Australasian Health Facility Guidelines

Part B - Health Facility Briefing and Planning

600 – Radiation Oncology Unit

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Australasian Health Facility Guidelines

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01 INTRODUCTION

1.1 PREAMBLE

This Health Planning Unit (HPU) has been developed by the Australasian Health Infrastructure Alliance (AHIA). This revision has been informed by an extensive consultation process that was completed in 2021.

The document is intended to be used by design teams, project managers and end users to facilitate the process of planning and design.

1.2 INTRODUCTION

Treatments for cancer may include surgery, chemotherapy, immune therapies, radiation therapy and supportive interventions such as palliative care, allied health and psycho-oncology. These treatments may also be used in combination.

Radiation therapy is the medical use of ionising radiation to treat cancer and other conditions. It may be used for curative cancer treatment (alone or in combination with surgery) and is also used as a palliative treatment with the aim of local disease control or symptom relief.

This HPU outlines specific requirements for a Radiation Oncology Unit. Should this service be part of an integrated cancer centre, refer to HPU 155 Ambulatory Care and Community Health for details relating to chemotherapy and outpatient clinics.

This document should be read in conjunction with the Australasian Health Facility Guidelines (AusHFG) generic requirements and Standard Components described in:

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

1.3 POLICY FRAMEWORK

Prior to undertaking a project, planners and project staff should familiarise themselves with individual national, state and territory specific policies, and with the following publications:

- Radiation Oncology Practice Standards Part A: Fundamentals (Radiation Oncology Alliance 2018); and
- Radiation Oncology Practice Standards Part B (Radiation Oncology Alliance, 2018).

These publications are a joint initiative of the Royal Australian and New Zealand College of Radiologists (Faculty of Radiation Oncology), the Australian Society of Medical Imaging and Radiation Therapy and the Australian College of Physical Scientists and Engineers in Medicine. The updated standards, developed in 2018, now incorporate requirements for both Australia and New Zealand and were developed with input from the New Zealand Radiation Oncology Executive and New Zealand Radiational Oncology Working Group.

The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) publish Codes of Practice or Standards detailing requirements for radiation safety and each jurisdiction has legislation in place to regulate and control radiative substances, radioactive sources and related equipment. Refer to Section 3.7.2 for further details.

A range of additional standards and guidelines relating to Radiation Oncology are listed in the Further Reading section of the Appendices.

1.4 DESCRIPTION

1.4.1 Definition of Health Planning Unit (HPU)

This HPU provides the information necessary to plan and design a Radiation Oncology Unit. A Radiation Oncology Unit may be provided as:

- a stand-alone unit, operating as a 'hub' centre;
- a 'spoke' service of a 'hub' centre; or
- a component of an integrated cancer centre.

Facility design should, where appropriate, meet all necessary criteria to reach accreditation standards with regards to design, equipment and radiation safety.

1.4.2 Types of Radiation Therapy

The types of radiation therapy to be provided within the unit will require confirmation to inform the proposed infrastructure and equipment requirements.

Radiation Therapy includes two main types:

- **external beam radiation therapy (EBRT)** - delivered by linear accelerators (linacs) or other devices, and provided in all radiation oncology centres; and
- **brachytherapy**, a form of internal radiation therapy, whereby a sealed radioactive source is delivered directly to the tumour (often by surgical means). Brachytherapy is only provided in specialised services.

EBRT is delivered using a range of different techniques and types of radiation, as described below. **Many of these are highly specialised therapies that will only be provided in selected units.**

- **Three dimensional conformal radiational therapy (3DCRT)** will be delivered by all radiation therapy units. As with many of the other therapies, it involves the use of medical imaging (typically a planning CT scan, but may include a planning MRI and/or PET) to design a radiation therapy treatment program that is individualised to each patient.
- **Intensity modulated radiation therapy (IMRT)** and **Volumetric Modulated Radiation Therapy (VMAT)** are advanced forms of conformal radiation therapy that allow the dose to be shaped to the tumour and are particularly useful for tumours located near healthy organs that are sensitive to radiation therapy. VMAT is different to IMRT in that the linac rotates around the patient during treatment which shortens the treatment time, improves accuracy and lowers the overall dose of radiation. The majority of linacs are IMRT and VMAT capable.
- **Stereotactic radiosurgery (SRS)** delivers high doses of radiation to small targets within the brain or spine. **Stereotactic body radiation therapy (SBRT)** relates to stereotactic radiation treatments for small tumours in the chest, abdomen or pelvis. SBRT can be delivered on a standard linac with appropriate consideration of the design of the linear accelerator treatment room (bunker). Dedicated equipment and specific planning systems are required for SRS. These are non-invasive procedures that require no anaesthetic or incisions and are specialised services that will only be provided in a small number of centres across each jurisdiction. However, the provision of stereotactic therapies is growing.
- **Superficial X-ray radiation therapy** utilises low energy, low penetration treatments for skin lesions and tumours just under the skin. This is a specialised treatment that is commonly provided in a dedicated room, however there are mobile options where the therapy can be undertaken in another appropriately shielded room, e.g. brachytherapy room if provided and the projected utilisation of both modalities supports efficient use of the space.

- **Orthovoltage** also utilises low energy, low penetration treatment, however it provides slightly deeper treatment. It requires a dedicated, shielded room and equipment. Orthovoltage machines can typically also deliver superficial x-ray radiation therapy.
- **Total Body Irradiation (TBI)** is used in the treatment of blood related cancers and is often given in conjunction with chemotherapy as part of the preparation for a blood stem cell or bone marrow transplant. This is a highly specialised service that is provided via a linac, however consideration needs to be given to the dimensions of the bunker as these procedures require an extended source to skin distance of approximately 4m and the largest practical field size (Wong et al., 2018).
- A **Gamma Knife** is a highly specialised machine used to provide SRS, primarily for small to medium tumours and lesions in the brain. It is a minimally invasive treatment and the machine includes built in shielding so has differing shielding requirements compared with a linac. Given the weight of the machine, there are significant floor loading requirements. Gamma Knife systems attract additional requirements relating to the physical security of the radiation source.
- **CyberKnife** systems are also highly specialised and provide SRS and SBRT through non-invasive treatment via radiation beams that can rotate 360 degrees around the patient. The CyberKnife does not have built in shielding and requires a specialised bunker design, with every wall needing to be a primary barrier.
- **Particle Therapy** is an advanced form of radiation therapy which is used for cancers close to vital organs such a brain, spinal cord or heart. The most common form is proton therapy, a form of external beam radiation therapy that uses proton particles instead of X-rays. The physical properties of protons offer a significantly reduced radiation dose being deposited in the healthy tissue beyond the tumour. Demand for this type of therapy is increasing worldwide. Proton therapy centres are complex projects and purpose built, with the design being informed by radiation shielding requirements and equipment specifications. At the time of publishing this HPU, Australia's first particle therapy centre, The Australian Bragg Centre for Proton Therapy and Research, was being constructed in Adelaide.

Brachytherapy (internal radiation therapy) is a highly specialised technique and is only provided in selected radiation oncology units. It allows a higher total dose of radiation to be administered to treat a smaller area and in a shorter time than is possible with EBRT. Brachytherapy may be either temporary or permanent, low dose rate (LDR) or high dose rate (HDR).

- **Temporary brachytherapy** involves placing radioactive material inside or near a tumour for a specific amount of time and then withdrawing it. It can be administered at a LDR or HDR. A delivery device, such as a catheter, needle, or applicator, is placed into the tumour using fluoroscopy, ultrasound or CT to help position it. The physician may insert the radioactive material at the same time manually through the delivery device. Alternatively, the patient may be admitted to a hospital room where the delivery device is connected to a remote-controlled machine (after-loader), which pushes the radioactive material to the tumour site. After a specified amount of time, the radioactive material is withdrawn back into the machine and disconnected from the delivery device.
- **Permanent LDR brachytherapy**, also called seed implantation, involves placing radioactive seeds or pellets in or near the tumour and leaving them there permanently. After several weeks or months, the radioactivity level of the implants eventually diminishes to nothing. The seeds then remain in the body with no lasting effect on the patient.

