clinical hand washing facilities should be provided convenient to the staff station and patient bed areas.

Alcohol based hand rub dispensers should also be provided generally throughout the unit to supplement hand basins. These should be located in each bed space and at the unit entry.

Refer to Part D: Infection Prevention and Control for further information regarding hand hygiene facilities schedules and locations.

3.4.4 Other Considerations

Acuity adaptable patient care spaces reduce the need to relocate patients as their condition changes. This reduces patient movement within the ICU which in turn reduces opportunities for cross infection and enhance patient comfort.

Depending on the role of the ICU, a requirement for pandemic containment capability may be required through the provision of an isolatable ICU pod. Also refer to AusHFG Pandemic Preparedness - Health Infrastructure Planning & Design Guidance.

3.5 Environmental Considerations

3.5.1 Patient Privacy and Observation

A major challenge in the design of ICU is the need to balance patient privacy and staff visibility of patients who are physiologically unstable and at risk of deterioration.

Bedrooms and other areas occupied by patients should be designed and configured to give staff the greatest ability to observe patients, particularly physiologically unstable or vulnerable patients. In addition, each patient bed space should have provision for visual privacy from casual observation by other patients and visitors.

Curtains and integral venetian blinds should be provided to screen open bed space ends and windows in dividing partitions and bedrooms, as recommended in the AusHFG Intensive Care standard components. As noted in the standard components, integral venetians are recommended for external windows and windows between rooms for IPC reasons. Capital cost and maintenance issues are factors to consider with integral venetians. Facilities may consider the installation of switchable glass that can readily change from opaque to transparent, however this will require consideration of the significant increase in capital cost in comparison to the provision of curtains and integral venetian blinds. Other considerations relating to switchable glass include the product lifespan, acoustic rating (noting it is single glazed glass in comparison to double glazing provided for integral venetians), operating regime and cleaning requirements.

Environmental graphics/films may be considered, particularly within PICUs, to enhance clinical observation and privacy while improving the patient experience. Refer to 3.5.6 Arts Integration for further guidance on developing artwork and graphic elements for the ICU environment.

3.5.2 Acoustics

Noise is a constant source of complaints from patients and may compromise patient comfort and recovery. Consideration should be given to noise minimisation to optimise patient comfort and facilitate sleep.

While the use of single bedrooms can significantly reduce the impact of noise, when the doors are closed, staff may not be able to hear the patients when outside the room. This may be overcome by the placement of microphone in the room that are linked to decentralised staff workstations. The location of speakers for emergency calls in staff areas should be considered early in the planning and design process to suit the size and operation of the unit.

Signals from patient call systems, alarms from monitoring equipment, and telephones should be modulated to a level that will alert staff members yet be rendered less intrusive. Consideration may be given to text messages alerts to staff as an alternative to audible systems, delivering notifications to staff via phone or paging systems.

The layout of the unit should consider the need to locate high activity/noisy areas such as pneumatic tube stations and dirty utility rooms with noise producing washer disinfectors away from patient bedrooms.

It is recommended that an Acoustic Comfort Strategy (or similar) be developed for the building as a whole (or for ICU unit separately if being undertaken as a separate project).

3.5.3 Natural Light

Natural light and external views contribute to a sense of wellbeing for all building occupants including patients, staff and other users. A limited number of research studies suggest a link between greater levels of natural light and improved clinical outcomes.

In areas where glare from the sun may impact the visual comfort of occupants, operable blinds with low visual light transmission should be provided.

The use of natural light should be maximised throughout the unit including borrowed light or installation of skylights. If natural light is not available to occupied rooms, specialised lighting systems that mimic natural daylight, i.e., circadian lighting or colour temperature adjustable lighting, may be considered.

In larger units, external views should be provided where possible. However direct access to windows of occupied rooms may not be possible; where this is not possible, internal views to green walls and internal atriums may be provided instead.

3.5.4 Interior Design Considerations

Some colours, particularly the bold primaries and green, should be avoided in areas where clinical observation occurs. Such colours may prevent the accurate assessment of skin tones, e.g., yellow/jaundice, blue/cyanosis, red/flushing.

Wall design should be suitable to patient cohort i.e., subtle soft contemporary colours for adults and with playful inclusions for paediatrics. Also consider non-glare finishes on walls and floors.

Biophilic design principles should be considered for interior décor as they have proven benefits for mental and physical health including reduced stress and quicker recovery time. Also consider IPC principles when considering biophilic design elements.

Overnight accommodation should provide for a non-institutional appearance that mimics the home environment with domestic style furnishings and framed artwork.

3.5.5 Signage and Wayfinding

Internally in larger units, the wayfinding of the ICU should orientate the visitors to the different pods. This may be done using colours to provide a memorable identifying element for each pod. Coloured lines on the floor may also be used to direct visitors to correct pods. Further consideration should be given to people with colour blindness, cognitive challenges or limited head mobility that may necessitate combination with other wayfinding elements to enhance accessibility.

For additional information refer to:

- AusHFG Part C: Design for Access, Mobility, Safety and Security
- NSW Department of Health, 2022, Wayfinding for Health Facilities, Second Edition
- Māori - English Bilingual Signage which is a Bilingual (Māori) English guideline for signage in Aotearoa New Zealand.

3.5.6 Arts Integration

Thoughtfully selected and wholistically integrated artwork can support patient, staff and visitor experience in the ICU by creating a calming environment and reducing the institutional feel.

Importantly, artworks can provide moments of positive distraction from feelings of boredom, anxiety and pain.

The below areas should be considered as a priority for arts integration:

- waiting and reception areas
- patient areas
- family and carer meeting rooms
- overnight rooms.

Options could include:

- viny wall or floor wraps
- framed artworks, e.g. paintings, photography, works on paper
- artwork graphics applied as window glazing or other forms of privacy screening
- dimmable lighting.

Artwork for the ICU is recommended to be selected in consultation with clinical staff teams and consumers of the service.

Refer to the AusHFG Arts in Health Framework for further guidance on arts integration from early planning.

3.6 Space Standards and Components

3.6.1 Ergonomics

Patients in ICUs are nursed in beds and require significant, if not total assistance with all activities of daily living. Some strategies that can be used include:

- electric beds so that staff minimise bending and poor posture and to enable the beds to be directly configured as patient chairs
- ceiling mounted hoists
- provision of mobile equipment bays to accommodate lifting equipment where ceiling mounted hoists are not provided.

Equipment, including beds, patient chairs, and hoists, will also be required for the management of bariatric patients. The provision of standard ceiling mounted lifter on single track in all ICU beds is on a project-by-project basis and to be determined early in the planning and design. The provision of H track and/or higher weight capacity tracks (up to 500-600kg) will be considered only for designated ICUs. Refer to jurisdictional policies regarding issues relating to ceiling mounted hoists and weight allowances.

There are different models and operational policy for taking the patient from the bedroom into the ensuite between jurisdictions and should be determined by risk assessment.

Consultation and risk assessment by ICU and Work Health and Safety (WHS) staff is required for the pendant design and patient lifter including discussion of safe working load.

3.6.2 Access and Mobility

The facility must comply with the Commonwealth Disability and Discrimination Act (DDA) and the following standards where applicable:

- Disability (Access to Premises – Buildings) Standard 2010
- National Construction Code (NCC)
- AS 1428.1:2021 Design for access and mobility, Part 1: General requirements for access - New building work
- NZS 4121:2001 Design for access and mobility: Buildings and Associated Facilities.

