

9.0 Cardiac Investigation Unit

9.1 Introduction

9.1.1 Description

The Cardiac Investigation Unit provides diagnostic procedures, interventional treatments and consultation for patients with cardiac conditions. The Unit consists of three major components:

- Cardiac Catheter Suite
- Cardiac Diagnostic Unit
- Outpatient Clinics.

This Functional Planning Unit will address the following components of a cardiac investigation service primarily for secondary and tertiary healthcare facilities:

- Cardiac Catheter Laboratories (CCL) – diagnostic and interventional
- Electrophysiology (EP) laboratory
- Echocardiography – Trans-Thoracic (TTE), Trans-Oesophageal (TOE) and stress echocardiography
- Exercise stress testing
- Electrocardiography (ECG)
- Holter monitoring
- Ambulatory blood pressure monitoring
- Pacemaker and defibrillator implantation and follow-up
- Outpatient clinics.

9.2 Planning

9.2.1 Operational Models

The following are Models of Care of individual areas within a Cardiac Investigation Unit:

Cardiac Catheter Laboratories – Model Of Care

Depending on the role and function of the service, catheter laboratories may be:

- A component of an interventional imaging suite in a Medical Imaging Unit
- A dedicated component of a Cardiac Precinct
- A component of an interventional floor incorporating operating theatres, cardiac investigations with access to a 23-hour or short-stay ward.

The number of laboratories will be determined by the service plan, but laboratories should operate at near-optimum capacity to justify the expense of operation, maintain the skills and teamwork of the operators and staff and provide maximum patient and operator safety.

Cardiac Diagnostic Center – Model Of Care

Cardiac diagnostic services may be provided:

- As part of a fully integrated Cardiac Investigation Unit
- As part of a Clinical Measurement Unit that may also include facilities for diagnostic neurology and respiratory function testing including spirometry
- As part of an outpatient clinic (depending on the range of tests to be provided).

Cardiac Outpatients Clinics – Model Of Care

Cardiac clinics may be conducted via:

- A general Outpatient Unit
- Consulting rooms in a Clinical Measurement Unit (usually shared with other disciplines)
- Dedicated consulting rooms in a Cardiac Precinct.

Provision of dedicated cardiac clinics should be based on throughput and service planning and in all

instances, as a minimum, access will be required to ECG testing.

9.2.2 *Planning Models*

Location

The most appropriate location for the unit will depend on the services to be provided and models of care as previously described. Consideration should be given to outpatient volumes with regard to vertical access to clinics if the Cardiac Precinct is not on a ground floor.

Configuration

Layout should ensure that the unit does not act as general public thoroughfare to other units that could adversely impact on issues relating to security, privacy and stock control.

The less complex and more frequently used diagnostic and clinic rooms should be located close to the unit entry, reception and waiting with the catheterization suite more discreetly located.

Ideally there should be separate staff and patient paths and a discrete access for inpatients.

9.2.3 *Functional Areas*

The Cardiac Investigation Unit will consist of the following functional zones that may or may not be collocated depending on operational policies, service delineation and relationships to other services:

- Reception and waiting
- Catheterization laboratories
- Diagnostic facilities
- Outpatient clinics.

Depending on the model of care, every opportunity should be taken to share facilities such as:

- Public waiting areas and amenities
- Reception
- Support areas
- Staff amenities.

Reception/Waiting

The Reception/Waiting area may be a shared area for all aspects of the Cardiac Investigation Unit. It should provide easy access to both the diagnostic and catheterization laboratories, and provide access to public and disabled amenities.

A separate reception/waiting area may be required for the Catheterization Suite.

Cardiac Catheter Laboratories

The number and type of laboratories will depend on the service plan, capability (secondary, tertiary) and anticipated caseload.

The Cardiac Catheterization Unit requires the following minimum functional areas:

Patient Care Area:

- Reception (may be shared)
- Patient/visitor waiting (may be shared)
- Patient bed bays (holding, recovery, depending on operational policies)
- Patient amenities
- Staff Station
- Clean and Dirty Utilities
- Storage.