- **HDR brachytherapy** is usually an outpatient procedure and involves positioning the radiation source into the cancer for a short period of time. A specified dose of radiation is delivered via a remote-controlled machine to the tumour in a short burst, lasting only a few minutes. This may be repeated several times a day before the delivery device is removed and the patient returns home. Patients may receive up to 12 separate HDR brachytherapy treatments over one or more weeks.
- **LDR brachytherapy** involves treating the patient with radiation delivered at a continuous rate over several hours or days. This treatment may be delivered using a manually or remotely after-loaded implant. A patient receiving LDR brachytherapy stays overnight in hospital, so the delivery device can remain in place throughout the treatment period.

1.4.3 Terminology

In addition to the therapies described above, radiation therapy refers to the following terms:

- course: a planned series of treatment sessions for either new or repeat patients;
- fraction: a patient treatment session, representing a single-treatment delivery of one radiation dose;
- field: an individual beam of a radiation delivered to a specific area as part of a treatment fraction. There may be one or more beams of radiation delivered to make a fraction;
- simulation: the initial step in the treatment planning process whereby a planning CT (or planning MRI, refer to Section 2.1.3) is undertaken to precisely locate the area of interest and surrounding critical structures. Highly accurate measuring devices are then employed to record the treatment site in relation to external markers. This may involve the use of patient immobilisation devices and skin markings to ensure that the patient is in the same position each day throughout the course of treatment;
- dosimetry: the science of measuring and calculating doses of radiation absorbed;
- phantoms: products that mimic human tissue that are utilised to estimate radiation doses delivered to patients. The material used can range from water to complex chemical mixtures;
- Surface Guided Radiation Therapy (SGRT): technique using 3D camera technology to track a patient's surface to verify their position before treatment and to track patient motion throughout treatment; and
- respiratory gating: use of advanced computer software to guide the delivery of radiation as a patient breathes. The gating system detects when to give radiation according to the patient's specific respiratory cycle to minimise radiation exposure to healthy tissue.

1.4.4 Model of Care

The diagnosis, treatment and management of cancer requires coordinated, multidisciplinary care.

Multidisciplinary patient centred clinics and case review meetings, often organised to focus on specific 'tumour groups', are considered a standard of care.

Radiation therapy is a major treatment modality. Approximately 48.3% of patients with a diagnosis of cancer should ideally have radiation therapy at some time during their treatment. Refer to Review of Optimal Radiotherapy Utilisation Rates (Barton et al., 2013).

Ideally, cancer services will be either collocated or located nearby related services to promote coordination and easy access for patients. Services in non-metropolitan locations will generally be networked to a major site. Telemedicine is needed to support these hub-and-spoke models to ensure both patients and clinical staff have access to expert advice.

The major phases of radiation therapy are described below.

Phase 1 – Initial Consultation

Patients are referred to a radiation oncologist by members of the multidisciplinary team for an initial consultation to assess their suitability for radiation therapy treatment.

Some cases will be collaboratively reviewed by the multidisciplinary team to determine the optimal approach to treatment, e.g. whether surgery and/or chemotherapy may be required first.

Phase 2B – Treatment Planning

The patient will attend the unit for planning scans. This typically involves a planning CT, also known as a CT simulator, however increasingly centres are accessing additional planning information using MRI and PET (refer to Section 2.1.3 below).

Planning processes are then undertaken to design and calculate the optimal treatment configuration for the patient. A three-dimensional treatment planning system is vital to ensure that radiation is delivered to precise parts of the body and that adjacent organs are protected. The planning process may take up to several days to complete and the patient is not in attendance during this process.

Treatment planning will determine the dosage, number of fractions and fields required to comprise the overall treatment course. This includes dosimetry, target delineation and beam design to produce an optimal plan for delivering the dose to the tumour prescribed by a radiation oncologist.

Phase 2C – Pre-Treatment Verification

Quality assurance (QA) activities including radiation therapist and medical physics review of the patient's treatment plan are undertaken including a 'dry run' of planned treatment, independent checking of the plan and monitor unit calculations and measurements.

Phantoms are routinely used during the introduction of new techniques and once the technique becomes routine, computer-based QA programs are commonly used with periodic phantom verification QA.

Phase 3 - Treatment

Treatment commences once the final treatment plan has been approved by a radiation oncologist. A treatment course may vary from one treatment attendance to a course totalling up to 40 fractions over six to eight weeks with daily or twice daily attendance. Each daily treatment attendance will usually take between 10 and 30 minutes.

Treatment may be coordinated with other cancer services such as chemotherapy.

Phase 4 – Post Treatment Follow-Up

Following treatment, patients are reviewed by the radiation oncologist at between two and six weeks to monitor for side effects. Patients may then be seen at three, six or 12 monthly intervals with other specialists and/or GP shared care arrangements. Ongoing follow-up may occur with children and patients on clinical trial protocols.

1.4.5 Future Trends

Planning for a radiation oncology service may consider the following trends which may in turn impact on the facility design:

- transition to cloud-based computing systems may alleviate some local computing requirements in planning;
- MRI-based simulation and planning (as noted under Section 2.1.3);
- increased complexity of individual treatment plans. This will impact radiation therapist and medical physics resources towards the increased load and patient focused quality assurance;

- increasing requirement for accuracy in treatment and reduced fractions per course. This increases the planning phase as it becomes more complex;
- the medium to long-term inclusion of newer technologies (e.g. helical tomotherapy, Gamma Knife, CyberKnife, MR linacs, particle therapy). Particular attention should be made to shielding design for rotational therapy, room size to hold additional devices like Calypso or ultrasound, depth of floor concrete and weight capacity, extra conduit space and ceiling mounts;
- increasing provision of clinical trials, however these will not be provided at all centres;
- use of 3D printing to develop treatment aids. These are most commonly located in the patient accessory fabrication rooms;
- increasing use of adaptive radiation therapy (ART) where treatment is adapted to account for internal anatomical changes. Images are taken immediately before or during the treatment and the treatment is then modified accordingly; and
- increasing use of Surface Guided Radiation Therapy (SGRT) and other motion management technologies such as respiratory gating.

1.4.6 Patient Experience

Recognising the often depleted physical and emotional state of patients, their families and carers, it is important to develop a quality-built environment that not only eases patient and carer anxiety but also provides staff with a work environment conducive to delivering optimal patient care. As far as is practicable, a non-clinical, restful environment should be encouraged by wall paintings, soft colours etc.

Planning must recognise the need for patients and their families to discuss personal matters in a private and confidential environment and to minimise concerns regarding appearance and loss of self-esteem.

Planning and design processes must include consideration of the local cultural context through engagement with local cultural groups. The facility should celebrate the local cultural heritage of the area and provide a culturally safe and welcoming environment that meets the needs of all people.

Access is required to services including:

- support and assistance with regard to affordable accommodation and travel that may be required for the duration of treatment particularly for patients from rural and remote areas;
- supportive care including palliative care, allied health and psycho-oncology. This may include exercise physiologists or physiotherapists given the documented physiological and psychological benefits of exercise;
- patient and family counselling;
- education / information resources - brochures, computer access, support organisations, etc.;
- interpreter services; and
- advice on available complimentary therapies (massage, stress management etc.) and provision of wigs. These services are usually provided as part of a broader integrated cancer service.

It must be noted that increasing survival due to early diagnosis and constantly improving technology is leading to an increase in the ongoing requirement for supportive care.

Refer to Section 3.1 regarding patient access requirements.

02 PLANNING

2.1 OPERATIONAL MODELS

2.1.1 Integrated Cancer Centres

Integrated Cancer Centres incorporate a range of cancer treatment services, e.g. radiation therapy, chemotherapy, outpatient services and supportive care services within the one facility. Teaching and research activities are also commonly provided. The term 'Comprehensive Cancer Centre' is also referred to and generally implies an integrated centre including surgical oncology services.

Where Radiation Oncology Units are provided as part of an integrated cancer centre, opportunities to share selected facilities should be explored to increase opportunities for collaboration and reduce duplication. Examples include:

- outpatient clinics;
- patient holding areas;
- meeting rooms to support training and multidisciplinary team approaches;
- resources and wellness areas for patients and carers; and
- research including clinical trials and data management.