There should not be steps within ICU, and the provision of elevated staff stations should be avoided. Also consider workspaces clearances and adjustable height desks in the staff areas.

3.6.3 Vertical Transport (Lifts)

Consider vertical transportation of patients to and from ICU. The lift location is important to ensure rapid access to sufficiently sized patient lifts in a non-public zone. Depending on the ICU service, it is an important early consideration in the planning process to provide a larger lift to accommodate additional large ICU equipment such as ventilator and extracorporeal membrane oxygenation (ECMO) equipment which need to be transported with the patient as well as the multiple staff required to assist with patient transfer.

Consider implementing a 'priority call' function for lifts to facilitate the rapid transport of critically ill patients. Additionally, ensure access to emergency power and integrate a built-in storage bracket for medical gas cylinders within the lift car to support emergencies in the lift car.

Refer to NSW Health Engineering Services Guide or Victoria Health Engineering Guidelines for Healthcare Facilities Volume 6 – Specialist Healthcare Engineering and Provision (HTG-2020-006) or other local jurisdictional guidelines for vertical transportation guidance for ICU.

3.6.4 Doors and Doorways

Ensure doorways have sufficient width and height to permit the manoeuvring of beds, wheelchairs, trolleys and equipment without risk of damage or manual handling injury, particularly in rooms designed for bariatric patients. Where standard Australian and New Zealand door leaf heights do not meet the functional requirements of a particular space, the option of a higher door should be evaluated on a project-by-project basis.

All entry points, doors, or openings in the clinical zone should be a minimum of 1400mm wide, unobstructed. Larger openings may be required for special equipment, such as bariatric beds, as determined by the operational policy.

Ensure that door swings into corridors or aisles are carefully considered to maintain safety and prevent obstructions. When doors must open outward into a corridor/passageway or held open for extended periods, a 180-degree swing onto an adjacent wall should be considered to minimise the risk of obstruction or accidental contact with individuals and mobile equipment passing through.

Also refer to AusHFG resource Design Guidance: Doors.

3.6.5 Bed Spacing and Clearances

There must be adequate clear distance between the bed and any fixed obstruction including bed screens or wall to facilitate resuscitation procedures without restricting movement of staff, beds, and equipment.

Beds should be arranged so that there is a minimum clearance of 1500mm to the staff side of the bed, 1200mm to the visitor side and 900mm to the head or foot. The current room layouts of the 1 Bedroom – Intensive Care and Patient Bay – Intensive Care standard components, exceed these minimum dimensions.

When an open plan arrangement is provided, a circulation space or aisle of 2400mm minimum clear width should be provided beyond dedicated cubicle space.

When designing spaces with ceiling-mounted equipment, such as service pendants, procedure/examination lights, and ceiling-mounted lifters, it is essential to account for height clearances in compliance with WHS standards. Proper planning minimises the risk of equipment collisions, prevents movement restrictions caused by other structural elements, and reduces the likelihood of staff overreaching or sustaining head injuries. Refer to AusHFG Part C: Design for Access, Mobility, Safety and Security for additional ceiling heights information.

Patient call systems should be positioned and connected to ensure conscious patients can easily access the call handset, whether lying supine or in reclined position in bed/recliner.

3.6.6 Corridors

The size of the basic ICU bed is often enlarged by the addition of monitors, IV equipment, and several staff, making movements more difficult than in other areas of the hospital.

Adequate circulation space will be provided for the safe and efficient movement of these trolleys and beds which are large and carry valuable and sensitive equipment, and patients who are severely ill.

Refer to AusHFG Part C: Design for Access, Mobility, Safety and Security.

3.6.7 Windows

The environment provided should minimise stress to patients and staff. Therefore, natural light and views should be available from the unit.

Windows are an important aspect of sensory orientation, and as many rooms as possible should have windows to reinforce day/night orientation.

Consideration should be given to the design of external windows so that patients might have access to natural light and views while in bed or in a chair. Beds should be able to be rotated 90 degrees for lower acuity patients to allow them to have a view out the window. If windows cannot be provided in each room, an alternate option is to allow a remote view of an outside window.

If single rooms are provided, glazing between rooms can allow staff to monitor patients in the next room. These viewing panels will need to ensure that patient privacy can also be achieved.

If ultrasounds are routinely being performed in the unit, the ability to blackout a space will be needed.

3.7 Safety and Security

3.7.1 Safety

The design and construction of the facility and selection of furniture, fittings and equipment should ensure that users are not exposed to avoidable risks of injury.

3.7.2 Security

Facility planners and designers should enhance security by incorporating the principles of Crime Prevention Through Environmental Design (CPTED) such as territorial reinforcement, passive surveillance, space management and access control into the design.

Access to an ICU should be controlled with the ability to lock-down the unit, however, this should not unnecessarily prevent access by family members/whānau.

Staff only areas will be planned so they are not accessed by unauthorised individuals.

Rooms containing high-cost equipment, medications and clinical supplies will be locked or under the direct supervision of staff to prevent theft and/or tampering.

3.7.3 Risk and Hazard Management

The physical environment has a significant impact on the health and safety of end users. A risk management approach ensures risks are managed systematically utilising a process that supports the anticipation, identification and avoidance of risks that may have an impact on users and services.

Broad consultation with all stakeholders and other identified processes may be utilised to identify risks according to the availability of expertise to ensure security, health and safety risks are proactively managed.

Individual jurisdictions should refer to their local legislation for further requirements for plant and buildings.

Work health and safety legislation requires designers to identify, assess and control risks in order to provide an optimal ergonomic design and to do this in consultation with stakeholders.

By adopting a risk management approach, many safety and security related hazards can be eliminated or minimised at the planning stage before work even begins, reducing the likelihood of adverse incidents occurring.

Refer to:

- AusHFG Part C: Design for Access, Mobility, Safety and Security
- AS/NZS ISO 31000:2018 Risk Management – Principles and Guidelines.

3.8 Finishes

3.8.1 General

Finishes in this context refer to walls, floors, windows and ceilings.

Refer to AusHFG Part C: Design for Access, Mobility, Safety and Security and the Standard Components for ICU specific rooms.

3.8.2 Wall Finishes

Adequate wall protection should be provided to areas that will regularly be subjected to damage. Particular attention should be given to areas where bed or trolley movement occurs such as corridors, bed head walls, treatment areas, equipment bays, and linen trolley bays.

3.8.3 Floor Finishes

Refer to local jurisdictional policies and to:

- AusHFG Part C: Design for Access, Mobility, Safety and Security
- AusHFG Part D: Infection Prevention and Control.

3.8.4 Ceiling Finishes

Ceiling finishes should be selected with regard to appearance, cleaning, IPC considerations, acoustics and access to services.

For more information refer to AusHFG Part B and C.

3.9 Fixtures, Fittings & Equipment

3.9.1 Definitions

The Room Data and Room Layout Sheets in the AusHFG define Fixtures, Fittings and Equipment. Refer to:

- Part C: Design for Access, Mobility, Safety and Security
- AusHFG Standard Components for ICU specific rooms.

3.9.2 Equipment

The type and quantity of equipment will vary with the type, size and function of the unit and should be appropriate to the workload of the unit.

