

Part B – Health Facility Briefing & Design
35 Cardiac Investigation Unit



iHFG

International Health Facility Guidelines
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35 Cardiac Investigation Unit

1 Introduction

Description

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

- Cardiac Catheter Suite/ Cardiac Diagnostic Unit
- Outpatient Clinics

This Functional Planning Unit (FPU) will address the following components of a cardiac investigation service, primarily for healthcare facilities at RDL 4 to 6.

- Cardiac Catheter Laboratories – both diagnostic and interventional
- Electrophysiology (EP) laboratory
- Echocardiography – trans-thoracic (TTE), trans-oesophageal (TOE) and stress echocardiography
- Exercise stress testing
- Electrocardiography (ECG)
- Holter monitoring
- Remote cardiac telemetry
- Loop recorder
- HUTT (Head-Up Tilt Table Test)
- Ambulatory blood pressure monitoring
- Pacemaker and defibrillator implantation and follow-up
- Outpatient clinics

2 Operational and Planning Considerations

Operational Models

Hours of Operation

The Cardiac Investigation outpatients' area will generally operate up to 8 hours a day, five-days a week. It is highly recommended, whenever possible, the Cardiac Investigation Unit, especially the Catheter Lab, should operate 24 hours a day.

The diagnostic and interventional areas of the Cardiac Investigations Unit may operate as 24 hours a day service, seven-days a week, depending on the Operational Policy.

Models of Care

The Cardiac Investigation Unit may incorporate the following Models of Care for specific components:

Cardiac Catheter Laboratories/ Cardiac Diagnostic Unit

Catheter laboratories, depending on their role within the service plan, may be provided with the following settings:

- The Unit may be integrated with medical imaging, however it should still be regarded as a surgical suite similar to a Day Surgery Unit within these guidelines
- Diagnostic and Interventional Imaging is commonly fully integrated and not regarded as separate models, meaning that treatment typically follows a diagnostic procedure during the same session.

- The Unit may be a component of a “Cardiac Precinct” within a larger facility forming a stand-alone component for Cardiology
- The Unit may be a component of an interventional floor that incorporates operating theatres and cardiac investigations with access to a 23-hour operation or short stay inpatient unit
- The Unit may be part of a general Clinical Measurement Unit that can include diagnostic facilities for other units such as neurology and respiratory function testing
- The Unit may be within an Outpatient clinic (depending on the range of tests to be provided by the unit)

The number of laboratories will be determined by the facility’s 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.

If a Catheter Laboratory is provided within the facility, a close relationship with the Emergency Unit is highly recommended. This should involve the ability for quick patient transfers from the Emergency Unit to the Catheter Lab to maximise the chances of recovery within the “Golden Hour” for patients with cardiac conditions.

Cardiac Outpatient Clinics

Cardiac Outpatient Clinics can be conducted through:

- A general Outpatient Unit
- Consulting rooms provided within a Clinical Investigation Unit that can be shared with other disciplines
- Dedicated consulting rooms within a Cardiac Precinct. The provision of dedicated cardiac clinics should be based on throughput requirements and service planning

Access to ECG testing is required as a minimum in all forms of cardiac outpatients’ clinics. The Cardiac Outpatients Clinics will generally work closely with the Cardiac Rehabilitation Service and patient referrals for ongoing therapy.

Unit Planning Models

The relationships required between the Cardiac Investigation Unit and other units within the health facility will determine the most appropriate location for the unit. The models of care, described above, will impact on the location of the unit in relation to other units, particularly if areas such as diagnostic units, are shared. If the Unit is not on the ground floor, consideration should be given to outpatient volumes in regard to vertical access to clinics.

Staff, patients, and the general public should not need to use the Cardiac Investigation Unit as a thoroughfare to other units of the healthcare facility as it could adversely impact on issues relating to security, privacy and stock control.

The diagnostic and clinic rooms that are less complex and more frequently used should be located closer to reception/ waiting areas of the Unit, while the catheterisation suite should be located in a more private zone and treated as a surgical zone.

It would be preferable if staff and patient paths are separate and a discreet access for inpatients is provided.

Functional Areas/ Zones

The Cardiac Investigation Unit can include the following functional zones, arranged in relation to each other depending on operational policies, service delineation and relationships to other services:

Outpatient/ Diagnostic Facilities

Cardiac Outpatient/ Diagnostic facilities generally comprise of the following:

- Entry Reception including:
 - Waiting with beverage bay and drinking water facilities if required
 - Public amenities, if not located in close proximity

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- Interview room
- Patient bed bays, for holding pre-procedure and recovery following procedures
 - Storage for files and stationery
- Outpatient/ Diagnostic areas that may incorporate the following rooms or diagnostic testing specialties according to the Service Plan:
 - Consult rooms
 - ECG cubicles
 - Stress testing and Echocardiography rooms. It is ideal to have these rooms combined but may be separated by doors
 - Echocardiography
 - Holter monitor application room
 - Loop Recorder & Remote Cardiac Telemetry
 - Head-Up Tilt table Test (HUTT)
 - Reporting areas with workstations
- Support areas including
 - Patient amenities with showers for post exercise hygiene
 - Patient change rooms, that may be located within the diagnostic rooms
 - Storage for linen, equipment, consumables, mobile equipment and resuscitation trolley
 - Clean-up room
 - Depending on the facility's service plan, the Outpatient facilities may be separated for adult vs. paediatrics, especially in level 6 facilities

Procedural Areas (Cardiac Catheter Laboratories)

The service plan, capability, RDL and anticipated caseload will determine the number and type of laboratories required.