For planning and design information relating to chemotherapy and outpatient clinics refer to HPU 155 Ambulatory Care and Community Health Unit. For services including a cytotoxic pharmacy refer to HPU 560 Pharmacy Unit.

2.1.2 Children and Adolescents

Paediatric radiation oncology is a specialised service, provided at one or two centres per jurisdiction.

The design of Radiation Oncology Units that treat children should consider the needs of children and their families such as the provision of private, discreet waiting areas close to the treatment area, and suitable distractions such as toys. The design of waiting areas should consider whether diversional therapies (e.g. music) may be delivered and the potential impact on adjacent areas. Close access to parenting rooms will be required.

The model of care is similar to that described above, however additional time is usually provided to meet the staff and see the machine to minimise anxiety.

Access to anaesthetic services will be required for paediatric services, as described at Section 2.2.4.

Consideration should be given to bunker design features that are welcoming and comforting to children without being inappropriate for adult patients. Examples include lighting elements that can be changed as appropriate and audio-visual interventions.

Units routinely treating adolescents and young adults should provide access to age-appropriate waiting space and information.

2.1.3 Medical Imaging and Radiation Therapy Planning

Planning CT / CT Simulator is the mainstay imaging modality provided within Radiation Oncology Units. The treatment planning CT scan may be merged with diagnostic quality images such as MRI and PET scans to optimise the precision of tumour targeting. Diagnostic MRI and PET are more commonly provided in medical imaging and nuclear medicine departments, rather than being part of the radiation oncology unit. The use of MRI in radiation oncology is increasing, in particular for head and neck tumours and neuro-oncology. This includes the provision of MRI for planning (MR Simulator) and MRI Guided Linear Accelerators (MR Linacs) which enable the simultaneous delivery of radiation treatment in conjunction with MRI based imaging. If an MR Linac is provided, the service will also require an MR Simulator, however some services will have an MR Simulator without an MR Linac, e.g. for brachytherapy.

Generally, if only one planning modality is provided in the unit, it will be a CT Simulator, however for units with two planning modalities the second one may be provided as an MR Simulator and this is anticipated to become increasingly common in the future.

The required imaging modalities for radiation therapy planning and access to diagnostic imaging within other departments will require confirmation prior to the commencement of planning and design.

For planning and design information relating to MRI and PET, refer to:

- HPU 440 Medical Imaging Unit
- HPU 500 Nuclear Medicine / PET Unit

2.2 OPERATIONAL POLICIES

2.2.1 General

Operational policies have a major impact on design requirements as well as on capital and recurrent costs for health care facilities. Operational policies should be established at the earliest stages in planning with consideration given to local jurisdictional policies.

Unit specific operational policies are detailed below; a list of general operational policies is available from Part B: Section 80 General Requirements.

2.2.2 Hours of Operation

Opening hours are usually 8.00am to 6.00pm Monday to Friday. However, extended hours of operation providing sessions into the evening and on Saturdays may occur. Regular 'down time' is required for maintenance of major medical equipment. After-hours emergency access is commonly required in most units, e.g. for spinal cord compression.

2.2.3 Multidisciplinary Case Review

Cancer treatment is increasingly provided by multidisciplinary teams that may include medical oncologists, radiation oncologists, haematologists, surgical oncologists, radiologists, pathologists, palliative care, allied health, nursing and radiation therapists. The Radiation Oncology Unit may provide rooms for these multidisciplinary case reviews to occur where not located as part of an integrated cancer service. The case reviews may involve face-to-face interaction or may involve videoconferencing and viewing of images and other data remotely, particularly for ‘spoke’ services. The room will require multiple screens and may include a microscope.

These rooms can also be used for meetings, staff and student education and video conferences with other centres and clinicians.

2.2.4 Anaesthesia and Recovery

General anaesthetic is rarely used for adults receiving radiation oncology. However, selected centres providing brachytherapy and those providing radiation therapy for children will require access to anaesthetic services.

Access to oxygen, medical air, suction, scavenging and anaesthetic equipment will be required in these treatment rooms with remote monitoring from the control room. Nitrous Oxide may also be required.

The provision of an anaesthetic preparation room is recommended for paediatric services and brachytherapy procedures. Access to an appropriate post anaesthetic recovery area (first stage recovery) with dedicated staff is also essential. The transfer of patients from treatment rooms to recovery areas should be as direct as possible and should not traverse public areas. The number of post anaesthetic recovery bed spaces will be based on the estimated throughput of cases per session and day only cases will also require access to a second stage recovery area that may be combined with or adjacent to stage 1 recovery.

2.2.5 Clinical Trials

Clinical trials will be conducted in many centres and provision is needed for staff including administrative work space and secure storage for pharmaceuticals, patient files and source documents. Trials involving patients will be conducted in the outpatient clinics and other planning and treatment areas of the unit. This may include access to interview rooms for surveys such as patient reported outcome measures.

2.2.6 Medical Records, Image and Data Storage

Ideally, an electronic record system will be in place. Some hard copy storage may be required for existing paper records that need to be accessed for historical reasons. The retention and disposal of medical records, including radiation dose information, is subject to the legislative and regulatory requirements.

Image management and data storage should ideally be a picture archiving computer system (PACS). Radiation oncology information systems (ROIS) should have online storage, back-up and archiving capability.

For further information, refer to:

- Guidelines for Medical and Dosimetry Record Storage (RANZCR, 2011); and
- jurisdictional policies.

2.2.7 Education and Training

The extent of undergraduate and post-graduate training for all disciplines to be undertaken in the Radiation Oncology Unit will need to be established to ensure that the necessary teaching and work space is provided. This may include multifunctional meeting / training rooms with appropriate AV equipment and consideration of students within the allocation of work areas and amenities. Most tertiary radiation oncology services will be affiliated with a university.

2.2.8 Food and Nutrition Services

Provision of beverages and vending machines for outpatients and visitors may be either within the unit or located nearby.

Light refreshments should be available for patients who may be in the unit for extended periods when receiving multiple treatments or extended stays in the patient holding / recovery area.

Storage may be required for dietary supplements and resource material provided by a dietician.

2.2.9 Maintenance

Each item of treatment and associated equipment should have a program of planned maintenance following manufacturer's recommendations. Additional days planned for quality assurance and technique development are preferred.

Service contracts should be in place for all major equipment (including software) or provided by radiation oncology-trained biomedical engineers or technicians to undertake adjustments and normal maintenance.

Space will be required to accommodate spare parts and vendor engineer desk space.

2.2.10 Medical Emergencies

Policies and procedures will be in accordance with overall health service policy where a Radiation Oncology Unit is located on a hospital campus. A resuscitation trolley, with defibrillator, should be readily accessible from the Planning area in case of adverse patient reaction to intravenous contrast. Others may be required in the patient holding / recovery area and treatment bunkers.

Consideration needs to be given to MRI specific resuscitation equipment if this modality is provided.

2.2.11 Patient Equipment

The use of custom designed patient specific items including immobilisation devices, whole body vacuum bags, active breathing control devices and mouth bites, is increasing. Blocks and wedges are no longer commonly used.

The majority of patient items will be stored within the bunker/s as indicatively noted on the AusHFG Standard Component for a linear accelerator treatment room, however it is recommended that a secondary storage room is provided in close proximity to the bunker for storage of larger immobilisation devices and/or as a holding space for equipment prior to a patient's treatment commencing. Storage requirements should be developed in consultation with the service providers based on the range of patient customisation provided, however storage solutions should be adaptable given the types of devices will change over time.

Items need to be stored separately with clean dividers between each patient's equipment for infection control reasons. Cleaning protocols will be in place and usually involve wiping down the item with an appropriate solution. Items that require reprocessing will be transferred to a central sterilising services unit. Reprocessing protocols must meet the requirements of AS 4187 'Reprocessing of reusable medical devices in health service organisations'.

Where MRI is provided, compatible patient equipment will be required.