The minimum standards for Intensive Care Units specifies the minimum equipment to be included in an ICU. This equipment is identified on Room Data Sheets.

Refer to College of Intensive Care Medicine of Australia and New Zealand (CICM), 2016, IC-1 Minimum Standards for Intensive Care Units.

3.9.3 Bedside Monitoring

Each unit should contain an approved high acuity patient monitoring system, with visual display for each patient at a central monitoring point, generally the staff station. In large units, a central monitor will be provided in each pod.

Bedside monitoring equipment should be located in a position that makes it easy for staff to access and view the equipment but does not interfere with their ability to see or access the patient. In each patient bedspace, one monitor will be located at the head of the bed. Patient entertainment system and additional functionality will be determined on a project-by-project basis.

An integrated ICU Clinical Information System should be a component of the monitoring system and will require access to patient information at each bedspace, usually via mobile technology to enable flexible positioning within the room.

3.9.4 Medical Services Pendants and Workstations

The placement and configuration of medical service pendants in ICU bedrooms are determined by project-specific requirements. Typically, service pendants with tandem/dual arms on a single insertion point or single arms on multiple insertion points are installed to provide the reach required around the bed. The inclusion of a third pendant, or foot pendant, remains uncommon. Its provision should undergo a comprehensive evaluation, considering service demands, such as ECMO use in tertiary facilities, staff workflow policies, and the associated additional capital and recurrent costs.

Ceiling-mounted workstation at the foot of the bed as an alternative to workstation on wheels (WOW) or computer on fixed desk may also be assessed for consideration at project level and in line with local ICT strategies.

Refer to Standard Components for 1 Bed Room – Intensive Care and Patient Bay – Intensive care for further information, Section 3.6.1 Ergonomics and Section 3.6.5 Bed Spacing and Clearances for additional considerations.

3.10 Building Services Requirements

3.10.1 General

Refer to local jurisdictional requirements relating to building and engineering services.

3.10.2 Air Handling Systems

Air handling system fan energy is typically the single largest energy end use in ICUs as these systems deliver high volumes of conditioned air 24 hours a day, 7 days a week. Consideration should be given to minimising air handling system fan energy by designing low face velocity air handling systems and low-pressure distribution ductwork and setting back air volume and temperature when not in use, whilst maintaining humidity within design parameters.

Provision of natural ventilation to patient care areas is not usually suitable within an ICU as the management of airflows and the creation of a stable environment are essential for controlling infection spread. Therefore, an air conditioning system should be provided.

Refer to additional AusHFG guidance:

- Part D: Infection Prevention and Control
- Project Resource Isolation Rooms – Engineering and Design Requirements

3.10.3 Electrical Services

Cardiac protection should be incorporated in all patient areas within the ICU in accordance with AS/NZS 3003:2018.

It is essential that services such as emergency/patient/staff call systems, emergency lighting, telephones, duress alarm systems, including the central computer and electronic locks are connected to the emergency power supply.

3.10.4 Fire Services

The fires services design shall comply with the national building code, its performance requirements or deemed to satisfy reference standards, and the local health engineering services guidelines.

3.10.5 Medical Gases

Provide oxygen, suction and medical air to each bed services panels or services pendants as required.

Refer to AusHFG Standard Components for ICU patient bedrooms/bays.

3.10.6 Pneumatic Tube System (PTS)

Consider the provision of pneumatic tube system to deliver pathology and/or pharmaceutical items. The location of the PTS station should be considered early in the design process to ensure easy access and monitoring by staff.

Refer to AusHFG Standard Component Bay - Pneumatic Tube Station for further information.

3.10.7 Lighting

Appropriate lighting, both general and task, will be provided throughout the ICU. An examination light will be required in each patient room/bay.

Lighting design should consider occupant comfort through task-based design with low glare, high colour rendering, and uniformity.

Lighting levels in patient rooms should be variable and individually controlled.

Consider the type of lighting which may interfere with patient monitoring equipment such as LED lighting which may potentially affect pulse oximeter measurements. To mitigate health risks to patients, all LED lighting installed shall have no observable effect as per the standard IEEE 1789-2015 - IEEE Recommended Practices for Modulating Current in High-Brightness LEDs for Mitigating Health Risks to Viewers.

3.10.8 Information and Communication Technology

A range of information and communications technology issues, and the associated infrastructure requirements, will need to be assessed during planning and design to ensure long term flexibility and capacity including:

- wireless technology
- radiofrequency identification (RFID) for access control, locks etc.
- duress alarm systems
- voice/data (telephone and computers)
- videoconferencing capacity/telemedicine
- electronic health records
- clinical point of care systems such as Clinical Information System (CIS)
- Picture Archiving Communication System (PACS)

- Patient Administration Systems (PAS)
- Radiology Information Systems (RIS)
- paging and personal telephones replacing most aspects of call systems
- overhead Public Address (PA) system which requires some rules/guidance for use
- patient multimedia devices including bedside monitors that function as televisions, computer screens for internet access, etc.
- bar coding for supplies
- server and communications rooms
- e-learning and simulation
- e-medication management and e-storage systems such as automated dispensing systems.

3.10.9 Telehealth

Facilities for video conferencing and consultations are required for staff education, patient consultations with specialist clinicians and to enable clinicians in remote locations to discuss cases.

Based on the jurisdiction, installation of overbed camera such as NSW Critical Care Overbed Network (CCON) cameras may be considered which can provide clinicians with access to specialists based at different hospitals.

Refer to CICM, 2019, 1C-16 Guidelines on the Use of Telemedicine in the Intensive Care Unit for additional principles and guidance.

3.10.10 Communications

All ICUs should have an intercommunication system that provides voice linkage between the staff station, patient care areas, staff overnight rooms, meeting rooms and the staff room.

Some types of communication, such as non-emergency calls, may be best accomplished using visual displays, such as numeric or colour-coded lights and ceiling mounted dual sided messaging corridor clocks, which eliminate unnecessary noise.

There should be a mechanism for emergency internal and external communications when normal systems fail.

3.10.11 Duress Alarms

Duress alarms - mobile or fixed - should be provided in accordance with jurisdiction policies. In the ICU context, fixed duress is likely to be provided at reception, in interview rooms and staff stations. If provided, consider mobile duress alarm coverage, storage, tracking, hardware, charging, availability and monitoring systems. These are monitored by security who needs to identify a person's location.

For further information refer to Part C: Design for Access, Mobility, Safety and Security.

3.10.12 Dialysis

In the context of in-wall hydraulics integration within the ICU, the following terminology will be used to define the associated elements:

- The *dialysis wall box* includes the in-wall box, the front face panel, an in-wall tundish with viewing panel, and the water and drainage connection points.
- The *dialysis wall panel* refers to the front face of the box that contains the connection points and viewing panel.

Access to Reverse Osmosis (RO) Water

For some types of dialysis provided in the ICU, consideration of access to reverse osmosis (RO) is required. The source of RO water will be dependent on the mode and frequency of dialysis used in the

unit. The use of portable RO units is recommended over the use of reticulated RO water systems in the ICU for the following reasons:

- Portable RO units help mitigate the risk of dialysis interruptions by scheduled heat sanitisation of the central RO plant, which typically occurs overnight and may temporarily affect water availability.
- As intermittent haemodialysis is infrequently performed in the ICU, stagnant water systems can pose quality concerns and often result in continuous water discharge to the drain, leading to unnecessary water waste.
- Installing and maintaining a dedicated central RO plant involves significant capital and operational expenditure.