The Cardiac Catheterisation Suite requires the following functional areas as a minimum:

- Entry/ Reception, which may be shared with an adjacent unit along with:
 - Patient /visitor waiting area
 - Change cubicles or Pre-op bed bays
 - Interview room for patient/ family discussions. To note, it is imperative that family consent for therapeutic procedures is gained from family members
 - Patient bed Bays for holding and post-procedure recovery
 - Patient amenities
- Treatment Area:
 - Catheter Laboratory/s (diagnostic or interventional)
 - Electrophysiology Laboratory (EP) rooms, as required
 - Computer equipment rooms (generators and computer modules for imaging equipment)
 - Control room/s (Note: it is not recommended that control rooms are shared; refer to Design: Environmental Considerations: Acoustics in this FPU)
 - Scrub bay/s for catheter laboratories. These should be located external to the catheter laboratories
- Support Areas will include:
 - Beverage bay for patient refreshments as required
 - Clean-up and Dirty Utility rooms
 - Clean Utility area that may be collocated with the staff station for ease of staff access
 - Handwashing bays with close access to bed bays
 - Staff station with observation of holding and recovery bed bays
 - Storage for linen, blanket warmer, sterile stock, equipment, consumables, lead aprons, resuscitation trolley and files
 - Set-up area for procedure set-up, as required
 - Viewing/ reporting room; may be combined with the Control room
- Staff Area:

- Staff Change rooms, separated by male and female, with showers, toilet and lockers
- Offices/ workstations, according to the service plan
- Staff Room and amenities

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 offices and amenities

Reception/ Waiting

The Reception/ Waiting area of the Cardiac Investigation Unit may be shared by all sections of the unit and should provide convenient access to both the diagnostic areas and procedural areas such as cardiac catheter laboratories, as well as allowing access to public and disabled amenities for patients and visitors. The Reception area may include patient registration, a patient queuing system and cashier facilities, where appropriate.

Waiting areas may be designed with separation to meet cultural requirements where appropriate. Waiting areas should accommodate a range of occupants including children, those less mobile or in wheelchairs.

A separate Reception/ waiting area may be provided for the Catheterisation Suite to offer discreet access to patients.

Cardiology Outpatient Clinics

Multi-function consultation rooms can sufficiently serve cardiology outpatient clinics. They may be scheduled for use by other disciplines. The number and size of rooms provided will be determined by throughput along with relationships to other units, as outlined in the service plan. If a pacemaker clinic is included in the service plan, there should be access to a room for testing equipment and access to an external defibrillator.

If the consulting rooms are part of a general outpatient area that is shared with other disciplines, the location and layout of the rooms should allow ready access to ECG facilities, which may be shared by other clinics and services.

ECG Cubicles

A room or bay for undertaking resting electrocardiograms is required, with ready access from the waiting area and outpatient area, as ECGs are routinely performed in a cardiac clinic.

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 required for patients' privacy. Patients may change in the room/ bay or an adjacent change cubicle. A handwash basin will be required in close proximity.

Stress Testing

Stress testing rooms should be located with ready access to change facilities and a shower for patients following the test. Stress Testing Rooms should ideally be located next to echocardiography rooms with a separate door in between and must comply with the Standard Component for Stress Testing.

Echocardiography

Echocardiography Rooms should comply with the Standard Component for Echocardiography.

Room size may be adjusted according to equipment to be used. Echocardiography rooms must be connected to stress testing rooms if both stress testing and echo are carried out.

A ratio of 1:3 consultation rooms for RDL 4 & 5 is recommended.

A ratio of 1:2 consultation rooms for RDL 6 is recommended.

Trans-Oesophageal Echo

Trans-Oesophageal Echo is a type of procedure room with adjacent recovery and utility rooms as a group. The numbers for this service depend on the individual facility's service plan.

Holter Monitoring/ Ambulatory Monitoring/ BP 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 (IPS) power in accordance with local authority requirements.

Refer to the engineering section Part E for more information on the power requirements.

Cardiac Catheter Laboratory/s

The Cardiac Catheter Laboratory is to comply with Standard Components Catheter Laboratory.

Rooms may be resized according to the equipment to be installed. Cardiac Catheter Laboratories should be located in close proximity to pre-op holding and recovery bed bays, which can be collocated.

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

X-ray shielding is also required and is subject to a radiation report submitted to the Ministry of Health approval.

Electrophysiology (EP) Laboratory

The Electrophysiology Laboratory is a room for undertaking electrophysiology studies and radiofrequency ablation if indicated; it will be the same layout as the Cardiac Catheter Laboratory but in a slightly larger space. 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 (Faraday 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 (4) staff plus equipment in the room.

Provide services pendants or power points integrated 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.

The room should include a bench or trolley for preparation of emergency drugs. The room will require storage space, drawers and shelves for consumable equipment required during procedures.

Staff Offices and Amenities

Offices and workstations may be required for senior staff managing the various zones of the unit to undertake administrative functions, or to facilitate educational and research activities. Offices / workstations may be located within the functional zone or may be provided as a combined general office complex in a cardiac precinct.

Staff will need access to the following:

- Toilets, showers, change rooms and lockers
- Staff room with beverage and food storage facilities
- Meeting room/s

Teaching and Research

An assessment to gain an understanding of the extent of the teaching and research, if required, to be undertaken within the Cardiac Investigation Unit will need to be conducted in order to allow for sufficient office space and teaching facilities. Teaching rooms are required in facilities under RDL 5, and research facilities are required under RDL 6.

The assessment should consider applicable guidelines for staff training and competence, particularly as new procedures and technologies are developed. The assessment will determine the type, size, and number of facilities provided in the service plan, as well as whether they are located within the unit or easily accessible from the unit. At a minimum, adequate access to facilities for meetings and staff education should be provided.

Clinical research needs should be assessed for provision of offices for senior coordinators, research fellows, research staff and assistants. Facilities may include consulting and diagnostic rooms if required for patient consultation, drug storage and monitoring, records storage and research laboratories.

Functional Relationships

External

The rapid transfer of emergency patients requires direct access from the Emergency Unit to the Catheter Laboratory.