Treatment Area:

- Catheter laboratories (diagnostic, interventional)
- Electrophysiology (EP) Laboratory
- Computer equipment rooms (generators etc.)
- Control rooms. (Note that shared control rooms are not recommended. Refer to Section on Acoustics)
- Scrub bays
- Staff change rooms
- Sterile stock storage and set-up area
- Equipment storage.

Support Area:

- Viewing and reporting room
- PACS room for digital storage if local system.

Staff Area:

- Offices
- Teaching and research facilities
- Amenities including staff rooms.

Cardiac Catheter Laboratory

The Cardiac Catheter Laboratory is to comply with Standard Components Catheter Laboratory. Rooms may be resized according to equipment to be installed.

Electrophysiology (EP) Laboratory

The Electrophysiology Laboratory is a room for undertaking electrophysiology studies and radiofrequency ablation if indicated. The room needs to be located away from external electrical interference i. e. plant rooms or other equipment requiring high voltage, and properly shielded, an electro-magnetic shielding cage may be necessary. The room will require direct access to Patient Holding bays.

Note that patients may become unstable during a procedure and therefore more support equipment is required. Allow for circulation space for four staff plus equipment in room.

The Control Room should be located at head or foot of bed not at the side for optimum patient visibility.

Equipment required may include:

- Two defibrillators
- Anesthetic pendant at head of table
- Anesthetic machine
- Resuscitation trolley
- Set-up and stock trolleys
- Three-dimensional mapping equipment
- Echocardiography (TOE) machine.

Provide services pendants or power points collocated with the patient table to reduce trip hazards from electrical cables across the room. Increasingly equipment is becoming cordless e.g. foot pedals, echo machines.

Benches will be required for preparation of emergency drugs. The room will include storage space, draws and shelves for consumable equipment required during procedures.

Cardiac Diagnostic Facilities

Cardiac diagnostic facilities usually comprise:

Patient Care Area:

- Reception/Waiting(may be shared)
- Change cubicles
- Toilets
- Shower (for hygiene post-exercise testing)
- Testing rooms for the various procedures (ECG, Holter/ambulatory monitoring, pacemaker clinic, echocardiography)
- Patient holding bays for TOE patient recovery.
- Staff/Support Area:
 - Technician/scientist workrooms
 - Clinical support areas – staff station, utilities, storage.

ECG Testing

A room or bay for undertaking resting electrocardiograms is required. This may be provided as a single room/cubicle or may be designed as two patient bays. If two bays are designed, curtain tracks and screens will be provided for patients' privacy. Patients may change in the room/bay or in an adjacent change cubicle.

The ECG Testing Room/Bay will require ready access from the waiting area and outpatient area as ECGs may be performed as a routine element of a cardiac clinic

The Rooms/Bays will require Body Protected power in accordance with local authority requirements.

Furniture, Fittings and Equipment within the testing area will include:

- Examination couch/table
- ECG machine
- Small desk and technician chair or stool
- Patient chair
- Hand basin which may be shared if two bays are provided
- Clothes hooks
- Storage for leads and consumable stock used in the procedure.

Holter/Ambulatory Monitoring Application Room

A room for attaching Holter monitors or blood pressure cuffs for ambulatory monitoring of patients may be required. Note that a multi-disciplinary Consult room may be suitable for this purpose. Patients may change in the room or in an adjacent change cubicle. The room should be located with ready access to the Waiting Area

The Room will require Body Protected power in accordance with local authority requirements.

Furniture, Fittings and Equipment within the room will include:

- Examination couch/table
- Holter monitoring equipment (ECG leads and monitors) and blood pressure equipment
- Small desk and technician chair or stool
- Patient chair
- Hand basin.
- Clothes hooks
- Storage for leads, equipment parts and consumable stock.

Cardiology Outpatients Clinic

Facilities for cardiology outpatient clinics will be provided as multi-function consult rooms sufficient for throughput as outlined in the service plan.

If consulting rooms are part of a general outpatient area, ready access to ECG facilities is desirable and rooms may be scheduled for use by other disciplines.

Staff Offices and Amenities

Offices/workstations will be required for senior staff permanently attached to the various zones of the unit.

