

42.0 Renal Dialysis Unit

42.1 Introduction

42.1.1 Description

Renal Dialysis is a medical process that becomes necessary when the normal functions of the kidneys become compromised by reduced kidney function and kidney failure. This may be due to disease, injury, infection or genetic factors. Renal failure may be classified as either Acute Renal Failure or chronic Kidney Disease. Hemodialysis and Peritoneal dialysis services involve filtering the blood of excess fluid, and waste products normally filtered by the kidneys.

Hemodialysis is a treatment for end stage renal failure where the function of the kidneys to remove substances from the blood is replaced by the use of a hemodialysis (dialysis) machine. Hemodialysis requires the patient to have one of the following – arterio-venous fistula, vein graft (artificial graft) or central line catheter inserted into their neck or upper chest for dialysis. Hemodialysis management may require the patient to undergo dialysis for 3 to 6 hours on a daily basis over 3 to 4 days a week.

Hemodialysis may be undertaken in the following locations:

- A hospital
- A Satellite unit
- A Stand-alone unit
- A Self-care unit
- At home.

Peritoneal dialysis is an alternative to Hemodialysis. Peritoneal dialysis involves the exchange of fluid to and from the abdominal peritoneum via an inserted peritoneal catheter 3 to 4 times each day with this being undertaken either manually or with the assistance of a machine (Automated Peritoneal Dialysis – APD) for 8 to 10 hours, generally overnight. Peritoneal dialysis is usually performed at home after supported technical training and education either as an inpatient or outpatient at a community dialysis unit.

The functions of the Renal Dialysis unit are:

- To receive and provide dialysis services to people who have been referred from the community or a hospital inpatient unit
- To provide training for patients, family members and/or relevant others in procedures related to hemodialysis and/or peritoneal dialysis (optional)
- To act as a resource to the community, other staff and agencies with regards to the requirements of renal health services.

42.2 Planning

42.2.1 Operational Models

Operational models of care for a service will influence the functional planning components for the unit. The role delineation of a hospital will determine the type and range of the renal dialysis services that will be provided and the associated support systems and services. The Renal Dialysis unit may be provided as:

- One of the departments in a hospital (in-center care) and also support dialysis services as required in an ICU, CCU or in a Renal Inpatient Unit
- A dialysis unit planned as a satellite unit which may be situated on the hospital site/campus or a stand-alone unit located within a community setting.

42.2.2 *Models of Care*

Renal dialysis can be provided in a number of settings as described in the operational models and Planning Models.

The development of the models of care to deliver a renal dialysis service is provided by a multi-discipline team to support the patient/client, their family and or carer. The important role of education should also be considered in the development of models of care.

The development of clear documented models of care by the service for the proposed renal dialysis unit should assist with the design development and planning, ensuring the future functionality of the unit.

Hours of Operation

Units operate from early morning until late afternoon providing multiple sessions per day. Some units may operate for extended hours to accommodate working patients/clients.

42.2.3 *Planning Models*

Some of the factors that should be taken into consideration when planning a Renal Dialysis Unit include:

- The operational model chosen as part of the planning model
- Age and mix of the patient group
- Acuity of the proposed or current patient group
- Comorbidity of the patient group
- Rate of infectious diseases to be expected in the patient group.

Service Delivery Methods

This FPU is applicable to the following Operational Models

- Hospital based unit – a unit within the hospital
- Satellite Unit – on a hospital campus but not in a hospital unit
- Stand-alone unit – positioned in a community setting.

42.2.4 *Functional Areas*

The Dialysis Unit will consist of or have access to the following functional areas for all service delivery methods:

- Main Entry/Reception Area
- Waiting
- Treatment Areas
- Staff Areas
- Support Areas
- Storage Areas:
 - o Clinical
 - o Non Clinical
 - o Bulk items storage e.g. Fluids, equipment and dialysis machine
 - o Service maintenance.

42.2.5 Functional Relationships

External

Planning is to address the following key issues:

- Ease of access to the unit where the majority of people will arrive by car on a daily basis
- Separation of walking and stretcher/ambulance patient arrivals
- Safe access to the Unit Store rooms for the delivery of bulk items e.g. fluids on a palette requiring mechanical lifting, moving and storage
- Safe access for the delivery of food, clean linen, pharmacy, consumables, disposable items and the related removal of bulk waste and soiled linen etc.