The Cardiac Investigation Unit should also be well-situated for easy access to:

- Emergency Unit or Urgent Care Unit
- Chest Pain Assessment Unit (which may be a component of the Emergency Unit)
- Medical Imaging (Chest X-rays, CT)
- Single-Photon Emission Computed Tomography (SPECT) & stress testing
- Positron Emission Tomography Unit ((PET), in tertiary facilities)
- Operating Unit for cardiac surgery
- Integrated Day Surgery/ Procedure unit

The Cardiac Investigation Unit will have a strong relationship with cardiac surgical specialties, including the Operating Unit and Cardiac Inpatient Units, and should be located to enable effective communication and collaboration between staff of these areas. Links with cardiac surgery occur at several levels, including clinical decision-making concerning patients who require cardiac surgery, cardiac management of patients in the post-operative phase including rehabilitation and cardiac research projects.

If the patient is delivered by ambulance or the patient has a relevant medical history of cardiac problems, the transfer should be directly from the Ambulance Bay via Emergency Unit to the Catheter Laboratory.

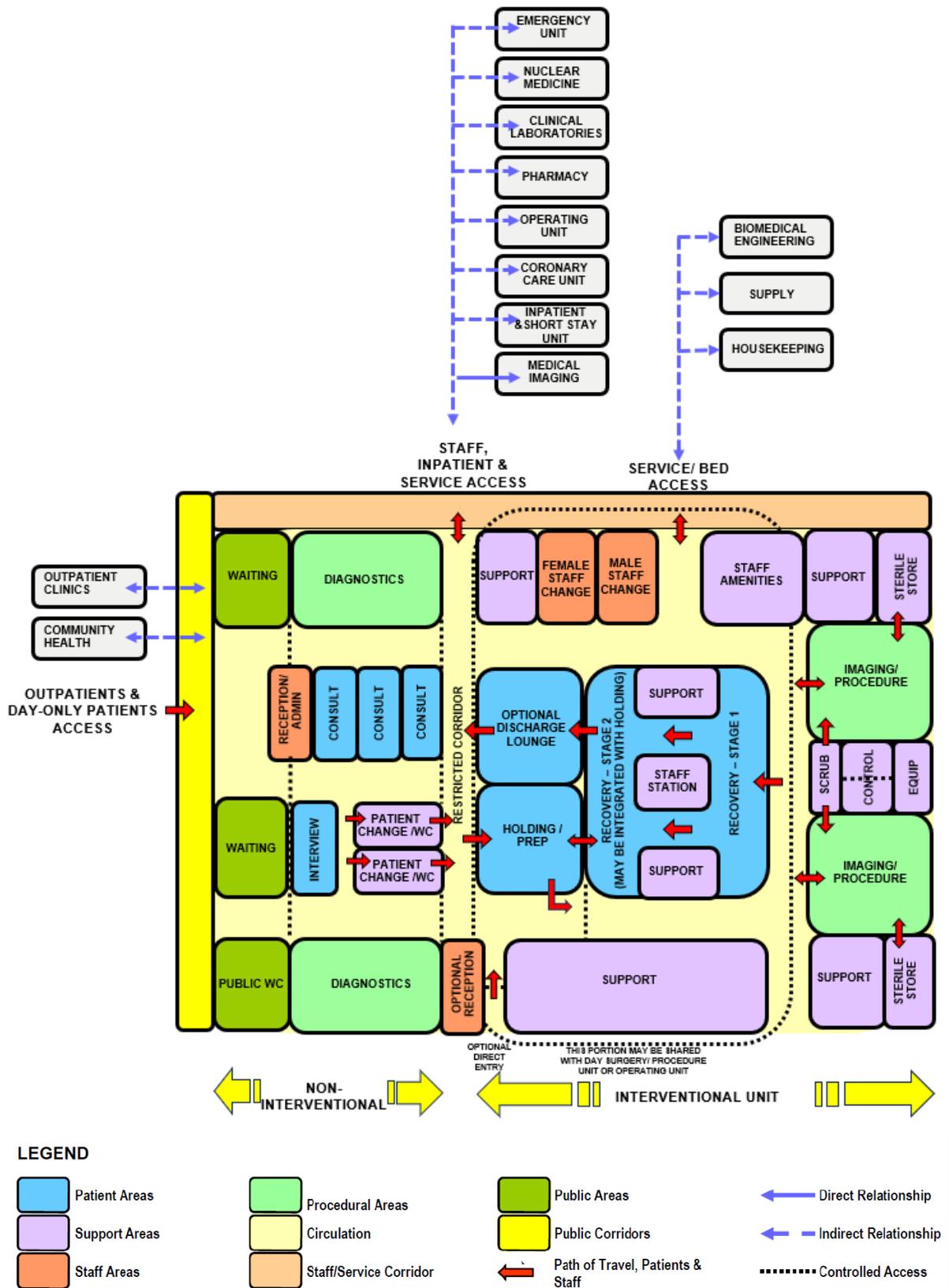
Internal

For patients incurring medical emergencies, communication prior to arrival between ambulance and facility is critical. Ideally, the Patient should have an Electrocardiogram performed before going to the Catheter Laboratory; optimally, undertaken by ambulance services.

Radiofrequency interference should be considered when planning the Cardiac Investigation Unit. The Electrophysiology (EP) laboratories, as well as Pacemaker and ICD (Implantable Cardiac Defibrillator) clinics 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 and affect new devices that use wireless technology. Expert advice should be obtained.

If Stress Echocardiography is undertaken within the unit, the Echo room may include a dedicated treadmill. Alternatively, the Echo room may be located adjacent to the Stress Testing room to allow for efficient staff and patient access.

Functional Relationship Diagram



The optimum external relationships include:

- Visitors access from a main circulation corridor with a relationship to the Main Entrance
- Separate entry and access for staff from hospital units to Administration
- Access for service units such as Supply and Housekeeping via a service corridor

Internal relationships should include the following:

- Reception at the entrance with access to an interview area
- Access to administrative sub-units such as Public Relations, Human Resources, Finance, and Clinical Administration etc. via staff corridors with link to Reception
- Areas of administration that are more frequently visited, such as Public Relations and Human Resources, located closer to Reception and entry
- Support areas located centrally for ease of staff access.