Proximity of ICU to the Renal Dialysis Unit to enable sharing of the RO water system is neither mandatory nor recommended, as other critical clinical adjacencies take precedence in planning. Furthermore, the majority of ICUs typically utilise only Continuous Renal Replacement Therapy (CRRT) or Peritoneal Dialysis (PD), rather than the full spectrum of dialysis modalities. Only ICUs with a substantial number of dedicated rooms for patients regularly receiving intermittent haemodialysis (IHD) or sustained low-efficiency dialysis (SLED) should consider being located in close proximity to the Renal Dialysis Unit for efficient sharing of the RO plant.

Water supply to the dialysis wall boxes must incorporate appropriate backflow prevention in accordance with the Plumbing Code of Australia and New Zealand (AS/NZS 3500) to protect the potable water supply from contamination.

Dialysis Modality and Clinical Services Requirements

The type of dialysis to be provided in the unit is dependent on the service capabilities of the ICU. Where dialysis wall boxes are to be provided, their placement and configuration should consider a single, consistent panel for ICU that supports all therapies - such as IHD, SLED, CRRT or PD. This will also support future adaptability to evolving services provision and growing population demands.

- Inclusion of dialysis wall boxes and panels – whether at select beds or provided universally across the unit – is to be determined on a project-by-project basis and should reflect the service requirements of the ICU.
- In accordance with AS/NZS 3500.2, where there is a risk of the plumbing trap drying out, traps must be primed with water from a local water source. For therapies such as CRRT and PD, a dedicated water point is required to periodically refill the trap to maintain compliance with the standard. This requirement supports the implementation of a standardised wall panel that can support all types of dialysis therapies in terms of number of water and drainage connection points, although the specific fittings may vary slightly depending on the water source and the therapy being delivered.
- Suitable connection components – such as quick connect fitting – must be confirmed by projects to suit dialysis equipment connection requirements and should be provided with the dialysis wall box. This is essential to prevent blockages, minimise the risk of leakage, reduce corrosion, and support ease of maintenance and servicing.
- In ICUs where IHD or SLED will not be provided, connection fittings will differ slightly to accommodate the connection of CRRT machines with auto-effluent discharge.
- Some types of dialysis, and the model of delivery (e.g. by ICU staff or by Renal Unit staff) will significantly impact the storage requirements for consumables, equipment and fluids in the ICU. The provision of CRRT and PD requires storage of a significant volume of bagged fluids and storage space, and FF&E will need to be considered carefully to support manual handling and transportation.
- The portable RO unit and haemodialysis machines require access to both water supply and drain connections within the area where they are stored to maintain regular disinfection and flushing, even while in storage.

Workforce Capability

Consider whether the model of care assumes that ICU staff will be trained and qualified to perform IHD and SLED, or whether these treatments will be delivered by renal dialysis staff as required within the ICU. The workforce model may impact where machines, equipment and consumables are stored and where ongoing maintenance will be undertaken.

Materiality, Maintenance and IPC Considerations

Where provided, dialysis wall boxes with integral tundishes and their associated plumbing must be designed and constructed using materials that minimise biofilm formation, can withstand hospital-grade disinfectants, can withstand high temperature wastewater, are resistant to corrosion from dialysis fluids, and ensure long-term durability. As part of cleaning and maintenance, the dialysis fixtures and plumbing may also need to withstand regular flushing with chemical agents such as peracetic acid (PAA), also known as peroxyacetic acid.

PAA is typically used at a working concentration of 0.5%. However, it is commonly supplied as a 5% stock solution, requiring appropriate dilution based on the volume of water present in the trap. For effective disinfection, a retention time of approximately 30 minutes is generally recommended.

Wastewater from the different types of dialysis will influence the dialysis wall box and pipework selection, e.g. to ensure it can withstand high temperatures (depending on operational policies for location of heat disinfection of dialysis machines). The dialysis wall box and pipework also need to be selected/designed to handle the volume of effluent produced by different dialysis therapies, the effluent's potential to cause build-up (e.g. biofilm, salts, etc.) in the drainage system, and subsequently the cleaning products needed to address/prevent this build-up. Routine cleaning and maintenance of dialysis wall boxes and associated pipework is essential to maintaining system performance and hygiene. Regular hot water flushing (+60^{o}C) plays a key role in dissolving fat-based deposits and disrupting biofilm formation, both of which can lead to blockages and reduced efficiency over time.

Refer to Appendix 7.1 Types of Dialysis and Infrastructure Considerations and Appendix 7.2 Materiality, Maintenance and IPC Considerations for additional information.

3.10.13 Clocks

The accurate tracking of time within the ICU is critical. The utilisation of synchronised digital wall clocks will be visible in all clinical areas and waiting areas.

The provision of clocks with date, time and day of the week may be provided in patient bedrooms to assist with orientation. However, an option to turn off or remove the clock should be considered for patients who show negative mood or display anxiety when the time is always visible to them.

3.11 Sustainability

Ambitious net zero greenhouse gas (GHG) emissions reduction targets are being set by governments across Australia and New Zealand, and healthcare services will be expected to contribute. Creating adaptable environments with reduced carbon emissions and less waste therefore decreasing carbon footprint, has become a goal in healthcare facilities. And like other units in the healthcare facility, ICU is one that can contribute by making sustainability a core element of in the planning, design, construction and in its everyday operations.

Some of the environmentally sustainable solutions will require infrastructure changes but there are others that may require a relatively small change in practice. One example is the provision of larger disposal rooms in ICU to allow staff to recycle not just the general waste but also to separate ICU waste such as blood pressure cuffs and PVC items prior to their pickup. There are numerous other opportunities to reduce use, encourage reuse and recycling, and ensure proper waste disposal to improve the environmental impact of the ICU.

Refer to ANZICS, 2022, A beginners guide to sustainability in the ICU, for further guidance on some strategies and approaches to assist in creating an ICU that responds to the goal of decreasing its carbon footprint.

Measurement of metric elements like separate electricity monitoring, waste monitoring and water usage may also be considered as part of the building management systems (BMS) for new developments as part of whole facility sustainability strategy.

There is a range of literature relating to ICU sustainability initiatives, however there is variability regarding the implementation of these across Australia and New Zealand. Strategies implemented need to consider 'whole of hospital' approaches to sustainability and the full logistics process, for example waste management processes relating to collection and recycling providers.

For further information refer to:

- ANSI/ASHRAE/ASHE Standard 189.3-2021, Design, Construction, and Operation of Sustainable High-Performance Health Care Facilities
- Jurisdictional waste management policies/regulations and relevant Environmental Protection Authority (EPA) guidance
- Victorian Health Building Authority, 2024 Biophilic design for health care facilities
- ANZICS, 2024 A Beginners Guide to: Green Teams in the ICU.

4 Components of the Unit

4.1 Standard Components

Rooms/spaces are defined as:

- standard components (SC) which refer to rooms/spaces for which room data sheets, room layout sheets (drawings) and textual description have been developed.
- standard components – derived (SC-D) are rooms, based on a SC but they vary in size. In these instances, the standard component will form the broad room 'brief' and room size, and contents will be scaled to meet the service requirement.
- non-standard components which are unique rooms that are usually service-specific and not common.