2.2.12 Pharmacy

Where a Radiation Oncology Unit is located within an integrated cancer centre, a cytotoxic suite may be provided. Otherwise, some access to medications is required which will typically be stored in the clean store / medication room, depending on local jurisdictional requirements. This is typically located within the patient holding / recovery area, and in close proximity to areas where anaesthetic services are provided.

2.2.13 Transport

A bay to accommodate wheelchairs and/or unoccupied patient trolley will be located in an accessible area and be used by staff to transport patients to and from the Radiation Oncology Unit. External transport may be provided by patient transport services or ambulance officers.

A holding area is typically used to accommodate patients transferred from inpatient units, other hospitals and residential aged care facilities and will require staff oversight.

2.2.14 Volunteers

Volunteers play a considerable role in assisting patients and their families in a range of duties including providing refreshments and keeping patients company. Consideration should be given to their needs depending on their duties such as a workstation for a co-coordinator, small workroom, lockers and storage. This will depend on whether centralised support areas are provided for volunteers across the facility and the size of the service.

2.2.15 Staffing

The staff establishment of the Radiation Oncology Unit will generally include:

- radiation oncologists - specialists and registrars;
- radiation therapists;
- nursing staff including cancer nurse co-coordinators;
- medical physicists and medical physics registrars;
- administration staff;
- a range of support staff including a quality assurance officer and IT support;
- allied health staff;
- clinical trials staff;
- radiation engineers or electronics / mechanical technician;
- students / research staff; and
- volunteers.

A detailed staffing profile will be needed to ensure that adequate staff work areas, planning and support space is provided within the unit. Requirements will depend on the range of services provided. For example, stereotactic services commonly require increased number of medical physicists depending on local jurisdictional approaches. Considering should also be given to visiting staff.

Units offering services for children and/or specialised treatments will affect staffing numbers. For example, paediatric services will include anaesthetic staff and play therapists.

2.3 PLANNING MODELS

Location

A Radiation Oncology Unit should generally be on ground level or underground due to the shielding requirements, the weight of equipment and for ease of installation and replacement of specialised equipment.

The unit should provide ready access for outpatients, including access for people with disabilities, ambulances, and inpatients on beds / trolleys.

If the unit is a free-standing facility on a hospital campus, enclosed links should be provided between the unit and the main hospital for access to other clinical units such as inpatients and medical imaging, and for the transfer of goods and supplies.

2.4 FUNCTIONAL AREAS

2.4.1 Functional Zones

The Radiation Oncology Unit comprises the following functional zones. The scope of the unit will be dependent on the service level, size and if the service is integrated as part of a larger cancer centre. These zones include:

- entry / reception / waiting;
- outpatient clinics (may be shared if the Radiation Oncology Unit is integrated with a cancer centre);
- planning areas including planning CT (and MRI for select services as noted above), patient accessory fabrication room, planning workroom and associated areas;
- patient treatment zone including linear accelerator/s, other specialised treatment modalities as required, and patient holding areas;
- medical physics and radiation engineering; and
- staff work areas and amenities.

2.4.2 Entry / Reception / Waiting

There should be a single public entry to the Radiation Oncology Unit leading to the main reception desk, patient administration (e.g. appointments, billings) and a main waiting area. Additional sub-waits will usually be located nearby outpatient clinics, planning and treatment areas.

A child play area may be incorporated into the main waiting area with access to a parenting room. This area will accommodate visitor amenities. Facilities for volunteers and transport staff may also be located in this area.

The waiting area will include access to patient and family resources / education facilities, including computer terminals with Wi-Fi access for patient education and completing quality of life data for clinical trials. These facilities would be shared if provided as part of an integrated cancer centre.

Electronic self-registration, queueing and wayfinding systems may be implemented in this area.

A separate entry to the unit is required for patients arriving on a trolley or bed, e.g. from another area of the hospital or external transfer, so that these patients are not transferred through a public area.

Reference should be made to contemporary guidelines regarding COVID-19 / other pandemics including consideration of physical distancing requirements in waiting areas. Strategies to enable expansion of waiting areas when required should be explored, e.g. through collocation of meeting rooms that can be expanded into.

2.4.3 Outpatient Clinics

The size and role of the outpatient clinics will vary depending on the service configuration (i.e. part of an integrated cancer centre or a stand-alone service). Details of anticipated occasions of service and session requirements will inform the number of consulting rooms.

Clinics should be located on the perimeter of the unit with direct access from the entry for easy access.

Patients are usually assessed weekly (or fortnightly) by a radiation oncologist or registrar throughout the course of their treatment. Follow-up clinics will also need to be accommodated. A meeting room will be required for multidisciplinary clinical review of patients. It should be equipped to enable video conferencing and the digital display of clinical information, images and related information. Larger, specialised facilities may require access to a microscope in this room.

A procedure room large enough to conduct endoscopic examinations such as head and neck examinations, pleural taps, peritoneal drains will also be required.

All consult rooms should be equipped to support telehealth services.

The main reception or other staff base will oversight waiting areas. Proximal access to clinical support areas is required and these may be shared with the patient holding / recovery area depending on the size of the unit.

Corridors and clinical rooms will permit trolley access.

2.4.4 Planning Areas

This area consists of simulation / CT, patient accessory fabrication room and planning workroom. These functions should be located in close proximity to facilitate efficient staff work flows, however it is acknowledged that planning activities can be undertaken off-site through virtual technology.

Simulation / CT

Facility requirements for treatment planning include:

- simulator / CT suite (noting additional modalities, such as MRI may be included as described under Section 2.1.3);
- interview room;
- resuscitation trolley bay; and
- patient and visitor amenities (change cubicles, toilets, sub-waiting, trolley bay).

Patient Accessory Fabrication Room

Contemporary practice is for custom designed patient specific items to be fitted in the CT Planning Room. A patient accessory fabrication room is required for the manufacture of these items, however this is a ‘dirty’ workroom and the patient will not attend this room.

The manufacture of personalised medical devices is regulated by the Therapeutic Goods Administration: https://www.tga.gov.au/sites/default/files/personalised-medical-devices-including-3d-printed-devices.pdf

Refer to Section 4.2.2 for further information.

Planning Workroom

Radiation therapists will require workroom space to accommodate planning activities, QA checking and data transfer. This should be discreet from the busy planning area given the high level of concentration required.

These workroom areas will be located near imaging rooms in a staff only zone. Planning workstations used by radiation therapists need to be sized to accommodate two large monitors.

These should also be closely located to quiet work areas for medical staff undertaking planning activities. Bookings staff will usually be located nearby.

2.4.5 Radiation Treatment Areas

This treatment area includes all aspects of radiation treatment with associated administration and support functions:

- bunkers, mazes;
- control areas;
- modulator - these may be located within the bunker, however it is preferred that they are located in a separate room adjacent to the bunker to reduce heat and noise. Requirements will depend on the vendor. Easy access to the modulator is required for servicing;
- adequate storage for large personalised immobilisation devices and treatment accessories;
- interview room/s;
- change cubicles;
- patient toilets (noting some treatments require a full bladder); and
- sub-waiting - seats and trolley bay to be located so the patient is not observed by members of the public.

The design of the bunkers requires careful consideration of the access arrangement and location of the control rooms. Refer to Section 3.6.3 for further information relating to the maze entry and strategies to avoid inadvertent access to the bunker. The linac control rooms should also be located to minimise the risk of interruption of staff by patients in adjacent waiting areas.

2.4.6 Patient Holding

Patient bays will be provided to hold selected patients before and after treatment or to recover following selected procedures. These patient bays will be arranged so they are easily observed from a staff station. Each bay will be curtained (to maintain privacy) and require power, oxygen and suction.

Utility rooms and other support space will be collocated but also arranged so they are accessible by other areas within the Radiation Oncology Unit.

Ideally, a consult room will be located nearby to support care or consultation that requires privacy. A resuscitation trolley bay may be needed if distance to the trolley bay in the planning area is too far.

2.4.7 Medical Physics and Radiation Engineering

Medical physics is responsible for the radiation physical aspects of radiation treatment and radiation safety of all staff, patients and others.