3 Design Considerations

Patient Treatment Areas

Direct visualisation, or indirect by video monitoring, of patients is essential 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. Design should allow for a future increase in monitoring equipment requirements, particularly mobile monitoring.

In the event that consultation is required with the patient's family during a procedure, the doctor may remain in the sterile zone while the family members may remain outside the sterile zone.

Environmental Considerations

Acoustics

The Cardiac Investigation Unit should be designed to minimise the ambient noise level within the unit and transmission of sound between patient areas, staff areas and public areas.

Acoustic treatment will be required to the following:

- Consult/ Interview and triage areas for discussions/ interviews with clients
- Seclusion and psychiatric assessment rooms
- Treatment and Procedure Rooms
- Waiting areas
- Staff Stations

Shared Control Rooms to cardiac laboratories are not recommended. The staff working in the control room are responsible for scheduling and coordinating all investigations and treatments. Acoustic difficulties may occur when several staff occupy the same space creating the potential for instructions to be misinterpreted and mistakes to be made.

Refer also to Part C - Access, Mobility, OH&S in these Guidelines.

Natural Light/ Lighting

The use of natural light should be maximised throughout the Unit. Windows are an important aspect of sensory orientation and psychological well-being of patients.

Natural light should be favourably considered when planning the Unit in patient areas and is desirable in other support areas such as waiting and family areas.

Variable lighting levels should be provided in Control/ Reporting rooms, Procedure rooms, Cardiac Catheterisation Laboratories, Ultrasound/ Echo rooms and Holter reading rooms, where screen visibility is required. There is no need for natural lighting in the Catheter Laboratories itself.

Privacy

The design of the Cardiac Investigations Unit needs to consider the contradictory requirement for staff visibility of patients while maintaining patient privacy. Unit design and location of staff stations will offer varying degrees of visibility and privacy.

Change rooms should be located adjacent to testing rooms so that a patient is not required to cross public areas to access them. Patients should not be in view when a door to a change room is open; therefore, entry should be discrete and controlled.

Additional privacy considerations will include:

- Privacy screening to all Patient Bed Bays
- Discreet and non-public access to medical records
- Location of doors to avoid patient exposure in Consult, Diagnostic and treatment rooms

Space Standards and Components

Bed Spacing/ Clearances

Patient Bays

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 1200 mm from the side of the bed to the nearest fixed obstruction or wall. At the head of the bed, at least 300 mm clearance shall be allowed between the bed and any fixed obstruction or wall.

Bed bays should have a minimum 2400 mm in width between bays if separated by curtains, this should be increased to 2800mm if enclosed by solid walls.

Catheter Laboratories

Catheter laboratories should have ceilings that are at least 3 metres high and are capable of supporting the weight of the various pieces of ceiling-mounted imaging equipment required. This may include the gantry for catheter equipment, theatre light, room lighting, air conditioning, medical gas booms etc. The co-ordination of all ceiling fixed services is vital to the functioning of the laboratories.

Accessibility

Design should provide ease of access for wheelchair bound patients in all patient areas including Consult, Diagnostic rooms and Catheter Laboratories. Waiting areas should include spaces for wheelchairs, with power outlets for charging electric mobility equipment, and suitable seating for patients with disabilities or mobility aids. The Unit will require provision for bariatric patients.

Doors

All entry points, doors or openings, shall be a minimum of 1200 mm wide, unobstructed. Larger openings may be required for special equipment, as determined by the Operational Policy, to allow the manoeuvring of beds, trolleys, equipment and wheelchairs without manual handling risks and risk of damage. It would be suitable for at least one outpatient consulting room to be provided for bariatric patients. Doors used for emergency bed transfer to the Operating Units must be appropriately positioned and sized. A minimum of 1400mm clear opening is recommended for doors requiring bed/trolley access.

Also refer to Part C – Access, Mobility, OH&S of these Guidelines.

Size of the Unit

The size of the Clinical Information Unit will be determined by a Clinical Services Plan and will take into consideration:

- The size of the population served by the Unit and demographic trends

- The average length of consultation, diagnostic procedure or stay
- The number of referrals and transfers from other local regions or hospitals

Safety & Security

The Cardiac Investigation Unit shall provide a safe and secure environment for patients, staff and visitors, while remaining a non-threatening and supportive atmosphere conducive to recovery.

The facility, furniture, fittings, and equipment must be designed and constructed in such a way that all users of the facility are not exposed to avoidable risks of injury.

The Cardiac Investigation Unit should include the following security considerations:

- The Reception may act as a control point for the unit
- Entry to the Cardiac Catheter Suite may require restricted access such as electronic card reader
- All Offices require lockable doors
- All Store rooms for files, records and equipment should be lockable
- After-hours access, which may be required to some diagnostic and procedural areas for emergency procedures

Finishes

Finishes including fabrics, floor, wall and ceiling finishes, should be inviting and non-institutional as far as possible. The following additional factors should be considered in the selection of finishes:

- Acoustic properties
- Durability
- Ease of Cleaning
- Infection Control
- Fire Safety
- Movement of Equipment

In areas where clinical observation is critical such as bed bays and treatment areas, colour selected must not impede the accurate assessment of skin tones. Walls shall be painted with lead free paint.

The floor finishes in all patient care and treatment areas should have a non-slip surface and be impermeable to water and body fluids.

Refer also to Part C – Access, Mobility, OH&S and Part D - Infection Control of these Guidelines.

Curtains/ Blinds

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.

Privacy bed screens must be washable, fireproof and cleanly maintained at all times. Disposable bed screens may also be considered.