Offices/workstations for medical staff and some nursing staff (manager/specialists/registrars/educators) may be located as part of an integrated Cardiac Precinct or as part of a general office complex.

The offices/workstations may be required for administrative as well as clinical functions to facilitate educational/research activities.

Staff will need access to the following:

- Toilets
- Shower
- Staff room with beverage facilities
- Meeting rooms.

Teaching and Research

The extent of teaching and research undertaken within the Cardiac Investigation Unit will need to be assessed so that appropriate office and teaching facilities are provided.

Clinical research needs should be assessed for provision of offices, facilities for drug storage and monitoring, records storage, dedicated consulting and diagnostic rooms if patients attend the Unit.

9.2.4 *Functional Relationships*

External

Direct access from the Emergency Unit to the Catheter Laboratory is essential for rapid transfer of emergency patients.

It is desirable that the Cardiac Investigation Unit has ready access to:

- Chest Pain Assessment Unit
- Medical Imaging particularly for chest X-Rays and CT scanning
- Nuclear Medicine (particularly for stress testing)
- PET Unit (tertiary facilities)
- Operating Unit
- Short stay unit/23-hour beds
- Pathology Services (via pneumatic tube)
- Biomedical Engineering
- Community Health Services (Hospital in the home etc.).

Internal

The Electrophysiology (EP) Laboratory should not be located close to any high voltage electronic equipment such as a sub-station or lift plant room as interruption by auxiliary radiofrequency will distort the assessment of the patient.

Pacemaker and ICD (Implantable Cardioverter Defibrillator) clinics should not be located in an area where high radiofrequency interference may affect new devices using wireless technology; expert advice should be obtained.

If Stress Echocardiography is undertaken, there should be ready access for patients and staff between the Echo Room and Stress Testing Room – assuming the Echo Room does not have a dedicated treadmill.

Linkages to cardiac surgery occur at several levels including clinical decision making about patients requiring cardiac surgery, joint research projects and joint management of patients in the post-operative phase including rehabilitation. The Units need to be well linked and preferably collocated.

9.3 Design

9.3.1 Patient Treatment Areas

Patients must be situated so that healthcare providers have direct or indirect visualization, such as by video monitoring, at all times. 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 Station.

Weight-bearing surfaces that support the monitoring and imaging equipment should be sturdy enough to withstand high levels of strain over time. It should be assumed that monitoring equipment will increase in volume over time. Therefore, space and electrical facilities should be designed accordingly.

9.3.2 Environmental Considerations

Acoustics

Acoustic privacy will be required in consulting and testing rooms and in any rooms where confidential information is discussed.

Minimization of sound transfer between clinical spaces will reduce staff error from miscommunication and disruptions and increase patient safety particularly in Control Rooms.

Note that shared Control Rooms to cardiac laboratories are not recommended as acoustic difficulties may occur when several staff occupy the same space with the consequent potential for instructions to be misinterpreted.

Natural Light

Natural light and views should be available from the Unit for the benefit of staff and patients. Windows are an important aspect of sensory orientation, and as many rooms as possible should have windows to reinforce day/night orientation. If windows cannot be provided in each room, an alternate option is to allow a remote view of an outside window or skylight.

Privacy

To ensure patient privacy, change rooms should be located so that the patient does not cross public areas to access testing rooms and are not open to view when doors are opened.

Interior Décor

A calming, non-threatening environment is desirable using colors that do not mask skin colors. Consideration could be given to ceiling art and murals.

9.3.3 *Space Standards and Components*

Where an open plan arrangement is provided in patient holding and treatment bay areas, bed spaces shall be arranged so that there is a clearance of at least 1200mm from the side of the bed to the nearest fixed obstruction or wall. At the head of the bed, at least 900mm clearance shall be allowed between the bed and any fixed obstruction or wall.

Ceilings in the catheter laboratories should be three meters high and capable of supporting the weight of ceiling--mounted imaging equipment. This may include the gantry for catheter equipment, theatre light, room lighting, air-conditioning, medical gas booms etc. Special attention is required in co-ordination of all ceiling fixed services.

Door Openings

All entry points, doors or openings, shall be a minimum of 1200mm wide, unobstructed. Larger openings may be required for special equipment, as determined by the Operational Policy.