Medical physicists provide scientific support for all treatment machines, simulators, CT, MRI, computer planning systems, brachytherapy sources and equipment as well as dosimetry, quality assurance and radiation safety. Medical physicists are specialised in advanced technique development. Where provided within the facility, they will also provide support for nuclear medicine modalities e.g. PET.

Radiation engineering services may be provided in-house or by external contractors. The service provides maintenance and service support to an extensive range of treatment and non-treatment equipment in radiation oncology. They will provide regular calibration and compliance checks of all treatment delivery and diagnostic machines.

Some of the equipment may be custom manufactured and not commercially available (e.g. compensators for individual treatments, planning / design and installation of rigid attachments for patient hoists, and calibration jigs).

Facility requirements include:

- administrative work space (workstations, meetings areas and access to staff amenities) for medical physicists and medical physics registrars (this will include consideration of students);
- medical physics laboratory;
- dosimetry laboratory;
- radiation engineering workshop; and
- storage for medical physics equipment including bulky water tanks and phantoms.

ICT support requirements should also be considered.

2.4.8 Staff Areas

The number of staff work areas will depend on the envisaged staff establishment when the unit is fully functional (e.g. if a bunker is planned in shell, the additional staffing requirements when commissioned will be factored in to the original plans). Provision of work space will comply with jurisdictional policies.

Clinical Trials / Research

Many radiation oncology services will be involved in clinical patient trials. Research may also involve data collection and analysis. Requirements will include administrative work space, secure storage for pharmaceuticals, patient files and source documents.

Staff Amenities

Amenities will include:

- staff toilets - depending on the overall size of the unit / cancer centre, toilets may need to be dispersed into the various zones for ease of access;
- staff room; and
- meeting room/s for multidisciplinary audit and review meetings.

Allocation of space for staff amenities will depend on the staff establishment and service location.

Student activity and amenities will need to be assessed.

2.5 FUNCTIONAL RELATIONSHIPS

2.5.1 External

The Radiation Oncology Unit, when located on a hospital campus, has functional relationships with:

- medical oncology – it is recommended that outpatient medical oncology and radiation oncology units are collocated where possible given a significant proportion of patients will have concurrent chemotherapy and radiation therapy;
- other cancer treatment services, both inpatient and outpatient services;
- medical imaging (CT and MRI);
- nuclear medicine / PET;
- palliative care;
- education and research facilities; and
- other services including transit lounge (where provided), inpatient services, outpatient services and emergency department depending on the models of care provided and high volume and/or urgent patient flows.

2.5.2 Internal

The Radiation Oncology Unit has many components. Key internal relationship requirements are noted below:

- the unit must be designed to optimise patient flow through the unit, minimise travel distances and to ensure patients / visitors do not inadvertently access restricted areas;
- the entry, reception and main waiting area must be designed to promote patient flow to and from the various areas including outpatient clinics, imaging / planning areas and treatment areas;
- the planning workroom should be collocated with imaging planning modalities and also medical staff work areas for consultation and collaboration; and
- support areas should be shared between zones where appropriate to optimise efficiencies and minimise travel distances.

03 DESIGN

3.1 ACCESSIBILITY

3.1.1 External

Level, undercover access is required for outpatients and inpatients in wheelchairs, trolleys and beds. A discreet, separate entry should be provided for patients arriving on a trolley or bed so they are not pushed through general public areas.

Accessible parking bays and patient drop-off and pick-up points should be located close to the entry to the Radiation Oncology Unit or integrated cancer centre. Ready access should be provided from the public car park to minimise stress for patients attending on a daily basis. If located on a hospital campus, access is required for deliveries (e.g. supplies) and waste removal.

After-hours access for urgent radiation therapy cases must be easy for inpatients and external (ambulance) patients.

Delivery and replacement of large heavy equipment will be required.

3.1.2 Internal

Internal circulation routes in all patient areas should allow for the efficient movement of wheelchairs and beds. Treatment and planning areas should not be used as thoroughfares. Wherever possible, a separation between patient circulation and staff / material circulation within the unit is preferred, especially where patients are transferred on beds.

Some access routes and circulation systems, particularly in the radiation treatment area, must allow delivery paths for large pieces of equipment. Height, width, and floor loads must be considered in the design of these access routes, as well as lift or crane access for the installation / decommission of large heavy equipment.

3.2 PARKING

The following areas will be required:

- undercover patient parking adjacent to main entry for patients with minimal mobility;
- ambulance access; and
- parking area for volunteer drivers.

Patients attending the service as outpatients may do so on consecutive days and/or for up to eight weeks and may require a space on a short-term basis or for up to five hours. Patients are often adversely affected by the rigours of the treatment and the provision of subsidised or dedicated ‘user friendly’ parking facilities reduces the associated stress in attending the unit. When planning new services, health services should ideally have a process in place to ensure access to affordable parking, close-by the unit, for patients who visit daily for treatment.

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

3.3 DISASTER PLANNING

Refer to Part B: Section 80 General Requirements for further information.

3.4 INFECTION CONTROL

Radiation Oncology Units will include a significant volume of immobilisation and patient specific devices, which need to be cleaned and stored between treatment sessions in line with national and jurisdictional infection prevent and control policies. The number of custom patient devices is increasing.

Most items can be wiped down with an appropriate solution and stored within the bunker or adjacent store room. Items must be separated through the use of dividers. Some items will be sent to a central sterilising service for reprocessing.

For further information, refer to:

- AusHFG Standard Components;
- Part D: Infection Prevention and Control; and
- jurisdictional policies.

3.5 ENVIRONMENTAL CONSIDERATIONS

3.5.1 Toxic Waste

Considerations include:

- safe handling and air exchanges for chemicals in the patient accessory fabrication room;
- provision of effective extraction systems to areas such as the patient accessory fabrication room;
- drainage systems designed to meet the requirements of the relevant sewerage authority and health department;
- safe storage and disposal of radioactive material;
- safe management of cytotoxics and heavy metals depending on the scope of services provided and patient specific devices manufactured.

3.5.2 Acoustics

The patient accessory fabrication room should be acoustically treated so noise associated with this activity is minimised.

All examination, consultation rooms and staff work areas will be acoustically treated to protect patient privacy. Where an MRI is included, appropriate noise controls will be needed.

Modulators can be located within a bunker, but a separate room is often provided in a location adjacent to the bunker to reduce heat and noise.

The bunker design should also consider acoustics to ensure appropriate patient communication throughout treatment.

3.5.3 Interior Decor

The environment should have a comfortable and welcoming appearance while not compromising clinical practice or safety. Treatment areas such as the simulator room and bunkers should be decorated in a manner that is calming while providing positive distractions during treatment.

Visual distraction is becoming the norm in rooms such as bunkers. This may include ceiling effects including a backlit photo mural or very large LED screens for images to be displayed on. Patients can often customise the images. The ceiling effects should consider the need for darkened rooms e.g. for visualisation of lasers, and the increasing use of ceiling mounted devices.

3.5.4 Patient Privacy

Waiting areas for patients who have changed into a gown should be located so they are not observed by members of the public. Patients also require privacy to discuss billing and private health related concerns with staff.

Consideration of the movement of patients through the department should be considered to maximise privacy where possible. This includes consideration of patient privacy while in treatment rooms and the location of CCTV monitoring screens to minimise the likelihood of inadvertent viewing.

3.5.5 Natural Light

As much natural light as possible should be provided, especially into public spaces, waiting areas and those treatment areas that patients and staff occupy for long periods of time.

Where possible, connections with the natural environment should be promoted through access to courtyards and views to trees and gardens.

3.6 SPACE STANDARDS AND COMPONENTS

3.6.1 Ergonomics

The design and construction of Radiation Oncology Units should protect patients, visitors and maintenance and other staff from avoidable risks of injury and/or radiation hazard.

The height, depth and design of desks in the radiation treatment area need to consider the constant up and down nature of the tasks undertaken and the distance to the wall of the emergency stop button.

Many staff within Radiation Oncology Unit use dual screens to plan radiation treatment requirements. Refer to AusHFG Part C: Design for Access, Mobility, Safety and Security for more details regarding ergonomics.