Building Service Requirements

Information and Communication Technology

The Cardiac Investigation Unit requires a wide range of systems to ensure the storage of patient information and image management is efficient and effective. These systems include, but are not limited to:

- Picture archiving communications systems (PACS) and storage for digital archives
- Voice/ data cabling and outlets for phones and computers

- Network data requirements and wireless network requirements to support remote reporting
- Video and teleconferencing capability
- CCTV surveillance, if indicated
- Patient, staff, emergency call, duress alarms and paging systems
- Communications rooms and server rooms
- Remote Cardiac Telemetry

Patient, staff assist and emergency call facilities shall be provided in all Diagnostic, 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 obtaining advice from consultants early in the design phase is recommended.

Staff Call

Hospitals must provide an electronic call system next to each treatment space including bathrooms to allow for patients to alert staff in a discreet manner at all times.

Patient calls are to be registered at the Staff Stations and must be audible within the service areas of the Unit including bathrooms and change areas. If calls are not answered, the call system should escalate the alert accordingly. The Nurse Call system may also use mobile paging systems or SMS to notify staff of a call.

Heating, Ventilation and Air conditioning

The air temperature and humidity in all treatment and procedure areas should be controllable from within the unit and adjustable to ensure patient comfort and safety. Cardiac Catheterisation Suites will require specialised air-conditioning and filtration requirements; refer to Part E - Engineering Services of these guidelines and to the Standard Components, Room Data Sheets (RDS) and Room Layout Sheets (RLS).

Medical Gases

Medical gas is that which is intended for administration to a patient in anaesthesia, therapy, or diagnosis. Medical gases shall be installed and readily available in each patient bay.

The Unit will require oxygen and suction in all patient investigation rooms, treatment rooms and procedure rooms. The Provision of medical air to patient recovery bays is optional.

Full anaesthetic capability is required within the catheter laboratories, including systems for the delivery of nitrous oxide and the 'scavenging' of gases that have been exhaled by the patient that should not be breathed in by any medical personnel.

Medical gases should also be provided in Echocardiography and Stress Testing rooms; ideally in its reticulated form, though its portable form is also accepted.

Refer to Part E - Engineering Services of these guidelines and to the Standard Components, Room Data Sheets (RDS) and Room Layout Sheets (RLS).

Radiation Shielding and Radiation Safety

The Catheter Laboratories shall require radiation shielding. A certified physicist or qualified expert will need to assess the plans and specifications for radiation protection as required by the relevant local radiation/ nuclear safety authorities. A radiation protection assessment will specify the type, location and amount of radiation protection required for an area according to the final equipment selections, the layout of the space and the relationship between the space and other occupied areas.

Radiation protection requirements must be incorporated into the final specifications and building plans. Considerations should be given to the provision of floor and ceiling shielding when rooms immediately above and below are occupied.

Infection Control

Standard precautions apply to the Cardiac Investigation Unit areas to prevent cross infection between patients, staff and visitors. Hand hygiene is important and it is recommended that in addition to hand basins, medicated hand gel dispensers be located strategically in staff circulation corridors.

Hand Basins

Basins suitable for surgical scrubbing procedures shall be provided for each Procedure and Treatment room (refer to Standard Components, Room Data Sheets (RDS) and Room Layout Sheets (RLS)). Clinical hand-washing facilities shall be provided within the diagnostic testing rooms, convenient to the Staff Stations and patient areas. The ratio of provision shall be one clinical hand-washing facility for every four patient bays in open-plan areas.

For further information refer to Part D – Infection Control in these Guidelines.

Antiseptic Hand Rubs

Antiseptic hand rubs should be located so they are readily available for use at points of care, at the end of patient beds and in high traffic areas.

The placement of antiseptic hand rubs should be consistent and reliable throughout facilities. Antiseptic hand rubs are to comply with Part D - Infection Control, in these guidelines.

Antiseptic Hand Rubs, although very useful and welcome, cannot fully replace Hand Wash Bays.

4 Components of the Unit

Standard Components

Standard Components are typical rooms within a health facility, each represented by a Room Data Sheet (RDS) and a Room Layout Sheet (RLS).

The Room Data Sheets are written descriptions representing the minimum briefing requirements of each room type, described under various categories:

- Room Primary Information; includes Briefed Area, Occupancy, Room Description and relationships, and special room requirements
- Building Fabric and Finishes; identifies the fabric and finish required for the room ceiling, floor, walls, doors, and glazing requirements
- Furniture and Fittings; lists all the fittings and furniture typically located in the room; Furniture and Fittings are identified with a group number indicating who is responsible for providing the item according to a widely accepted description as follows:

Group	Description
1	Provided and installed by the builder
2	Provided by the Client and installed by the builder
3	Provided and installed by the Client

- Fixtures and Equipment; includes all the serviced equipment typically located in the room along with the services required such as power, data and hydraulics; Fixtures and Equipment are also identified with a group number as above indicating who is responsible for provision
- Building Services; indicates the requirement for communications, power, Heating, Ventilation and Air conditioning (HVAC), medical gases, nurse/ emergency call and lighting along with quantities and types where appropriate. Provision of all services items listed is mandatory

The Room Layout Sheets (RLS's) are indicative plan layouts and elevations illustrating an example of good design. The RLS indicated are deemed to satisfy these Guidelines. Alternative

layouts and innovative planning shall be deemed to comply with these Guidelines provided that the following criteria are met:

- Compliance with the text of these Guidelines
- Minimum floor areas as shown in the schedule of accommodation
- Clearances and accessibility around various objects shown or implied
- Inclusion of all mandatory items identified in the RDS

The Cardiac Investigation Unit consists of Standard Components to comply with details described in these Guidelines. Refer also to Standard Components Room Data Sheets (RDS) and Room Layout Sheets (RLS) separately provided.

Non-Standard Components

Non-standard rooms are rooms are those which have not yet been standardised within these guidelines. As such there are very few Non-standard rooms. Non-Standard rooms are identified in the Schedules of Accommodation as NS and are separately covered below.

ECG Cubicle/s

The ECG Cubicle is similar to a Patient Bay – Holding with the following inclusions:

- Cubicle partitions, optional
- Body protected power to protect patients from electric shock in accordance with local authority requirements
- Examination couch/ table
- ECG machine, mobile, with storage for leads and consumable stock
- Small desk and technician chair or stool
- Patient chair
- Hand basin located in close proximity
- Clothes hook/s for patient use

Multiple cubicles will require screening for patient privacy.