Internal

The internal planning of the Renal Dialysis Unit should be planned by considering the units functional areas/zones.

Some of the critical relationships to be considered include:

- Staff work station requires an unobtrusive view of all patient treatment areas; the inclusion of decentralized staff work areas may be considered in larger units that have multiple rooms or treatment spaces
- Reception requires a clear view of entry and exit/egress points of the Unit
- Easy access from the Waiting area to the Patient Treatment area for the convenient arrival and departure of patients and family
- Functional relationship of training and isolation rooms to the entry of the unit with access to outdoor space.

42.3 Design

42.3.1 General

The Unit shall be designed to provide:

- Ease of public access for patients who may arrive either walking, using mobility equipment, families with children, on an ambulance stretcher or patient trolley
- Ease of access to public parking for patients who are often debilitated and who may need to visit the unit on a regular basis
- Ease of delivery of large amounts of fluids (dialysate) on palettes to the Unit on a regular basis.

42.3.2 Patient Treatment Areas

Patients should be situated so that healthcare providers have direct or indirect visualization. This approach permits the monitoring of patient status under both routine and emergency circumstances.

The preferred design is to allow a direct line of vision between the patient and the staff.

42.3.3 Environmental Considerations

Natural Light

Natural light contributes to a sense of wellbeing of patients, staff, visitors and other users. The use of natural light should be maximized throughout the Unit.

Natural light and a view to pleasant and interesting outdoor areas is of particular importance for patients who spend long periods of time sitting in dialysis chairs. Every effort should be made to provide a view to all treatment areas either by locating treatment bays adjacent to a window or enabling unobstructed sight lines through areas to an outdoor view.

Privacy

Confidentiality for persons receiving treatment is a highly important consideration to be addressed. The Unit should be designed to:

- Ensure confidentiality of personal discussions and medical records
- Provide an adequate number of rooms for discreet discussions and treatments to occur whenever required
- Enable sufficient space within each treatment space to permit curtains to be easily drawn whenever required
- Appropriately locate windows and doors to enhance visual and acoustic privacy.
- Acoustics.

Many of the functions undertaken in the Unit require consideration of acoustic privacy including:

- Family/case conference/interviews rooms
- Isolation of noisy areas such as waiting rooms from clinical areas e.g. clean and dirty utilities
- Staff discussions regarding confidential matters (including Meeting rooms)
- Noise sources may arise both within and from outside the dialysis unit and may include:
 - o Sanitary facilities
 - o Equipment
 - o Other patients/clients
 - o Staff activities
 - o Traffic through the unit e.g. visitors, food, linen or other trolleys.

Solutions to be considered include:

- Selection of sound absorbing materials and finishes
- Use of sound isolating construction
- Planning to separate quiet areas from noisy areas
- Review of operational management and patient/client flows. This may include separate areas for patients with special needs.
- Location of the unit.

Interior Design

This includes the style of design, furnishings, color, textures and ambience, influenced by perceptions and culture. The décor of the Unit should be of a standard that meets the expectations of people using the services and make every effort to reduce an institutional atmosphere. Cleaning, infection control, fire safety, patient care requirements and the patients' perception of a professional inviting environment should always be considered.

Suggestions to achieve this balance include the following:

- Use of design features such as colors and artworks to distract the sight from clinical areas
- Inclusion of soft furnishings that act as a design feature such as screening, lounges, in waiting areas and window treatments
- Elimination of corridors through good design wherever possible
- Inclusion of corridors at the minimum required widths to meet the service needs e.g. wide corridors are a feature that potentiates institutional environments
- Provision of a beverage bay for people to use while waiting
- Background music through a piped system or a centralized unit
- Television systems with head set access to reduce ambient noise in the Unit.

42.3.4 Space Standards and Components

Accessibility – External

There should be a weatherproof vehicle drop-off zone with easy access for less-mobile patients and wheelchair bound patients. Consideration should be given to the separation of ambulant and non-ambulant patient arrivals to enhance privacy of ambulance and or stretcher patients frequenting the service.