The standard component types are listed in the attached Schedule of Accommodation. The current Standard Components can be found at: https://www.healthfacilityguidelines.com.au/standard-components

4.2 Non-Standard Components

Non-Standard Components are unit-specific and are described below.

4.2.1 1 Bed Room – Intensive Care (Class N Isolation)

Description and Function

Single bedroom which may be used for patients requiring respiratory isolation. The room will have an adjoining anteroom that will be used by staff. Patients will enter the enclosed room via the main doorway. An internal communication system (for example intercom) should be provided between the bedroom and anterooms.

Location and Relationships

Isolation Rooms should be clustered and located away from the unit entrance. However, the location should be carefully considered to ensure appropriate observation given these patients are often extremely unwell.

Considerations

Handsfree communication should also be considered between the inside of the room and the immediate area outside the negative pressure room such as the corridor or other areas where staff may be present to provide timely communication between the staff inside and outside of the negative pressure room.

Refer to AusHFG Project Resource Isolation Rooms – Engineering and Design Requirements and AusHFG Part D: Infection Prevention and Control.

4.2.2 Decentralised Staff Workstation

Description and Function

A workstation for up to two staff located between two enclosed ICU bedroom for close patient observation. The workstation may have a telephone and computer equipment which include slave or mirror monitoring, electronic medical records and PACS functionalities.

Provision of these workstations and the provision of passive/non-passive secondary patient monitor is dependent on models of care.

Location and Relationships

The workstation will be generally located immediately outside the patient bedrooms to allow full view of the patient, especially the head and torso, through an observation window.

Considerations

The area of this workstation is not included in the 1 Bed Room – Intensive Care or 1 Bed Room – Intensive Care (Class N Isolation).

If integral venetian or smart glass is provided on the observation window between the patient room and staff workstation, the control should be provided on both sides.

Consider the services requirements to supply power and voice/data to the ICT equipment.

4.2.3 Outdoor Area

Description and Function

A balcony/courtyard or garden for use by ICU patients and family/visitors, especially those experiencing long term hospitalisation. Sufficient area should be provided for patient on a bed or chair, staff, and family/visitors.

Location and Relationships

The outdoor area should be located with easy and direct access to the clinical area of the unit in the event of an emergency.

Considerations

Provide medical services panel including gases, suction, emergency call and power points to support a ventilated patient. Also consider easy access to hand hygiene facilities.

IPC team approval may be required for the plants and soil selection. An airlock may also be required to prevent garden debris and dust from entering the unit during patient movement. Also consider weather protection to enhance usability of the space.

In facilities where an open outdoor space cannot be provided due to site constraints, a dedicated private area (not a public thoroughfare) where ICU patients can look down into the open space in the glazed atrium of the hospital may be considered. A glazed ‘winter garden’ or sunroom may also be considered after risk assessment. These spaces will also require medical services panel including medical gases, suction, emergency call and emergency power supply to support a ventilated patient.

Consideration can also be given to providing an outdoor area located within the waiting area to support cultural waiting behaviours.

4.2.4 Milk Preparation / Storage Room

Description and Function

The Milk Preparation / Storage Room provides storage of formula and expressed breast milk (EBM) including bench space to make up formula and associated storage. Access to refrigerated/frozen storage of EBM must be secure with consideration of local jurisdictional policies relating to the safe management of breast milk.

This is usually a staff only area and should be a lockable room.

Requirements include:

- refrigerators (with temperature monitoring and alarms)
- freezers (with temperature monitoring and alarms)
- bench space for preparation
- a sink to dispose of unused milk products
- a hand wash basin, Type B
- storage of formula, breast pumps, and associated consumables.

Location and Relationships

This room will be located in paediatrics ICU and ICUs with combined adult and paediatric patients.

Considerations

It is essential that each infant/toddler receives the right feed. All feeds must be clearly labelled and identifiable. Consider mounting or storage of sticker labels.

Local operational practices should be confirmed regarding sterilising and reprocessing requirements in relation to usage of single use items for breast pump accessories and bottles.

4.2.5 Bay – Bulk Fluids

Description and Function

An open bay for the delivery and storage of multiple large boxes and/or pallets of IV and dialysis fluids.

Location and Relationships

The bay should be located with easy access from the services lifts and services entry to ICU. Avoid a location with direct sunlight to protect the fluids from high temperatures.

The bay should not be in the ICU clinical space but in the periphery of the unit.

Considerations

The bay should be deep enough so as not to impede adjacent corridor circulation. The depth of the bay should allow for pallet storage and manoeuvrability of the pallet jack.

Wall and corner protections are essential.

4.2.6 Simulation Room

Description and Function

A Simulation Room is a flexible space which provides clinical scenario simulation, training and/or clinical skills assessment of healthcare professionals using low and high-fidelity manikins, real-life clinical space set-ups and scenarios.

Location and Relationships

The room may be located adjacent to other educational spaces in ICU. Where a Simulation Room is provided, a separate adjacent Simulation Control Room may also be provided.

Considerations

The room may be part of a shared education and training area within the healthcare facility and may be used by staff other than those in the ICU. As such, access to the room may be required from outside of ICU without going through the unit.

Storage of full body manikins and other educational items should be provided.

Consider audiovisual systems to observe and/or record the scenarios remotely.

4.2.7 Simulation Control Room

Description and Function

A Simulation Control Room is used to store audiovisual equipment to control clinical scenarios in the Simulation Room.

Location and Relationships

The control room will be located adjacent to the Simulation Room. The room may have glazed observation window to directly observe the simulation space or have audiovisual systems to observe and/or record the scenarios remotely.

Considerations

Consider the services requirements to supply power and voice/data to the ICT equipment.

4.2.8 Workroom - Telehealth

Description and Function

A private room with facilities for video conferencing and consultations for staff education, patient consultations with specialist clinicians and to enable clinicians in remote locations to discuss cases. The room can be used for viewing medical images and discussions, and for telehealth activities for liaison regarding transfers, virtual rounds etc.

Inclusion of this room depends on operational guideline of unit.

The telehealth workroom is for the provider of telehealth services in larger tertiary facilities. The receiver of the ICU telehealth support will be in smaller remote or rural facilities which should be equipped with appropriate ICT equipment such as camera, workstation on wheels, microphone and appropriate internet connectivity.

Location and Relationships

The room does not need to be located in the ICU. However, when located in ICU and staffed by roaming clinicians with patient load, the telehealth room is to be located in the clinical zone of the unit to allow clinicians easy access between the ICU clinical area and attending to telehealth duties.

Considerations

Based on the jurisdiction, installation of overbed cameras such as NSW Critical Care Overbed Network (CCON) may be considered which can provide clinicians with access to specialists based at different hospitals.

Consider the services requirements to supply power and voice/data to the ICT equipment.

This room may also be provided as proprietary single or multiple person soundproofed telehealth booth depending on project requirements.

4.2.9 Respiratory / Biomedical Workroom

Description and Function

A respiratory/biomedical workroom is an area for the repair maintenance and calibration of both respiratory and biomedical equipment, and as a work base for anaesthetic and biomedical technicians when visiting the unit. This area will typically be occupied intermittently by one or two persons. Piped oxygen and air should be provided to this area.

This room is typically provided for larger multi-pod ICU.

Location and Relationships

A respiratory/biomedical workroom should be accessible from all areas of the unit.