5 Schedule of Equipment (SOE)

This Schedule of Equipment (SOE) below lists the major equipment required for the key rooms in this FPU.

Cardiac Investigation Unit – (non-interventional)

Roome Name		
Consult/ Exam Room, Room Code (cons-i)		
Air flowmeter	Monitor: physiologic, vital signs, wall mounted	Table: examination/ treatment, electric
Diagnostic set: wall mounted	Oxygen flowmeter	
Light: examination, single, ceiling mounted	Suction adapter	
Stress Testing, Room Code (strt-i)		
Defibrillator: with monitor	Table: examination/ treatment, electric	
Oxygen flowmeter	Testing system: stress	
Suction adapter	Treadmill: exercise, automatic	
Echocardiography, Room Code (echo-i)		
Light: examination, single, ceiling mounted	Suction adapter	
Monitor: physiologic, vital signs, wall mounted	Table: examination, echocardiography	
Oxygen flowmeter	Ultrasound scanning unit: cardiac/ echo	

Cardiac Investigation Unit – (Interventional)

Roome Name		
Patient Bay - Recovery Stage 1, 12m2 , Room Code (pbtr-rs1-12-i)		
Air flowmeter	Light: procedure, single, ceiling mounted	Suction adapter
Infusion pump: single channel	Monitor: physiologic, critical care	
Infusion pump: syringe	Oxygen flowmeter	
IV pole: mobile	Stretcher: procedure/ recovery	
Consult/ Exam Room, Room Code (cons-i)		
Air flowmeter	Monitor: physiologic, vital signs, wall mounted	Table: examination/ treatment, electric
Diagnostic set: wall mounted	Oxygen flowmeter	
Light: examination, single, ceiling mounted	Suction adapter	
Catheter Laboratory Procedure Room, Room Code (clab-i)		
Air flowmeter	Injector: contrast media, angiography	Refrigerator: drugs
Anaesthesia unit: standard	Light: surgical, ceiling	Suction adapter
Angiography table	Defibrillator: with monitor	Supply unit: ceiling
Angiography: interventional cardiology	Linen carrier: dirty, single	Supply dispensing system: automated, catheter
IV pole: mobile	Monitor: physiologic, operating theatre/ cardiac	
Infusion pump: single channel	Oxygen flowmeter	
Infusion pump: syringe	Rack: lead apron	

6 Schedule of Accommodation

The Schedule of Accommodation (SOA) provided below represents generic requirements for this Unit. It identifies the rooms required along with the room quantities and the recommended room areas. The sum of the room areas is shown as the Sub Total as the Net Area. The Total area is the Sub Total plus the circulation percentage. The circulation percentage represents the minimum recommended target area for corridors within the Unit in an efficient and appropriate design.

Within the SOA, room sizes are indicated for typical units and are organised into the functional zones. Not all rooms identified are mandatory therefore, optional rooms are indicated in the Remarks. These guidelines do not dictate the size of the facilities, therefore, the SOA provided represents a limited sample based on assumed unit sizes. The actual size of the facilities is determined by Service Planning or Feasibility Studies. Quantities of rooms need to be proportionally adjusted to suit the desired unit size and service needs.

The Schedule of Accommodation are developed for particular levels of services known as Role Delineation Level (RDL) and numbered from 1 to 6. Refer to the full Role Delineation Framework (Part A - Appendix 6) in these guidelines for a full description of RDL's.

The table below shows a typical Non-Interventional Cardiac Investigation Unit at RDL's 2 to 6 and an Interventional Unit at RDL 4 to 6.

Cardiac Investigation Unit– Non-Interventional

ROOM/ SPACE	Standard Component Room Codes	RDL 2-6			Remarks
		Qty x m ²			
Entry/ Reception Area					
Reception/ Clerical	recl-10-i	1	x	10	
Waiting Room (male/ Female)	wait-15-i	2	x	15	For patients and visitors. Divided into
Play Area	plap-10-i	1	x	10	For families/children.
Meeting Room - Small	meet-9-i	1	x	9	Adjust number to suit service requirement.
Bay – Beverage, Open Plan	bbev-op-i	1	x	5	Optional
Bay - Patient Holding	pbtr-h-10-i	1	x	10	Bed or trolley for waiting inpatient. Temporary patient holding if required
Store - Files	stfs-10-i similar	1	x	8	Clinical records; optional for digital records
Store - Photocopy/Stationery	stps- 8-i	1	x	8	
Toilet - Public	wcpu-3-i	2	x	3	May share amenities if located conveniently
Toilet - Accessible	wcac-i	1	x	6	May share amenities if located conveniently
Outpatient/ Diagnostic Area					
Consult/ Exam Room	cons-i	1	x	13	Quantity according to service demand
ECG Cubicle - 1 Patient	NS	1	x	8	Screened cubicle close to hand wash basin
ECG Cubicle - 2 Patients	NS	1	x	16	Screened cubicles close to hand wash basin
Stress Testing	strt- i	1	x	15	Inclusion of resuscitation trolley essential
Echocardiography - General	echo-i similar	1	x	15	25m2 if combined with stress testing
Echocardiography	echo-i similar	1	x	15	
Trans-Oesophageal (TOE)					
Holter/ Ambulatory BP Application	cons-i similar	1	x	10	Locate close to consult rooms.
Office – Reporting	off-wis-i	2	x	12	Holter Analysis, Echo reporting
Tilt Table Testing (HUTT)	trmt-14-i similar	1	x	15	Optional
Support Areas					
Bay Hand wash - Type B	bhws-b-i	1	x	1	
Bay - Linen	blin-i	1	x	2	
Bay - Mobile Equipment	bmeq-4-i	1	x	4	Mobile ECG Units
Bay - Resuscitation Trolley	bres-i	1	x	1.5	May be stored in ECG Stress Testing Room
Change - Patient (Male/Female)	chpt-12-i	2	x	12	Shower, Toilet, Lockers
Clean – Up Room	clup-7-i	1	x	7	For clean-up of echo probes.
Store - Equipment	steg-20-i	1	x	20	
Toilet - Accessible	wcac-i	1	x	6	As required
Staff Areas					
Office – Single Person	off-s9-i	1	x	9	Unit Manager
Office – 2 Person Shared	off-2p-i	1	x	12	General administration
Office- Write – Up (Shared)	off-wis-i	1	x	12	Qty as required
Office – Workstation (Technicians)	off-ws-i	1	x	5.5	Numbers depends on staffing level
Staff Room	srn-15-i	1	x	15	Includes beverage making facilities
Toilet - Staff	wcst-i	2	x	3	
Sub Total				338	
Circulation %				35	
Area Total				456	