42.3.5 *Safety and Security*

Equipment, furniture, fittings and the facility itself should be designed and constructed to ensure that users are not exposed to avoidable risks or injury. A high standard of safety and security can be achieved by careful configuration of spaces and zones to include:

- Control access/egress to and from the Unit
- Optimize visual observation for staff
- Similar functions shall be co-located for easy staff management.

Access to public areas shall be considered with care so that the safety and security of staff areas within the Unit are not compromised.

Refer also to Part C of these Guidelines.

42.3.6 *Finishes*

Floor and ceiling finishes shall be selected to suit the function of the space and promote a pleasant environment for patients, visitors and staff.

The following factors shall be considered:

- Aesthetic appearance
- Acoustic properties
- Durability
- Ease of cleaning
- Infection control
- Movement of equipment.

Refer also to Part C and Part D of these Guidelines.

42.3.7 *Fixtures and Fittings*

Refer to Part C of these Guidelines and Standard Components of individual rooms for information related to fixtures and fittings.

42.3.8 *Building Service Requirements*

Communications/Information Technology

It is vital to provide reliable and effective Information Technology/Communications service for efficient operation of the Unit. The following items relating to Information Technology/Communication to support the planning, design and the current and future expansion of the Unit and support the development of technical and operational guidelines require consideration early in the planning process:

- Bar coding for supplies, X-Rays and records
- Data entry (e.g. scripts and investigative requests)
- Email
- Access to Picture Archival Communications System (PACS) viewing
- Paging systems
- Electronic medical records and medical record storage systems
- Point of clinical care
- Patient administration system
- Building management system (BMS)
- Videoconferencing, teleconferencing/telemedicine
- Wireless technology considerations including duress alarm systems – fixed and mobile units
- Communications rooms and server requirements.

Nurse Call and Emergency Call facilities shall be provided in all patient areas (e.g. Bed/chair spaces, Toilets and Bathrooms) and clinical areas in order for patients and staff to request for urgent assistance. The individual call buttons shall alert to distributed identified ceiling -mounted

annunciators and also to a central module situated at or adjacent to the Staff Station /s or to a paging system. The alert to staff members should be done in a discreet manner.

Provision of a duress alarm system is required for the safety of staff members who may at times face threats imposed by clients/visitors. Call buttons will be required at all Reception/Staff Station areas and Consultation/Treatment areas where a staff may have to spend time with a client in isolation or alone. The combination of fixed and mobile duress units should be considered as part of the safety review during planning for the unit.

Water Treatment Services

A key component of the Renal Dialysis Unit is the need to treat the water that will be used in the hemodialysis process to remove any contaminants. Different commercial water treatment systems may undertake the water treatment activities in slightly different ways but in general the main phases of water treatment occur in the following sequence:

Phase 1: Particle filtration to 20 microns.

Phase 2: Water softening to remove calcium and magnesium carbonate.

Phase 3: Carbon filtration to remove chlorine; chlorine is taken out as late as possible in the process so that its disinfection properties are utilized.

Phase 4: Particle filtration to 5 and 1 micron.

Phase 5: Reverse Osmosis Process.

Planning considerations for the design and installation of the water pre-treatment include:

- Water feed quality
- Pressure of the feed water
- Maximum water flow – consideration of the growth of service activity
- Average water flow per day – consideration of the growth of the service
- Spatial requirement to safely install and operate the water pre-treatment plant
- Drainage requirements
- Weight of the water pre-treatment plant and the ability of the floor to safely support that weight
- Water quality monitoring systems
- Power supply requirements
- Facilities and access to safely service and maintain the water pre-treatment plant
- Water distribution loop.

Components of water treatment services include:

- Feed water temperature control
 - o High feed water temperatures may require a heat exchanger to cool the feed water; if the feed water is cold it can be heated by mixing hot and cold water with a thermostatic mixing valve.
- Back flow preventer
 - o All water pre-treatment systems require a form of back flow prevention device; this device prevents the water in the pre-treatment system from flowing back into the source water supply system; a reduced pressure zone device (RPZD) or a break tank with an air gap may be used.
- Multimedia depth filter
 - o Particulates of 10 microns or greater are removed by a multimedia filter (or depth bed filter); these particulates can clog the carbon and softener tanks, destroy the Reverse Osmosis (RO) pump, and foul the RO membrane.