3.6.2 Human Engineering

The design should permit effective, appropriate, safe and dignified use by all people, including those with disabilities. Also refer to AusHFG Part C: Design for Access, Mobility, Safety and Security for information.

Where appropriate, design must comply with AS 1428 (Set) 2010 ‘Design for access and mobility Set (SAI Global)’.

3.6.3 Doors and Corridors

Doors and corridors must be wide enough to accommodate large items of equipment and enable calibration equipment and trolleys / beds to pass through with ease. Special consideration needs to be given to any bariatric bed that may travel from hospital inpatient units.

Double doors will be provided to all workshop areas.

A maze entry without doors to the bunker is preferred as closed doors can make patients feel like they are locked in and shielded doors take time to open due to their weight. In addition, the sense of confinement and disconnection with shielded doors may not be culturally appropriate depending on local demographics. A visual barrier is required at the entry to the maze through provision of a lightweight physical barrier, such as a gate, and/or laser gate to ensure that other patients / visitors do not inadvertently access the bunker. In addition, the entrance to the maze should not align with the end of a corridor to avoid inadvertent access. The entry to the maze should be visible from the control room.

Although not the preferred approach, shielded doors to the bunker are used in some facilities where space is constrained or where pre-cast construction approaches are used as the reduced footprint and construction time may outweigh the significant capital cost of shielded doors.

3.7 SAFETY AND SECURITY

3.7.1 General

Safety and security involves people and policies as well as physical aspects. Security of the facility must be addressed at each stage of the planning and design process. A safety audit via a risk analysis of potential hazards should be undertaken during the design process. Security may include:

- emergency 'stop' buttons in treatment bunkers and control rooms;
- 'last man out' systems;
- access control to rooms storing high cost equipment;
- radioactive source security as provided for brachytherapy services;
- fixed and personal duress alarms; and
- controlled staff access after-hours.

The Radiation Oncology Unit should only be accessible to authorised persons and must be locked and alarm activated once the area is vacated after hours. Care should be taken with wayfinding and signage to discourage accidental entry to these areas.

3.7.2 Radiation Safety

The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) publish Codes of Practice or Standards detailing requirements for radiation safety. Refer to the Radiation Protection Series (Website): https://www.arpansa.gov.au/regulation-and-licensing/regulatory-publications/radiation-protection-series

Key reference materials include:

- Fundamentals for Protection Against Ionising Radiation (F-1), Radiation Protection Series (ARPANSA, 2014);
- National Directory for Radiation Protection (RPS 6) (ARPANSA, 2017);
- Code of Practice for Radiation Protection in the Medical Applications of Ionizing Radiation (RPS-14), Radiation Protection Series (ARPANSA, 2008);
- Safety Guide for Radiation Protection in Radiotherapy, Radiation Protection Series (RPS-14.3) (ARPANSA, 2008); and
- Code of Practice for the Security of Radioactive Sources (RPS-11), Radiation Protection Series (ARPANSA, 2019).

Each jurisdiction has legislation in place to regulate and control radiative substances, radioactive sources and related equipment. Refer to:

- NSW Radiation Control Act 1990 (amended 2002) (NSW Government, 2002) and the Radiation Control Regulation 2013 (under the Radiation Control Act 1990) administered by Environment Protection Authority;
- Northern Territory Radiation Protection Act 2004 (Northern Territory Government), as in force at 1 May 2016;
- Queensland Radiation Safety Act 1999 (Queensland Government, 2013) and the Queensland Radiation Safety Regulation 2010 (Queensland Government, 2019);

- South Australia, Radiation Protection and Control Act 1982 (Government of South Australia, 2012);
- Tasmania, Radiation Protection Act, 2005 (Tasmanian Government, 2013) and the Radiation Protection Regulations 2016 (Tasmanian Government 2017);
- Victoria Radiation Regulations 2017, Radiation Act 2005 (State Government of Victoria, 2019); and
- Western Australia Radiation Safety Act 1975 - 1999 (Act No 44 of 1975) (Government of Western Australia, 2004).

Specialised services such as brachytherapy and gamma knife radiation attract additional requirements relating to the physical security of the radioactive source and a facility construction license may be required prior to commencing construction.

3.8 FINISHES

Refer to AusHFG Part C: Design for Access, Mobility, Safety and Security and the relevant standard components.

3.9 FIXTURES, FITTINGS AND EQUIPMENT

3.9.1 General

Room Data and Room Layout Sheets in the AusHFG define fixtures, fittings and equipment (FFE).

Refer to the relevant AusHFG Standard Components - Room Data Sheets (RDS) and Room Layout Sheets (RLS).

3.9.2 Equipment - General

All items of equipment will need to be itemised and dimensions of larger items obtained during the design phase to ensure:

- equipment is housed to enable its operation and maintenance. In particular, room sizes and specifications for linear accelerator and electronic cabinet rooms should accommodate the equipment manufacturer's recommendations, as space requirements vary from one machine to another and one manufacturer to another. Equipment requiring services such as chilled water, air and special power must be noted and project engineers advised;
- cable length between parts of major equipment should be checked and adequate in-floor conduit space provided;
- doors are sized to allow passage of equipment;
- heat loads are estimated and catered for; and
- weight loads are estimated and checked structurally.

Space allocations should be sufficient to accommodate a range of vendor equipment as replacement is required every 10 to 15 years.

Adequate space must also be provided for the maintenance of major equipment. Note that electronic control cabinets are bulky and need special access to three sides.

3.9.3 Linear Accelerator Machines

Ideally, linear accelerator machines should be ‘paired’ within a unit. This ensures that treatment can continue to be delivered should a machine malfunction. This paired machine would deliver the same beam energy and quality.

Linear accelerator rooms (bunkers) require radiation protection that will include concrete walls, floors and ceiling to a specified thickness. The radiation protection needs of the unit shall be assessed by a certified physicist or radiation safety consultant in accordance with National standards and legislative and regulatory requirements for each jurisdiction.

Reference should be made to local radiation licensing requirements and regulations.

Note that the schedule of accommodation indicates the bunker size including the maze to ensure that sufficient 'footprint' is allowed during early planning stages.

3.10 BUILDING SERVICE REQUIREMENTS

3.10.1 Future Proofing

Selected services may seek to future-proof facilities to anticipate new or emerging technologies. For example, shielding for primary beams other than in sentinel directions may be required if cyber knife technology is being considered.

Selected units may include additional imaging modalities such as MRI and PET. Retrofitting these modalities is problematic (especially PET) so ideally, facility requirements should be considered in planning project stages. In addition, extra space may be required within particular rooms to accommodate planning equipment. For further information, refer to:

- HPU 440 Medical Imaging Unit; and
- HPU 500 Nuclear Medicine / PET Unit.

3.10.2 Structural

Radiation treatment bunkers, CT simulation rooms and brachytherapy procedure / treatment rooms need radiation protection built into the facility. Bunkers need special construction to ensure they meet radiation safety requirements.

The flooring for a Radiation Oncology Unit will be designed to meet the load requirements for equipment and patient care.

Ceiling mounted equipment should have properly designed rigid support structures located above the finished ceiling sufficient to support heavy ceiling-mounted equipment such as frames of data monitors. A lay-in type of ceiling should be considered for ease of installation, service, and remodelling.

A minimum three metre ceiling height is required in procedure rooms, plus appropriate shielding to the ceiling and adequate space for building and engineering services. Due to these requirements, bunkers are generally not able to be accommodated within typical hospital building floor to floor heights.

Consideration should be given to separation of linacs between fire compartments to avoid damage from smoke, dust and noise during replacement / refurbishment works.

3.10.3 Communications and Information Systems

Information, Communications and Technology (ICT) are key enablers to optimise patient care and to ensure efficient and effective patient data and image management. The continuity of ICT systems is essential, and requirements should be carefully assessed during the planning and design process.