9.3.4 *Finishes*

In all areas where patient observation is critical, colors shall be chosen that do not alter the observer's perception of skin color.

Refer to Part C of these Guidelines and Standard Components for more information on wall protection, floor finishes and ceiling finishes.

9.3.5 *Fixtures and Fittings*

Clocks

An analogue clock with a second sweep hand shall be provided and conveniently located for easy reference from all bed positions and the Staff Station.

Window Treatments

Window treatments should be durable and easy to clean. Consideration may be given to use double-glazing with integral blinds, tinted glass, reflective glass, exterior overhangs or louvers to control the level of lighting.

9.3.6 *Infection Control*

Handbasins

Scrub basins shall be provided for each Procedure and Treatment room (refer to Standard Components Room Layout and Room Data Sheets). Clinical hand-washing facilities shall be provided convenient to the Staff Station and patient areas. The ratio of provision shall be one clinical hand-washing facility for every four patient bays in open-plan areas.

Refer to Part D of these Guidelines for additional information.

9.3.7 *Building Service Requirements*

Mechanical Services

The unit shall have appropriate air-conditioning that allows control of temperature, humidity and air change. Cardiac Catheterization Suites will require specialized air-conditioning and filtration requirements, refer to Standard Components Catheter Laboratory Room Data Sheets and Room Layout Sheets.

Refer to Part E of these Guidelines for the specific requirements for Mechanical and Electrical provision.

Communications

Cardiac Investigation Units will require a wide range of systems to ensure efficient and effective patient information and image management. These will include but are not limited to:

- Voice/data cabling and outlets for phones, fax and computers
- Video and teleconferencing capability (LAN/WAN)
- Picture archiving communications systems (PACS) and storage for digital archives
- Increased provisions for wireless technology; (stress testing is often wireless)
- Data cabling to support remote reporting
- Audio visual, web network access to view angiograms
- CCTV surveillance if indicated
- Patient, staff and emergency call systems
- Communications rooms and server requirements.

Nurse and Emergency Call facilities shall be provided in all Procedure/Treatment Rooms and patient areas (e.g. Catheter Laboratories, Echo Rooms, ECG rooms and toilets) in order for patients and staff to request for urgent assistance.

Close collaboration with the IT Unit and consultants early in the design phase is recommended.

Lighting

Dimmable lighting should be provided in Control/Reporting Rooms, Procedure Rooms, Cardiac Catheterization Laboratories, Ultrasound/Echo and Holter Reading Rooms to improve reporting environment and screen visibility.

Medical Gases

The Unit will require:

- Oxygen and suction in all patient investigation rooms
- Provision of medical air to patient recovery bays and interventional rooms is optional
- Full anesthetic capability including nitrous oxide and scavenging within the Catheter Laboratories.

Refer to Part E of these Guidelines and to the Standard Components, RDS and RLS.

Radiation Shielding and Safety

The Catheter Laboratories require radiation shielding.

Plans and specifications will require assessment for radiation protection by a certified physicist or other qualified expert as required by the Radiation and Nuclear Safety Agency. The radiation protection assessment will specify the type, location and amount of radiation protection required according to the final equipment selections and layout. Radiation protection requirements shall be incorporated into the final specifications and building plans.

9.4 Components of the Unit

The Cardiac Investigation Unit will consist of Standard Components to comply with details described in these Guidelines. Refer to Standard Components, Room Data Sheets and Room Layout Sheets.

9.5 Schedule of Accommodation

Non Interventional Cardiac Investigations

Quantities and sizes of some spaces will need to be determined in response to the service needs of each unit on a case-by-case basis.