In smaller ICU this room may be located away from the unit and shared by other critical care areas for minor repairs and calibration of other medical equipment.

Considerations

Consider storage of spare parts, workbench, desk and a computer for the equipment nurse or officer.

5 Schedule of Accommodation

The application of the schedule of accommodation below will require confirmation of the total ICU capacity requirements through detailed clinical services planning and required pod size for larger units.

The schedule of accommodation provided is based on the following indicatively sized ICUs:

- 12 bed Paediatric Intensive Care Unit
- 12 bed Adult Intensive Care Unit
- 48 bed Adult Intensive Care Unit (assumed to be configured as 4 pods of 12 beds).

As noted, each pod will require dedicated clinical support space to ensure that materials are close to hand and staff travel time is minimised, however a number of assumptions are noted regarding opportunities to share some support areas between pods.

The space allocated to staff and support areas will need to reflect bed numbers, the arrangement of the beds and staffing profiles.

The 'Room/Space' column describes each room or space within the unit. Some rooms are identified as 'Standard Components' (SC) or as having a corresponding room which can be derived from a SC. These rooms are described as 'Standard Components –Derived' (SC-D). The 'SC/SC-D' column identifies these rooms and relevant room codes and names are provided.

All other rooms are non-standard and will need to be briefed using relevant functional and operational information provided in this HPU.

In some cases, rooms/spaces are described as 'Optional'. Inclusion of this room/space will be dependent on a range of factors such as operational policies or clinical services planning.

5.1 Entry / Waiting and Family Support Areas

Room Code	Room Name	SC / SC-D	PICU 12 beds		Adult ICU 12 beds		Adult ICU 48 beds (4 pods)		Comments
			Qty	m2	Qty	m2	Qty	m2	
RECP-10	Reception	Yes	1	10	1	10	1	12	**Optional for 12-bed PICU and 12-bed Adult ICU scenarios.** Provision will depend on the size of the unit and staffing arrangements.
WAIT-10 WAIT-30	Waiting	Yes	1	20	1	20	1	58	Nominal area. To be calculated at 1.2m^2 per able-bodied person, 1.5m^2 per wheelchair occupant.
PLAY	Activity Area	Yes	1	10		10	1	10	**Optional for 12-bed PICU and 48-bed Adult ICU scenarios.** **Shared for 12-bed Adult ICU scenario.**
BVM	Bay - Vending Machine	Yes	1	2	1	2	1	4	Locate close to but not within waiting area given level of noise and heat generation. Area may include food, drinks & toiletries vending machines and phone charging station.
BWTR	Bay - Water Fountain	Yes	1	1	1	1			
BBEV	Bay - Beverage	Yes					1	4	
WCPU	Toilet - Public	Yes	1	3	1	3	4	3	
WCAC	Toilet - Accessible	Yes	1	6	1	6	1	6	**Optional.** Include if not located nearby.
PAR	Parenting Room	Yes	1	9	1	9	1	9	**Optional.** Include if not located nearby.

Room Code	Room Name	SC / SC-D	PICU 12 beds		Adult ICU 12 beds		Adult ICU 48 beds (4 pods)		Comments
			Qty	m2	Qty	m2	Qty	m2	
INTV	Interview Room	Yes	1	14	1	14	2	14	**Optional for 12-bed PICU and 12-bed Adult ICU scenarios.** For interviews with relatives. Include dual egress. Consider including some interview rooms within the clinical zone.
MEET-20	Meeting Room, 20m^2	Yes	1	20	1	20	1	20	Multifunctional meeting room for family and staff meetings. Larger meeting room frequently required for end-of-life discussions.
LNGE-20	Multipurpose Family / Visitor Lounge	Yes	1	15	1	15	1	30	Multipurpose family/visitor downtime space. Adjust area depending on provision of family overnight rooms. Consider design for use during the day as overflow meeting room. A small family/whanau lounge directly adjacent to a palliative care bed room may be also be considered.
OVES	Shower / Toilet	Yes	1	5	1	5	1	5	Provide and locate in close proximity to multipurpose family/visitor lounge.
BPROP	Property Bay	Yes	1	1	1	1	1	2	**Optional.** For family/visitor belongings if using multipurpose family/visitor lounge or overnight stay rooms as multipurpose spaces.
Discounted Circulation %			**25%**		**25%**		**25%**		

5.2 Overnight Accommodation – Family (Optional)

The provision of overnight rooms within or adjacent to ICU depends on local operational policies. Overnight rooms may be provided on other floors of the healthcare facility, within the healthcare grounds or located nearby as part of the hospital wide family accommodation provision.

Room Code	Room Name	SC / SC-D	PICU 12 beds		Adult ICU 12 beds		Adult ICU 48 beds (4 pods)		Comments
			Qty	m2	Qty	m2	Qty	m2	
OVBR	Overnight Stay - Bedroom	Yes		10				10	**Optional for 12-bed PICU and 48-bed Adult ICU scenarios.** The provision of overnight rooms within or adjacent to ICU depends on local operational policies. May be designed for use during the day as overflow interview rooms.
OVES	Overnight Stay - Ensuite	Yes		5				5	**Optional for 12-bed PICU and 48-bed Adult ICU scenarios.** The provision of overnight rooms within or adjacent to ICU depends on local operational policies. Required if Overnight Stay - Bedroom is provided.
Discounted Circulation %			**25%**		**25%**		**25%**		

5.3 Patient Areas

Room Code	Room Name	SC / SC-D	PICU 12 beds		Adult ICU 12 beds		Adult ICU 48 beds (4 pods)		Comments
			Qty	m2	Qty	m2	Qty	m2	
1BR-IC	1 Bed Room - Intensive Care	Yes	7	25	7	25	28	25	The number of enclosed vs open bays provided will depend on the patient cohort and infection control considerations. Includes provision for a palliative care space.
PBIC	Patient Bay - Intensive Care	Yes	4	24.5	4	24.5	16	24.5	Recommended at 4 per pod of 12. The final number of enclosed vs open bays provided will depend on the patient cohort and infection control considerations.
1BR-IC	1 Bed Room - Intensive Care (Class N Isolation)	Yes	1	25	1	25	4	25	No. dependent on patient cohort and local jurisdictional policies.
1BR-IC	1 Bed Room - Intensive Care (Class P Isolation)	Yes		25		25		25	**Optional.** Depends on cohort and local jurisdictional requirements.
ANRM	Anteroom	Yes	1	6	1	6	4	6	Attached to 1 Bed Rooms - Isolation Class N (neg pressure ventilation).
BATH	Bathroom	Yes	1	15	1	15	1	15	**Optional for 12-bed PICU and 12-bed Adult ICU scenarios.** Requires gases. May be shared between pods subject to design. Specialist ICU such as designated burns ICU bathroom to be designed to suit function.
ENS-SP	Ensuite - Special	Yes	2	6	2	6	8	6	Ensuites dedicated to negative pressure, positive pressure and standard isolation rooms. Number dependent on isolation room requirements. PICUs should include bathrooms with baths for younger children.
ENS-SP	Ensuite - Special	Yes	2	6	2	6	8	6	Ensuites to be shared between remaining rooms. Assume a 1:6 ensuite to remaining ICU bed space ratio which may be adjusted depending on unit needs. PICUs should include bathrooms with baths for younger children.
SSTN-20	Staff Station	Yes	1	25	1	25	4	25	1 central staff station per pod.
OFF-CLN	Office – Clinical Workroom	Yes	1	15	1	15	4	15	1 per pod.
	Decentralised Staff Workstation		4	2	4	2	16	2	**Optional.** 1 between 2 enclosed rooms. Provision dependent on models of care.
BHWS-A	Bay - Handwashing, Type A	Yes	2	1	2	1	8	1	Also included within each patient bay.
BLIN	Bay - Linen	Yes	1	2	1	2	4	2	1 per pod.
BRES	Bay - Resuscitation Trolley	Yes	1	1.5	1	1.5	4	1.5	1 per pod.
BPATH	Bay - Pathology Point of Care Testing (POCT)	Yes	1	3	1	3	4	3	1 per pod. May be shared between 2 pods depending on layout.
BPTS	Bay - Pneumatic Tube Station	Yes	1	1	1	1	4	1	1 per pod.
BMEQ	Bay - Mobile Equipment	Yes	3	4	3	4	12	4	3 per pod. Locate in quiet low traffic areas.
BBW	Bay - Blanket / Fluid Warmer	Yes	1	1	1	1	2	1	Shared between 2 pods if collocated, subject to design.
	Discounted Circulation		**40%**		**40%**		**40%**		