Key considerations will include:

- wireless technology;
- voice / data systems;
- telephone and video conferencing capacity;

- duress call - fixed and personal (if required);
- CCTV monitoring systems of entry points;
- infrastructure for PACS (usually a separate system from the medical imaging PACS), electronic health records and ROIS;
- large bandwidths to support the movement of images from hub and spoke locations; patient / nurse and emergency call systems (that should be consistent with existing systems);
- the use of cloud-based systems;
- dedicated, air-conditioned rooms for servers, with capacity to accommodate current and future capacity (depending on the level of transition to cloud-based solutions);
- alarm systems - drug fridges, medical gases, entries etc. that register in an area manned 24 hours per day;
- pan, tilt and zoom patient viewing cameras, treatment delivery computers and intercoms to allow the radiation therapist to monitor and communicate with the patient during treatment when the patient is alone in the treatment room; and
- increased formal networking and exchange of clinical data between units, extended computer networks to rural and remote communities. This has major implications for bandwidth.

3.10.4 Electrical Services

Sufficient power should be provided for current need and future expansion of services.

An uninterruptible power supply (UPS) and an emergency back-up system should be available for high priority equipment and illumination.

Cable ducts and/or conduits should be provided in the floors, walls and ceilings as required for specialised equipment.

There should be a maximum distance of 7.5 metres for the cable run between the simulator and the generator. Minimal distances are preferable to minimise the degradation of cable operation. Cable runs in the radiation treatment control area need careful planning.

3.10.5 Mechanical Services

Mechanical services requirements will include:

- appropriate air exchanges and exhausts for chemicals in the patient accessory fabrication room;
- sufficient air-conditioning capacity and compressed air in radiation treatment and CT rooms;
- humidity control in line with the vendor’s environmental specifications;
- appropriate air-handling systems in computer equipment rooms; and
- general air conditioning to cool equipment but not blow over partially undressed patients on beds.

To maintain a high level of staff concentration and to minimise the possibility of accidents, the temperature of the unit should be maintained within a comfortable range not exceeding 25°C.

Smoke / heat detectors in radiation treatment and simulator rooms must be of the type not sensitive to radiation (i.e. photoelectric) and require special consideration.

3.10.6 Medical Gases

Oxygen and suction will be required in all bunkers, simulation, treatment and patient bed bays. Medical air and scavenging additionally are required in rooms where general anaesthesia may be administered. Nitrous oxide may also be required.

3.10.7 Radiation Protection

Linear accelerator rooms (bunkers) require additional radiation protection that will include concrete walls, floors and ceiling to a specified thickness. Primary beam protection may be enhanced by the use of steel plate inserts. The radiation protection needs of the unit shall be assessed by a certified physicist or consulting radiation expert to ensure compliance with the requirements of jurisdictional authorities.

This assessment is to specify the type, location and amount of protection to be installed in accordance with final approved department layout and equipment selection. The radiation protection requirements shall be incorporated into the final plans and specifications.

A suitably qualified expert will be required to provide advice regarding suitable construction methods and materials, with special consideration given to shielding of wall penetrations and the stability of any barriers over time. The qualified expert should continue to be involved throughout the planning and construction stages to ensure that the building design and facilities satisfy safety standards and practice.

3.10.8 Lighting

Lighting in the Radiation Oncology Unit will need to be of various types and will be dependent on the task. The main lighting requirements are:

- even distribution of luminance throughout the non-working areas;
- walls that do not show reflections of luminaires, particularly at eye-height of staff when working;
- fully dimmable lighting in bunkers, simulator areas, planning areas and administration areas where medical staff undertake planning activities;
- special three level lighting in radiation treatment bunkers; and
- lasers for patient positioning in bunkers and CT simulator rooms with high level luminance available for maintenance and repairs.

3.10.9 Hydraulic Services

The trade waste plumbing and drainage system must be designed to meet the requirements of the relevant sewerage authority and the health departments. Information about the quality of chemicals to be used / discharged must be provided by the client to the hydraulics engineer.

04 COMPONENTS OF THE UNIT

4.1 STANDARD COMPONENTS

Rooms / spaces are defined as:

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

The standard component types are listed in the attached Schedule of Accommodation.

The current Standard Components can be found at:

https://www.healthfacilityguidelines.com.au/standard-components

4.2 NON-STANDARD COMPONENTS

4.2.1 Volunteers Workroom

Description and Function

A base for volunteers who may work in the unit, should volunteers be part of the service model. This base may provide a worktable, storage and lockers.

Location and Relationships

Location may depend on roles undertaken by volunteers. For example, if volunteers assist with wayfinding and provide support within the resource room, then a location near the entry would be ideal.

Volunteers are commonly included as part of a Wellness Centre where provided.

Considerations

Requirements may change depending on the roles undertaken by volunteers.

4.2.2 Patient Accessory Fabrication Room

Description and Function

Used for the manufacture of patient accessories such as immobilisation devices. Storage space is required for the large volumes of material used.

While the shell forming for head and neck patients is predominantly thermoplastic based, there still may be patients that require plaster impressions.

3D printers are also being increasingly used in the manufacture of patient accessories and are commonly stored in this room.

Expert advice should be sought regarding requirements of this room including that it complies with work, health and safety requirements.

Location and Relationships

This area should be located away from patient areas due to possible noise and fumes.

Considerations

This room requires air extraction for the molten metal used to fabricate photons and electron shielding.

Bulky foam cutters for personalised stabilisation products may be required to manufacture custom masks.

FF&E will include:

- heavy-duty stainless-steel benching;
- large sink and plaster trap;
- hand wash basin;
- water bath (built-in or free-standing);
- shelving and cupboards to support storage requirements in line with local work practices;
- instruments - drill, hot wire cutter, heat source for moulding wax (e.g. bunsen burner or heat gun);
- chemically resistant floor vinyl;
- dust and fume extraction; and
- acoustic containment.

4.2.3 CT Planning Control Room

Description and Function

Control area for the Radiation Oncology CT Planning Room.

Location and Relationships

Directly adjacent to the Radiation Oncology CT Planning Room with glazing to view the patient.

Considerations

FF&E will include:

- CT control console;
- simulator control panel;
- breathing management system;
- control system for laser bridges;
- control system for IV contrast;
- workbenches;
- patient viewing monitor and microphone / speaker;
- phone;
- emergency ‘stop’ button; and
- duress alarm.

4.2.4 Planning Workroom

Description and Function

The area used by the radiation therapists who work individually using computer terminals with dual screens to review plans and produce radiation dosage profiles.

Some planning work may be undertaken remotely depending on local operational policies.

Location and Relationships

Ready access to the planning modalities including CT.

Easy access to the computer server data storage room for retrieval of archived data, however the use of cloud-based systems is increasing.

Considerations

Specialised FF&E will include:

- work benches sized to suit the planning computers with dual screens;
- planning computers – one per workstation;
- PACS terminals at a ratio of one per workstation;
- a printer shared within the room; and
- an electronic journey board (depending on local practices).

4.2.5 Superficial / Orthovoltage Room

Description and Function

A specialised room used for low energy, low penetration treatments, e.g. for skin lesions and tumours just under the skin.

Radiation shielding is required, as well as a collocated control room. Orthovoltage rooms have greater shielding requirements and therefore the current and future function of the room will require confirmation.

Location and Relationships

Immediately adjacent to the Control Area so that access can be monitored.

Considerations

FF&E includes:

- illuminated warning signs at the room entrance;
- an interlocked door linked to the beam on. This should be shielded in lieu of needing a treatment room maze;
- a cooling unit which may be located in the treatment room but due to associated noise it is recommended it be housed outside the treatment room but nearby. Consider distance to plant room and refer to vendor requirements;
- custom storage for treatment cones and treatment shield– this should be separated and of sufficient volume in line with service requirements;
- CCTV to monitor the patient's movement;
- medical services panel with oxygen and suction;
- nurse call system including emergency call; and
- sufficient dimmable lighting including movable examination light.

4.2.6 Brachytherapy Procedure Room

Description and Function

The brachytherapy model of care will need to be confirmed at the commencement of planning. Invasive brachytherapy procedures including LDR brachytherapy seed implantation will be undertaken in an operating room environment with access to anaesthetic services. The brachytherapy procedure room may be provided in the theatre suite or Radiation Oncology Unit depending on the local operational model.

Brachytherapy cavity insertions, e.g. for gynaecological applications, are less complex and can be undertaken in a 'brachytherapy treatment room' described at Section 4.2.8.