ROOM/ SPACE	Standard Component							Level5/6 Qty x m ²	Remarks
Main Entry/ Reception									
Reception/ Clerical	RECL-10-SJ							1 x 10	
Waiting	WAIT-20-SJ							2 x 20	For patients and visitors, separate female waiting
Toilet - Patient	WCPT-3-SJ							2 x 4	
Toilet - Accessible	WCAC-SJ							1 x 6	
Store - Files	STFS-10-SJ							1 x 8	
Store - Photocopy/ Stationery	STPS-8-SJ							1 x 8	Collocate with Ward Clerk
Patient Bay – Holding	PBTR-H-10-SJ							1 x 10	Bed or trolley for waiting patient
Bay – Mobile Equipment	BMEW-4-SJ							1 x 4	Mobile ECG machines (optional)
Consult Room	CONS-SJ							1 x 14	Adjust depending on service demand and requirements
Patient Areas: Treatment									
Consult Room	CONS-SJ							4 x 14	Consult only without examination
Interview Room	INTF-SJ							1 x 12	For patient education
ECG/ Stress Testing Room								2 x 20	2 patients; Inclusion of resuscitation trolley essential
Echocardiography/ TOE/ Stress Echo Room	ECHO-SJ							1 x 30	
Echocardiography	ECHO-SJ							2 x 15	
Holter Monitoring								2 x 15	Adjust number of rooms to suit throughput and services requirement
Holter Analysis Room								2 x 12	
Tilt Table Room								1 x 16	Optional
Change Cubicle - Patient	CHPT-SJ							2 x 2	Inside Echo/ Stress Testing Rooms
Shower/ Toilet - Patient	ENS-ST-SJ Similar							1 x 5	
Toilet - Patient	WCPT-SJ							2 x 4	
Support Areas									
Bay - Linen	BLIN-SJ							1 x 2	
Bay - Mobile Equipment	BMEQ-4-SJ							1 x 4	ECG Machines
Bay - Resuscitation Trolley	BRES-SJ							1.5 x 1.5	
Clean-Up Room	CLUP-7-SJ							1 x 7	
Store - Equipment	STEQ-20-SJ							1 x 20	
Waiting - Sub	WAIT-10-SJ Similar							4 x 5	Near diagnostic rooms
Staff Areas									
Office – Single Person	OFF-S9-SJ							1 x 9	Unit Manager
Office - 2 Person Shared	OFF-2P-SJ							1 x 12	General administration, as required
Meeting Room - Small	MEET-9-SJ							1 x 9	Interviews, small meetings
Office - Workstations	OFF-WS-SJ							4 x 5.5	Qty will depend on staff numbers
Staff Room	SRM-15-SJ Similar							1 x 20	Unit-specific space, with beverage bay
Property Bay - Staff	PROP-3-SJ							2 x 3	
Toilet - Staff	WCST-SJ							2 x 3	
Net Department Total								502.3	
Circulation %								35	
Grand Total								678.0	

Interventional Cardiac Investigations (Cardiac Catheter Suite)

Note: If the Cardiac Catheter Suite is collocated with Non-Invasive Cardiac Investigations Unit, Entry/ Reception, Support Areas & Staff Areas may be shared between the two Units.