Also note the following:

- Areas noted in Schedules of Accommodation take precedence over all other areas noted in the Standard Components.
- Rooms indicated in the schedule reflect the typical arrangement with 2 catheter laboratories.
- All the areas shown in the SOA follow the No-Gap system described elsewhere in these Guidelines.
- Exact requirements for room quantities and sizes shall reflect Key Planning Units (KPU) identified in the Clinical 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.
- Provision for the Intensive Care Unit should be a minimum of 5% of all beds, or one per Operating Room and two per Catheter Laboratory.

Cardiac Catheter Suite/ Imaging – Interventional

ROOM/ SPACE	Standard Component Room Codes	RDL 4-6 Qty x m2 2 Cath Labs			Remarks
Entry / Reception					
Reception/ Clerical	recl-10-i	1	x	10	
Waiting (male/ Female)	wait-15-i similar	2	x	15	Divided into gender segregated areas.
Change Cubicle - Accessible	chpt-i-i	4	x	4	Divided into gender segregated areas.
Meeting Room - Small	meet-9-i	1	x	9	Interviews, post angiography reviews, etc.
Patient Bay- Holding /Recovery	pbtr-h-10-i	12	x	10	6 bays per laboratory, plus 1-2 for TOE
Toilet - Public	wcpu-3-i	2	x	3	May share amenities if located conveniently
Toilet - Accessible	wcac-i	1	x	6	
Procedural Area					
Consult/ Exam Room	cons-i	1	x	13	
Catheter Laboratory Procedure Room	clab-i	2	x	42	There should be a minimum of 42m2 for single plane and 55m2 for bi-plane
Catheter Laboratory	clcr-i	2	x	14	May be combined to 25m2
Control/Reporting Room					
Computer Equipment Room	coeq-i similar	2	x	10	Computer & technical equipment modules
Electrophysiology Laboratory	clab-i	1	x	42	There should be a minimum of 42m2 for single plane and 55m2 for bi-plane
Electrophysiology Lab -Control Room	clcr-i	1	x	14	
Scrub Up/ Gowning	scr-b-6-i	1	x	6	1 per Lab/ Procedure room
Support Areas					
Bay - Beverage, Open Plan	bbev-op-i	1	x	5	
Bay - Blanket/ Fluid Warmer	bbw-1-i	1	x	1	
Bay - Handwashing Type B	bhws-b-i	1	x	1	1 per 4 bed bays
Bay - Linen	blin-i	1	x	2	
Bay - Pathology	bpath-1-i	1	x	1	Point of care testing units. May be inside another room such as the procedure room
Bay - PPE	bppe-i	1	x	1.5	Lead aprons
Bay - Resuscitation Trolley	bres-i	1	x	1.5	
Clean-Up Room	clup-7-i	1	x	7	
Dirty Utility Room	dtur-12-i similar	1	x	10	
Disposal Room	disp-8-i	1	x	8	
Set-Up Room	setup-8-i	1	x	8	
Staff Station/ Clean Utility	sscu-i	1	x	9	
Store - Sterile Stock	stss-12-i	1	x	12	Provide 12m2 per Procedure room
Store - Equipment	steq-14-i similar	1	x	16	
Store - Files	stfs-10-i similar	1	x	8	Files, stationery
Store - General	stgn-14-i similar	1	x	12	
Viewing and Reporting	xrrr-i	1	x	12	Optional; May be combined with control room or offices
Staff Areas					
Change Room – Staff (Male/ Female)	chst-12-i	2	x	12	Shower, Toilet & lockers, may be shared
Office – Single Person	off-s9-i	2	x	9	Unit Manager; Note 1

ROOM/ SPACE	Standard Component Room Codes	RDL 4-6 Qty x m2 2 Cath Labs			Remarks
Office – 2 Person Shared	off-2p-i	2	x	12	Cardiac technicians
Staff Room	srm-15-i	2	x	15	May share with an adjacent unit
Staff Toilet	wcst-i	2	x	3	May share with an adjacent unit
Sub Total				609	
Circulation %				35	
Area Total				822	

Note: If the Cardiac Catheter Suite is collocated with a non-interventional Cardiac Investigations Unit, Entry/ Reception, Support Areas and Staff Areas may be shared between the two Units.

Note 1: Offices to be provided according to the number of approved full-time positions within the Unit

Also note the following:

- Areas noted in Schedules of Accommodation take precedence over all other areas noted in the Standard Components
- Rooms indicated in the schedule reflect the typical arrangement with 2 catheter laboratories
- All the areas shown in the SOA follow the No-Gap system described elsewhere in these Guidelines
- Exact requirements for room quantities and sizes shall reflect Key Planning Units (KPU) identified in the Clinical 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
- Provision for the Intensive Care Unit should be a minimum of 5% of all beds or one per Operating Room and two per Catheter Laboratory.

7 Future Trends

Technological advances are continuing to make investigative and diagnostic cardiac procedures safer and more effective in a wider range of patients. The development of new technology, such as multiplanar systems will impact the design, spatial requirements and functioning of Cardiac Investigation Units.