Reverse Osmosis (RO) is a process of forcing water from one side of a semi-permeable membrane to the other, producing purified water by leaving behind the dissolved solids and organic particles. The equipment that performs this process is usually referred to as the RO system. The aim of all the above processes is to improve the purity of the water to be used by removal of particulates, salts and bacteria before it comes into contact with the person receiving hemodialysis.

Booster pumps may also be required to ensure a certain speed of water (at least 10 meters/second) and a certain pressure of water (varies dependent on the concentration of the salt solution on the reject side of the membrane) to enable these processes and to limit the ability of tubing contamination by bacteria and molds. These contamination processes are also reduced by the application of heat (85 – 90 degrees Celsius), eliminating any right angle bends, ensuring the internal surfaces of tubing have a high level of smoothness and by keeping tubing runs as short as possible.

The Plant Room for water treatment is ideally located as part of the Renal Dialysis Unit to keep tubing runs short and to make it easy for staff to monitor and service the water treatment systems.

The Design Team should gain expert input from the agency that will provide these services early in the design process to ensure that all requirements are identified as early as possible during planning.

Drainage System

Services that facilitate the drainage of fluids from the hemodialysis machines must be ventilated to prevent condensation and the subsequent growth of mould. This should be considered when designing covers or screens for the drainage systems. Commercial models which comply with the relevant Standards are available.

42.3.9 Infection Control

Infectious patients and immune-suppressed patients may be sharing the same treatment space at the different times of the same day. The design of all aspects for the Unit should take into consideration the need to ensure a high level of infection control in all aspects of clinical and non-clinical practice.

Hand washing facilities for staff within the Unit should be readily available. Where a hand wash basin is provided, there shall also be liquid soap, disposable paper towels and waste bin provided and PPE equipment.

For further details relating to the Infection Control refer to Part D of these Guidelines.

42.4 Components of the Unit

The Renal Dialysis Unit will contain Standard Components to comply with details described in these Guidelines. Refer also to Standard Components Room Data Sheets and Room Layout Sheets.