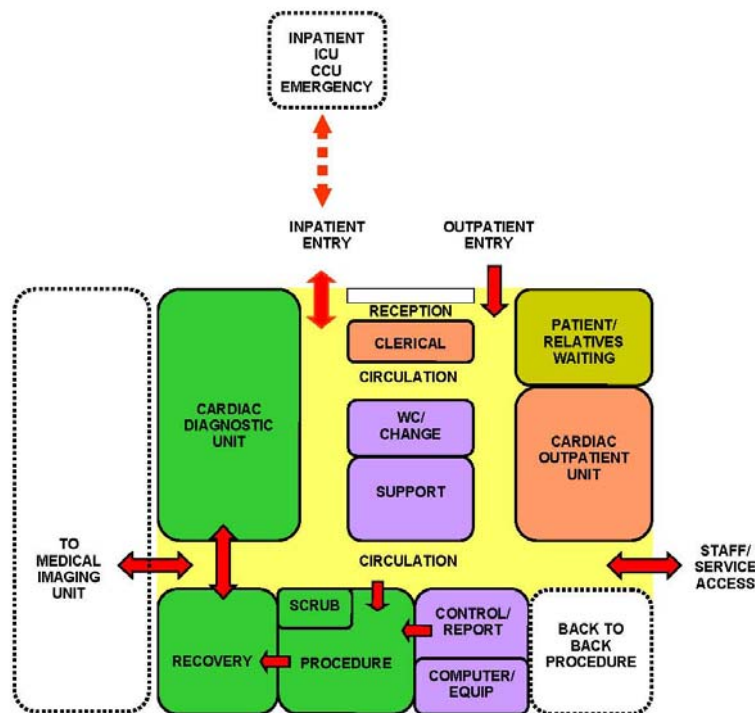
ROOM/ SPACE	Standard Component							Level 5/6 Qty x m ²	Remarks
Entry/ Reception									
Reception/ Clerical	RECL-15-SJ							1 x 15	
Office – 2 person shared	OFF-2P-SJ							1 x 12	Optional for admin staff
Waiting	WAIT-10-SJ Similar							2 x 15	Separate female waiting
Store - Files	STFS-10-SJ							1 x 10	Depends on operational policies
Store - Photocopy/ Stationery	STPS-8-SJ							1 x 8	Collocate with Clerk
Consult Room	CONS-SJ							4 x 14	Consult only without examination
Meeting Room - Small	MEET-9-SJ							1 x 9	Interview function, small meetings
Patient Areas: Treatment									
Staff Station/ Clean Utility	SSCU-SJ Similar							1 x 15	
Patient Bay - Holding/ Recovery	PBTR-H-10-SJ							12 x 9	3 bays per Procedure room
Catheter Laboratory Procedure Room	CLAB-SJ							4 x 45	
Catheter Lab Control/ Reporting Room	CLCRT-SJ							4 x 10	May be shared between Procedure rooms
EP Laboratory								1 x 60	According to service plan
Control Room – EP Lab								1 x 15	According to service plan
Computer Equipment Room	COEQ-SJ							4 x 8	1 per Procedure room
Scrub Up / Gowning	SCRB-6-SJ							4 x 6	1 per Procedure room
Bay – Lead Aprons								2 x 1	Shared between Procedure rooms
Toilet - Patient	WCPT-SJ							2 x 4	
Change Cubicle - Patient	CHPT-SJ							2 x 2	
Support Areas									
Bay - Beverage, Open plan	BBEV-OP-SJ							1 x 4	
Bay - Handwashing, Type B	BHWS-B-SJ							3 x 3	1 per 4 bays
Bay – Pathology	BPATH-SJ							1 x 1	Blood gases, point of care testing
Bay - Linen	BLIN-SJ							1 x 2	
Bay – Blanket Warmer	BBW-SJ							1 x 1	
Bay - Resuscitation Trolley	BRES-SJ							1 x 1.5	
Clean Utility	CLUR-12-SJ							1 x 12	
Cleaner's Room	CLRM-5-SJ							1 x 5	
Dirty Utility - Sub	DTUR-S-SJ							1 x 8	
Disposal Room	DISP-8-SJ							1 x 8	
Ensuite - Standard	ENS-ST-SJ							1 x 5	
Preparation/ Set-up Room	PREP-S-SJ							1 x 12	
Store - General	STGN-12-SJ							1 x 12	
Store - Equipment	STEQ-16-SJ							1 x 16	
Store - Sterile Stock	STSS-12-SJ							4 x 48	Provide 12m2 per procedure room
Store -Films/ Files	STFS-10-SJ Similar							1 x 5	According to operational policies
X-Ray Viewing and Reporting	XRRR-SJ							1 x 12	
Staff Areas									
Office - Unit Manager	OFF-S9-SJ							2 x 9	Unit Manager , Chief Radiographer
Office – 2 person shared	OFF-2P-SJ							1 x 12	For Cardiac Technicians
Staff Room	SRM-15-SJ							1 x 15	May share with an adjacent unit if appropriate
Change - Staff (Male/Female)	CHST-12-SJ							2 x 12	Toilet, Shower, Lockers

ROOM/ SPACE	Standard Component			Level 5/6 Qty x m ²	Remarks
Net Department Total				1002.5	
Circulation %				40	
Grand Total				1403.5	

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.

9.6 Functional Relationship Diagram



9.7 Further Reading

- Australasian Health Facility Guidelines (Aus.). 'Part B – Health Facility Briefing and Planning, Rev 5', 2012. Retrieved from website: www.healthfacilitydesign.com.au 2014
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