5.4 Outdoor Areas

Room Code	Room Name	SC / SC-D	PICU 12 beds		Adult ICU 12 beds		Adult ICU 48 beds (4 pods)		Comments
			Qty	m2	Qty	m2	Qty	m2	
AIRLE-12	Airlock	Yes	1	12	1	12	1	12	**Optional.** May be required to prevent garden debris and dusts entering the clinical zone.
	Outdoor Area		1	20	1	20	1	40	**Optional for 12-bed PICU and 12-bed Adult ICU scenarios** but highly recommended. Provide medical services panel to support ventilated patients.

5.5 Support Areas

Room Code	Room Name	SC / SC-D	PICU 12 beds		Adult ICU 12 beds		Adult ICU 48 beds (4 pods)		Comments
			Qty	m2	Qty	m2	Qty	m2	
BBEV	Bay - Beverage	Yes	1	4	1	4	2	4	**Share between 2 pods where collocated.** One to be located near palliative care room if provided in larger units.
BMT	Bay - Meal Trolley	Yes	1	4	1	4	2	4	**Optional.** Depends on local operational policy for food services. Share between 2 pods where collocated.
	Milk Preparation / Storage Room		1	9					Used for formula preparation and storage, and sterilising of expressing equipment within PICUs.
MED-14	Medication Room	Yes	1	12	1	12	2	20	Share between 2 pods where collocated but may also be provided per pod in line with the unit's medication storage policy. Area to be distributed if automated dispensing units are provided centrally within central staff area.
CLN-10	Clean Store	Yes	1	26	1	26	2	52	Clean stock. Distribution between pods dependent on layout.
STEQ-20	Store - Equipment	Yes	1	24	1	24	4	24	$2m^2$ per bed. May include specialty stores e.g., for retrieval equipment, renal, allied health etc. Rooms may be consolidated into larger shared stores.
STGN	Store - General	Yes	1	12	1	12	2	24	Rooms may be consolidated into larger shared store.
	Bay - Bulk Fluids		1	4	1	4	1	10	Storage of bulk delivery of palletised IV and dialysis fluid. Easy access from services lifts.
	Respiratory / Biomedical Workroom		1	12	1	12	1	20	For set up and servicing.
DTUR-12	Dirty Utility	Yes	1	12	1	12	4	12	1 per pod.
CLUP-7	Clean-Up Room	Yes	1	7	1	7	1	24	For cleaning and disinfection of ICU equipment such as ventilators, CPAP, dialysis machine and IV pumps before storing or use for other patients.
CLRM	Cleaner's Room	Yes	1	5	1	5	4	5	Number and distribution depend on layout.
DISP-10 DISP-15	Disposal Room	Yes	1	10	1	10	1	20	Includes recycling bins. Size requirements for a Disposal Room will be dependent on a department's estimated waste output, the frequency of waste collection and local operational policies for waste management that may dictate the number of waste streams and minimum bin sizes.

Room Code	Room Name	SC / SC-D	PICU 12 beds		Adult ICU 12 beds		Adult ICU 48 beds (4 pods)		Comments
			Qty	m2	Qty	m2	Qty	m2	
	Simulation Room		1	25			1	25	**Optional.** Requirement will depend on education and training requirements/access to central simulation facilities.
	Simulation Control Room						1	10	**Optional.**
	Workroom - Telehealth		1	12	1	12	1	12	**Optional for 12-bed PICU and 12-bed Adult ICU scenarios.** Inclusion depends on operational guideline of unit. Can be used for viewing medical images and discussions, and for telehealth activities for liaison regarding transfers, virtual rounds etc.
WCST	Toilet - Staff	Yes	2	3	2	3	4	3	For ease of access from clinical areas.
Discounted Circulation			**40%**		**40%**		**40%**		

5.6 Staff Areas

Room Code	Room Name	SC / SC-D	PICU 12 beds		Adult ICU 12 beds		Adult ICU 48 beds (4 pods)		Comments
			Qty	m2	Qty	m2	Qty	m2	
OFF-1P-9	Office - 1 Person, 9m^2	Yes		9		9		9	Quantity and area allocation will be dependent on staff profile and jurisdictional policies relating to staff work areas. Provision of specific office allocations within unit on a project-by-project basis.
OFF-1P-12	Office - 1 Person, 12m^2	Yes		12		12		12	Quantity and area allocation will be dependent on staff profile and jurisdictional policies relating to staff work areas. Provision of specific office allocations within unit on a project-by-project basis.
OFF-WS	Office - Workstation		Yes	4.5		4.5		4.5	Quantity and area allocation will be dependent on staff profile and jurisdictional policies relating to staff work areas. Provision of specific workspaces allocations within unit on a project-by-project basis.
MEET-15	Meeting Room	Yes	1	15	1	15	1	12	
MEET-20	Meeting Room, 20m^2	Yes		20		20	1	20	**Shared for 12-bed PICU and 12-bed Adult ICU scenarios.** Assume shared access to 20m^2 meeting room under Entry/Waiting & Family Support for smaller services.
MEET-55	Meeting Room	Yes					1	50	
BMFD-3	Store - Multifunction Device	Yes	1	3	1	3	2	3	
SRM-15 SRM-35	Staff Room	Yes	1	18	1	18	1	52	
CHST-10 CHST-35	Change - Staff	Yes	1	18	1	18	1	63	Indicative only; peak access periods need to be assessed; separate male and female and support for all gender/gender neutral facilities needed is in line with local policies. Includes toilets, showers, lockers; size depends on the staffing per shift.
WCAC	Toilet - Accessible	Yes		6		6	1	6	**Shared for 12-bed PICU and 12-bed Adult ICU scenarios.**
OVBR	Overnight Stay - Bedroom	Yes		10		10		10	Requirement depends on staffing arrangements and availability of centrally managed on-call staff accommodation. Close access to toilet/shower facilities required.
Discounted Circulation			**25%**		**25%**		**25%**		

6 References and Further Reading

6.1 References

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6.2 Further Reading

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7 Appendices

7.1 Types of Dialysis and Infrastructure Considerations

Water supply and wastewater flow rates, along with temperature parameters, should be carefully considered in the design and material selection of the dialysis wall box. These values are intended as a general guide and should be used in conjunction with the specific requirements provided by the dialysis machine supplier or manufacturer.