42.5 Schedule of Accommodation

Typical Renal Dialysis Unit with 6, 12 and 30 chairs

ROOM/SPACE	Standard Component	6 Chairs Qty x m²			12 Chairs Qty x m²			30 Chairs Qty x m²			Remarks
Entry/Consulting Area											
Reception/Clerical	RECK-10-SJ RECL-15-SJ	1	x	9	1	x	9	1	x	15	
Waiting	WAIT-10-SJ WAIT-30-SJ	1	x	10	1	x	10	1	x	25	Include waiting for families, may include public phone and beverage bay
Consult Room	CONS-SJ	1	x	14	1	x	14	3	x	14	Also for Interviews
Staff Station	SSTN-5-SJ	1	x	10	1	x	12	2	x	12	Subdivided in larger Units
Store – Files	STFS-10-SJ				1	x	6	1	x	12	Optional; Not required for electronic records
Store – Photocopy/Stationery	STPS-8-SJ	1	x	6	1	x	8	1	x	8	Printers, fax, records; May be combined with Reception
Toilet – Accessible	WCAC-SJ	1	x	6	1	x	6	1	x	6	May be shared
Toilet – Public	WCPU-3-SJ	1	x	3	1	x	3	2	x	3	May be shared
Patient Areas: Treatment											
Bay – Beverage	BBEV-ENC-SJ	1	x	5	1	x	5	1	x	5	To receive and issue refreshments to patients
Bay – Handwashing, Type B	BHWS-B-SJ	2	x	1	3	x	1	10	x	1	1 per 4 chair/bed bays
Bay – Linen	BLIN-SJ	1	x	2	1	x	2	2	x	2	
Bay – Mobile Equipment	BMEQ-4-SJ	1	x	4	1	x	4	1	x	4	Mobile equipment, weighing scales
Bay – PPE (Personal Protective Equipment)	BPPE-SJ	1	x	1.5	1	x	1.5	1	x	1.5	
Bay – Resuscitation Trolley	BRES-SJ	1	x	1.5	1	x	1.5	1	x	1.5	
Bay – Storage (Dialysis Fluid)	BS-2-SJ	1	x	2	1	x	2	3	x	2	To hold dialysis fluid close to treatment bays; 1 per cluster of chairs
Bay – Wheelchair Park	BWC-SJ	1	x	4	1	x	4	1	x	8	May be subdivided
Bay – Utility (Dialysate Preparation)	BUT-2-SJ	1	x	2	1	x	2	3	x	2	Adjacent to Bay-Storage, Dialysis Fluid; 1 per cluster of chairs
Clean Utility	CLUR-12-SJ	1	x	12	1	x	12	1	x	12	Including medications and dressing set-ups
Dirty Utility	DTUR-12-SJ	1	x	12	1	x	12	2	x	12	
Isolation Room – Type S		1	x	14	1	x	14	2	x	14	
Shower – Accessible	SHD-SJ	1	x	4	1	x	4	2	x	4	
Treatment Bay-Renal Dialysis	TRMT-RD-SJ	5	x	9	11	x	9	28	x	9	Arrange in clusters of 10 chairs
Training/Treatment/Procedure Room	TRMT-SJ	1	x	15	1	x	15	1	x	15	Optional
Ensuite – Standard	ENS-ST-SJ	1	x	5	1	x	5	2	x	5	1 per enclosed bay
Toilet – Patient	WCPT-SJ	1	x	4	1	x	4	4	x	4	1 per 8 bays
Toilet – Accessible, Patient	WCAC-SJ	1	x	6	1	x	6	1	x	6	May be shared
Staff Station	SSTN-14-SJ	1	x	10	1	x	12	3	x	20	1 per cluster of chairs
Support Areas											
Cleaner's Room	CLRM-5-SJ	1	x	5	1	x	5	1	x	10	Includes dry storage for cleaning consumables
Equipment Clean-Up	ECL-10-SJ	1	x	8	1	x	10	1	x	12	For the cleaning and servicing of haemodialysis and other machinery
Disposal Room	DISP-8-SJ	1	x	5	1	x	8	1	x	10	Waste and dirty linen holding
Store – Equipment	STEQ-10-SJ	1	x	8	1		10	1	x	15	
Store – General	STGN-6-SJ	1	x	6	1	x	6	1	x	30	
Store – Main		1		8	1		16	1		30	
Water Treatment Plant Room		1	x	12	1		15	1	x	25	Close to treatment areas
Staff Areas											
Change – Staff (Male/Female)	CHST-20-SJ	1	x	12	1	x	14	2	x	14	Toilet, Shower, Lockers

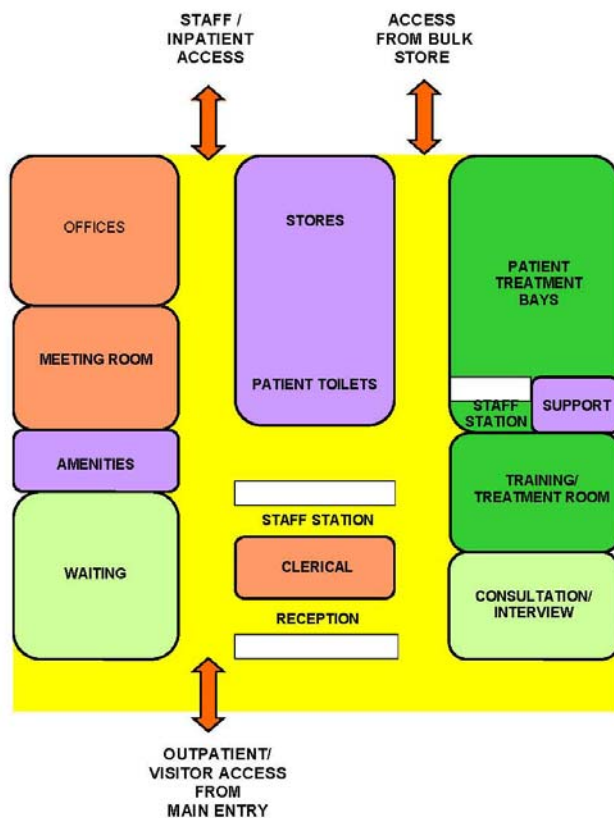
ROOM/SPACE	Standard Component	6 Chairs Qty x m ²			12 Chairs Qty x m ²			30 Chairs Qty x m ²			Remarks
Meeting Room	MEET-L-30-SJ	1	x	12	1	x	20	1	x	30	Optional
Office – Manager	OFF-S9-SJ	1	x	9	1	x	9	1	x	9	
Office – 2-Person Shared	OFF-2P-SJ							1	x	12	Nursing/Medical; According to staffing numbers
Staff Room	SRM-15-SJ SRM-25-SJ	1	x	15	1	x	15	1	x	25	Discreet location; May be shared
Net Department Total		309			404			851			
Circulation %								32			
Grand Total		407.88			533.28			1123.32			