There is a general movement towards the use and development of technology for remote monitoring of cardiovascular implantable electronic devices. Remote monitoring is proving to be a safe alternative to in-office evaluation of cardiac function, improves discovery of clinically important events, and reduces clinical response time and follow up contact visits. Facilities for the provision of this service will be increasingly required in the near future.

The disciplines of cardiology and cardiac surgery are increasingly converging with the development of interventional electrophysiology. Interventional electrophysiology therapies include endovascular mitral valve repair, permanent pacing for Brady arrhythmias, surgery for arrhythmias, percutaneous catheter ablation for atrial fibrillation, cardiac brachytherapy for restenosis, and implantable devices for tachyarrhythmias. The need for interventional electrophysiology is increasing with complex conditions now able to be treated with three-dimensional mapping and endovascular surgery. Mapping technology is constantly improving and able to accurately replicate the cardiac anatomy underlying an arrhythmia, to provide a plausible representation of the activation of the chambers, allowing for planning and implementation of appropriate interventions. The distinction between the two disciplines of cardiology and cardiac surgery is becoming blurred and the spatial relationships and facilities provided should reflect this interconnection.

Other emerging technologies associated with interventional electrophysiology include remote magnetic navigation techniques where catheters with magnetic tips are steered within the patient, without the need for an electrophysiologist to manoeuvre the catheter manually. Catheter ablations for complex arrhythmias can be long procedures with additional risks such as X-ray exposure. Magnetic navigation is well suited to the treatment of complex arrhythmias, because of its efficacy and reliability, the significant reduction in X-ray exposure for both patient and operator, and the very low risk of perforation. Ongoing developments will likely improve results and procedure times. The proliferation of magnetic navigation technologies will result in a drastic change in the size and amount of equipment required for various procedures.

Infarct angioplasty is likely to become more widely practiced, predominantly in those patients with large infarcts who have a high mortality rate. This procedure is becoming more widely accepted as evidence has established it to be highly effective. It has been shown that the rapid transfer of patients from general hospitals to acute revascularisation units is safe and effective. Compared to current thrombolytic treatment, angioplasty achieves a much higher rate of normal flow, a lower re-infarction rate, a lower mortality rate, improved ventricular function and a lower rate of stroke. Few centres worldwide are equipped or staffed for the routine application of primary angioplasty but this is set to change as the procedure becomes more widely accepted and practiced. The introduction of facilities for infarct angioplasty will result in an increase the amount of catheter laboratories required and will again require an interconnected cardiac investigation and cardiac surgery unit.

8 Further Reading

In addition to Sections referenced in this FPU, i.e. Part C- Access, Mobility, OH&S and Part D – Infection Control and Part E – Engineering Services, readers may find the following helpful:

- A. Alyson and W. G. Stevenson. (2006) "Catheter Ablation of Atrial Fibrillation." *Circulation: American Heart Association*. Refer to website: <http://circ.ahajournals.org/content/113/13/e666.full>
- A. Da Costa, P. Lafond, C. Romeyer-Bouchard, A. Gate-Martinet, L. Bisch, A. Nadrouss, and K. Isaaz. "Remote Magnetic Navigation and Arrhythmia Ablation. (2012) "Archives of Cardiovascular Diseases. Refer to website: <http://www.sciencedirect.com/science/article/pii/S1875213612000940>
- Australasian Health Facility Guidelines, Part B: Health Facility Briefing and Planning, Clinical Investigation Unit, 2016, refer to website: <https://healthfacilityguidelines.com.au/health-planning-units>
- The Cardiac Society of Australia and New Zealand (2013). Guidelines: Clinical Practice. CSANZ; refer to website <http://www.csanz.edu.au/guidelines/clinical-practice>.
- DaCosta, Antoine, Patrick Lafond, Cécile Romeyer-Bouchard, Alexie Gate-Martinet, Laurence Bisch, Abdallah Nadrouss, and Karl Isaaz. "Remote magnetic navigation and arrhythmia ablation." *Archives of Cardiovascular Diseases* 105 (2012): 446-53. *Science Direct*. 2012. Elsevier. <http://www.sciencedirect.com/science/article/pii/S1875213612000940> .
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- Dixon, S. R. (2005) "Infarct Angioplasty: Beyond Stents and Glycoprotein Iib/IIIa Inhibitors." *Heart* 91. Refer to website: http://heart.bmj.com/content/91/suppl_3/iii2.full.pdf+html
- D. L. Packer, "Three-Dimensional Mapping in Interventional Electrophysiology: Techniques and Technology." *Medscape*. Journal of Cardiovascular Electrophysiology, 2005. Refer to website: http://www.medscape.com/viewarticle/514067_2
- G. L. Kaluza,., and A. E. Raizner. "Brachytherapy for Restenosis after Stenting for Coronary Artery Disease: Its Role in the Drug-eluting Stent Era." *Current Opinion in Cardiology* 19.6 (2004): 601-07. Print.
- Guidelines for Design and Construction of Health Care Facilities; The Facility Guidelines Institute, 2014 Edition refer to website www.fgiguide.org
- International Health Facility Guideline (iHFG) www.healthdesign.com.au/iHFG
- Teo, W. S., R. Kam, and A. Tan. (1998) "Remote Interventional Electrophysiology and Its Role in the Treatment of Cardiac Arrhythmia." *Pubmed*; refer to website: <http://www.ncbi.nlm.nih.gov/pubmed/9663319>.
- Left Ventricular Assist Device: Guidelines, Complications. *MedicineNet*, 2014. Refer to website: http://www.medicinenet.com/left_ventricular_assist_device_lvad/article.htm
- UK Department of Health, Health Building Note 01-01: Cardiac Facilities , refer to website: <https://www.gov.uk/government/collections/health-building-notes-core-elements>
- US Department of Veteran Affairs: Office of Construction & Facilities Management, Design Guides, refer to website: <http://www.cfm.va.gov/til/dGuide.asp>