Refer to ICU Dialysis Infrastructure and Design Considerations table below for additional guidance.

7.2 Materiality, Maintenance and IPC Considerations

The following guidance is based on currently available information, technology and products; however, alternative strategies developed following hydraulic engineering and IPC expert advice may also be considered if they are proven effective. To reduce hygiene risks and simplify maintenance:

- Each tundish's waste outlet should be engineered to discharge directly into the drainage system, minimising surface contact and preventing accumulation of scale, bacterial growth, and discolouration.
- Care should be taken to address crystallisation of IHD reject water, which can lead to deposits of glucose and human waste fats inside the tundish enclosure, potentially causing blockages. The dialysis wall box should ideally incorporate an internal pipe connected to the quick connect fitting. This pipe must be designed for easy replacement in the event of blockage. It should be configured to discharge wastewater directly above the outlet drain, thereby minimising contact with the internal surfaces of the wall box and reducing the risk of contamination or residue buildup.
- In ICUs where CRRT or PD effluent is directly discharged into the dialysis wall box or a dedicated drainage point, the project teams should:
    - confirm the connection fitting requirements to minimise risk of hose disconnection during effluent discharge
    - consider the potential for biofilm build-up from the high glucose effluent from CRRT and salt build-ups from PD effluent and assess both infrastructure and operational practice options for mitigating this issue
    - consider the incorporation of an internal pipe connected to the quick connect fitting noted above.
- If heat sanitation for IHD and SLED machines is to be performed at the bedside, the pipework must accommodate the large discharge volume and high temperature of wastewater, as well as allowing for cooling the wastewater prior to it encountering standard uPVC pipework. Typically, this cooling function is provided through the provision of a large cooling water trap with a sealed lid (often called a sealed floor waste) which can hold a larger volume of water used to cool the wastewater compared to a standard trap and can withstand higher temperatures. The large cooling water trap must be sealed so no aerosolised pathogens are able to escape.
- It is important to note that both the portable RO water unit and dialysis machine typically emit heat during operation and disinfection.

To further support IPC, hot water (+60˚C) flushing of the drainage system – whether automated on a timed cycle or performed manually – should be considered. If automated, the systems used for flushing the drainage system should incorporate fail safe considerations. A strategy should be in place to ensure the system defaults to a safe condition in the event of a failure. For example, an automatic shut-off may be set for when the outlet is blocked during a timed flush to prevent water from overflowing onto the floor. A comprehensive maintenance strategy with an accompanying standard operating procedure (SOP) including the coordination of PAA dosing with the hot water flushing process should also be implemented.

The flushing system should also incorporate design features that mitigate splashing. This will help reduce the risk of environmental contamination and support safer maintenance practices in the clinical zone. Splash control is equally critical to safeguard staff from potential exposure to hazardous substances, e.g. when dialysis is required for patients undergoing chemotherapy and wastewater may contain cytotoxic residues.

In summary, the following infrastructure and design elements should be taken into account when planning for the various dialysis modalities that may be implemented in the ICU:

ICU Dialysis Infrastructure and Design Considerations

Type of Dialysis	RO Water	Connection Points	Water Supply Flow Rate and Temperature Range	Wastewater Flow Rate and Temperature Range	Other Infrastructure Considerations	Wastewater / Effluent Additional Considerations
Intermittent Haemodialysis (IHD) and Sustained Low-Efficiency Dialysis (SLED)	Required (portable RO water trolley to generate local dialysis water)	• 1 x potable water connection • 1 x drain for portable RO machine • 1 x drain for dialysis machine	• 0.75-1.2 L/min) while dialysis is being undertaken • Dialysis machine disinfection 2.25 L/min • 15°C - 25°C	• 500 to 800 mL/min (0.5 to 0.8 L/min) from dialysis machine during therapy • 0.25-0.4 L/min from the RO water trolley • Dialysis machine disinfection 1 L/min • 37°C during therapy • 15°C - 25°C from RO water trolley • Dialysis machine disinfection 95°C - 100°C	• Equipment storage and maintenance, including portable RO • Needs water and drains in the rooms where they are to be stored • Consumables storage	• Drainpipe from quick connect fitting to wall box outlet to be piped using a replaceable pipe (when blocked) and aligned directly over wall box outlet • Crystallization of IHD reject water can lead to deposits of glucose and human waste fats inside the tundish enclosure, potentially causing blockages • High temperature wastewater from heat disinfection of dialysis machines and the water production plant or trolley/cart. Hydraulic design to allow for cooling of high temperature water prior to water reaching standard uPVC plumbing
	Required (central reticulated RO system to generate dialysis water - **not typically provided in ICU**)	• 1 x RO water connection • 1 x drain for dialysis machine	• Dialysis water - 500-800 mL/min (0.5-0.8 L/min) while dialysis is being undertaken • Dialysis machine disinfection 1.5 L/min • 15°C - 25°C	• 500 to 800 mL/min (0.5 to 0.8 L/min) from dialysis machine during therapy • Dialysis machine disinfection 1 L/min • 37°C during therapy • Dialysis machine disinfection 95°C - 100°C	• RO plant location, maintenance and consumables storage	

Type of Dialysis	RO Water	Connection Points	• Water Supply Flow Rate and Temperature Range	• Wastewater Flow Rate and Temperature Range	• Other Infrastructure Considerations	• Wastewater / Effluent Additional Considerations
Continuous Renal Replacement Therapy (CRRT)	Not Required	**In-room wastewater disposal:** • 1 x drain port (same port as PD where both are performed) • Combined with dialysis wall panel where IHD/SLED are also performed • Effluent disposal via transfer to the Dirty Utility is to be eliminated in new projects, aligning with IPC principles and minimising manual handling risks	• No water connection is used for this process	• 29 mL/min • 37°C	• Equipment storage and maintenance • Consumables storage, including storage for dialysis fluids (transport and storage of heavy fluid bags)	• Drainpipe from quick connect fitting to wall box outlet to be piped using a replaceable pipe (when blocked) and aligned directly over wall box outlet • Water supply to fill trap even if there is no IHD • High glucose content can contribute to biofilm build up that can cause blockages as it is a food source for microorganisms. Hydraulic design to consider, hot water flushing (+60°C) and cleaning requirements to reduce blockage risk
Peritoneal Dialysis (PD)	Not Required	**In-room wastewater disposal:** • 1 x drain port (same port as CRRT where both are performed) • Combined with dialysis wall panel where IHD/SLED are also performed • Effluent disposal via transfer to the Dirty Utility is to be eliminated in new projects, aligning with IPC principles and minimising manual handling risks	• No water connection is used for this process	• 50-100 mL/min • 37°C	• Equipment storage and maintenance • Consumables storage, including storage for dialysis fluids (transport and storage of heavy fluid bags)	• Drainpipe from quick connect fitting to wall box outlet to be piped using a replaceable pipe (when blocked) and aligned directly over wall box outlet • Water supply to fill trap even if there is no IHD • High salt content can contribute to corrosion and salt build up that can cause blockages. Hydraulic design to consider hot water flushing (+60°C) and cleaning requirements to reduce blockage risk