Notes:

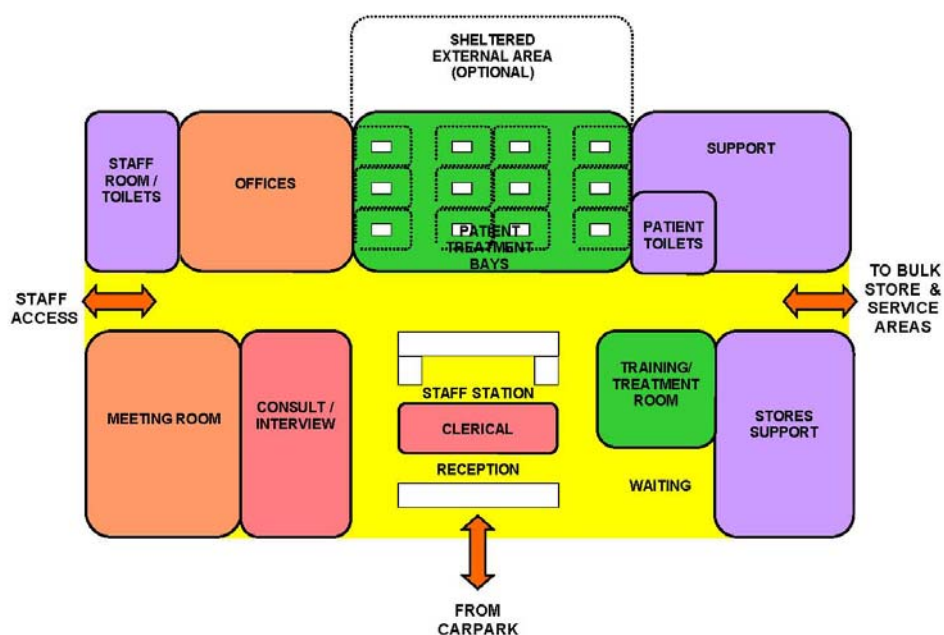
- Areas noted in Schedules of Accommodation take precedence over all other areas noted in the FPU
- Rooms indicated in the schedule reflect the typical arrangement according to the Role Delineation
- Exact requirements for room quantities and sizes will reflect Key Planning Units identified in the Service Plan and the Operational Policies of the Unit
- Room sizes indicated should be viewed as a minimum requirement; variations are acceptable to reflect the needs of individual Unit
- Office areas are to be provided according to the Unit role delineation and staffing establishment; Executives and Managers may be responsible for more than one area but should have only one office assigned within the campus
- Staff and support rooms may be shared between Functional Planning Units dependent on location and accessibility to each unit and may provide scope to reduce duplication of facilities.

42.6 Functional Relationship Diagram

Hospital-Based Unit



Stand-Alone/Satellite Unit



42.7 Further Reading

- Australasian Health Infrastructure Alliance (Aus.). 'Australasian Health Facility Guidelines'. Retrieved from website: www.healthfacilityguidelines.com.au 2014
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- The Facility Guidelines Institute (US). 'Guidelines for Design and Construction of Health Care Facilities' 2010 Edition. Retrieved from website: www.fgiguidelines.org 2014
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