For brachytherapy procedures, a radioactive source is delivered internally through a tube or applicators are inserted during surgery. The radiation source is inserted manually or, more commonly, performed by a remote after loading machine.

Location and Relationships

The brachytherapy procedure room must be located adjacent to support areas noted in the schedule of accommodation to optimise patient flow and staff work practices. These align with support areas provided for a standard operating theatre.

Considerations

There will be additional requirements relating to the physical security of the radioactive source and a facility construction license may be required prior to commencing construction. A suitably qualified expert will be required to provide advice regarding radiation safety requirements.

Interlocked doors are required that will retract the radiation source if the door is open during treatment.

Access to a brachytherapy seed store and loading for specialised services providing prostate brachytherapy is required.

Access to oxygen, suction, medical air, nitrous oxide and scavenging will be needed.

4.2.7 Brachytherapy Seed Store and Loading

Description and Function

Used for the storage of radioactive iodine seeds used for LDR brachytherapy seed implantation.

Checking of seeds is undertaken by physics staff. This involves taking x-rays of seed packs and calibrating loose seeds in a well chamber in the brachytherapy seed room.

Location and Considerations

The brachytherapy seed room must be closely accessible to the brachytherapy procedure room.

4.2.8 Brachytherapy Treatment Room

Description and Function

Brachytherapy cavity insertions, e.g. for gynaecological applications, are less complex and can be undertaken in a 'brachytherapy treatment room, rather than requiring an operating room environment.

Location and Relationships

The brachytherapy treatment room is located within the Radiation Oncology Unit and may be collocated with the brachytherapy procedure room if the procedure room is provided within this unit rather than the theatre suite.

Considerations

There will be additional requirements relating to the physical security of the radioactive source and a facility construction license may be required prior to commencing construction. A suitably qualified expert will be required to provide advice regarding radiation safety requirements.

Interlocked doors are required that will retract the radiation source if the door is open during treatment.

Access to oxygen, suction and medical air is required.

A shielded cupboard with lead door is required to store radioactive sources.

4.2.9 Medical Physics Laboratory

The medical physics laboratory will provide sufficient space for computer workstations and a work area to carry out equipment testing, technical analysis and discussion for quality assurance activities and projects. This may include ultrasound QA for brachytherapy.

Location and Relationships

Locate close to medical physics staff work areas and the dosimetry laboratory.

Considerations

Open plan space with appropriate space to manoeuvre equipment and trolleys.

Sealed vinyl floor and laminated bench tops required.

FF&E will include:

- workbenches (seated and standing heights or adjustable);
- large wall-mounted screen;
- hands free telephone;
- free-floating workbench (away from walls);
- whiteboards;
- storage;
- water supply and sink; and
- office furniture.

4.2.10 Dosimetry Laboratory

Description and Function

The dosimetry laboratory will provide sufficient space for computer workstations and a work area to carry out dosimetry measurements, including in-vivo dosimetry such as thermoluminescence dosimeter (TLD), optically stimulated luminescence dosimeter (OSLD) or film dosimetry, as well as dosimetry equipment QA (including Sr-90 source checks) and brachytherapy source calibrations. The Dosimetry Laboratory will provide sufficient space for the safe storage of radioactive sources required for dosimetry equipment QA and brachytherapy.

Location and Relationships

Locate close to medical physics staff work areas and the medical physics laboratory, in a non-public area away from waiting areas or high occupancy rooms such as offices and consult rooms.

Considerations

Open plan space with appropriate space to manoeuvre equipment and trolleys.

Secure access to authorised medical physics personnel.

Sealed vinyl floor and laminated bench tops required.

Radiation source safe for radioactive materials required with appropriate shielding and security, compliant with local regulations.

Work, health and safety (WHS) considerations include appropriate mounting of the radiation source safe and storage at a height safe for lifting heavy shielded sources.

Depending on service delivery requirements, a separate radiation source storeroom or hot lab may be required to provide sufficient space for safe storage of radioactive sources.

FF&E will include:

- workbenches (seated and standing heights or adjustable);
- hands free telephone;
- whiteboards;
- storage;
- shielded source safe and secured storage;
- wall-mounted light boxes may be required depending on service delivery requirements; and
- office furniture.

Note that dosimetry measurements using certain radioactive sources may require a shielded space, either mounted or portable shield. Several QA procedures may happen at one time, with one or more using radioactive sources. There must be a dedicated radioactive source handling area, including warning signs and a fume hood extraction system separate from rest of the laboratory that complies with local radiation safety regulations.

4.2.11 Store – Medical Physics

Description and Function

This room will accommodate fragile, bulky and highly sensitive equipment and instruments for use by medical physicists in the quality assurance and calibration of the linacs, including multiple water tanks and reservoir, both of which are approximately 1m x 1m and 1.8m high.

Storage related to medical physics research will also require consideration.

Location and Relationships

Ready access with free passage to bunkers and treatment rooms is required, with close proximity to the medical physics laboratory.

Easy access to a deep sink in the cleaner's room for filling and emptying of the water tank may be required.

Considerations

Access for large items of equipment including manoeuvring the water phantom trolley and reservoir.

Secure access to authorised personnel.

Cable storage and heavy-duty shelving for numerous phantoms.

Temperature / humidity-controlled storage for sensitive instruments and devices may be required depending on the unit's location.

FF&E will include:

- shelving and storage;
- GPOs for charging equipment.

4.2.12 Engineering Workshop

Description and Function

Workshop used for visiting or permanent engineering personnel servicing linacs and equipment and storage of equipment parts and tools.

Requirements will vary depending on the specific service provider / vendor contracts in place.

Location and Relationships

Part of the medical physics zone.

Considerations

For the maintenance of electrical equipment, the space should be divided into ‘clean’ and ‘dirty’ zones.

Light-coloured, antistatic flooring required. Electrostatic earthing required throughout the area.

FF&E will include:

- compressed air outlet;
- benches - general and for electronic work in a clean work area;
- hands-free telephone;
- sink;
- peg board;
- storage for spare parts;
- mobile fume extraction unit;
- drill and lathe in a 'dirty' work area; and
- general office furniture.

05 APPENDICES

5.1 SCHEDULE OF ACCOMMODATION

A schedule of accommodation follows for a two bunker and a four bunker unit with an optional brachytherapy bunker for the four bunker unit. The space allocations shown in this schedule of accommodation assumes a stand-alone or self-contained service.

Increasingly, radiation oncology services are being included as part of integrated cancer centres. Where this model is adopted, opportunities should be sought to share infrastructure and reduce duplication. Examples include outpatient clinics, holding and recovery, wellness and patient resources, volunteer spaces, visitor and staff amenities etc.

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

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

In some cases, Room / Spaces are described as 'Optional' or 'o'. Inclusion of this Room / Space will be dependent on a range of factors such as operational policies or clinical services planning.

ENTRY / RECEPTION / WAITING

AusHFG Room Code	Room / Space	SC / SC-D	2 Bunkers		4 Bunkers		Remarks
			Qty	m2	Qty	m2	
AIRLE-10	Airlock - Entry	Yes	1	10 (o)	1	10 (o)	Optional, not required if entry is provided through an internal entry.
WAIT-20	Waiting	Yes	1	20	1	30	Consider access to health promotion and patient education in waiting area. Electronic self registration and queueing systems may be implemented.
RECL-10	Reception / Clerical	Yes	1	15	1	20	2 and 3 staff assumed. To be aligned with proposed staffing requirements.
	Office – Workstation			4.4		4.4	Other administrative workstations. Number dependent on staffing profile.
STPS-8	Store - Photocopy / Stationery	Yes	1	4	1	8	
BWC	Bay - Wheelchair	Yes	1	4	1	6	Trolleys and wheelchairs.
WCPU-3	Toilet - Public	Yes	2	3	2	3	
WCAC	Toilet - Accessible	Yes	1	6	1	6	
PAR	Parenting Room	Yes	1	6 (o)	1	6 (o)	Optional. Access may be provided through an adjacent department. This is essential for paediatric services.
BWD-1	Bay – Water Dispenser	Yes	1	1	1	1	
BVM-3	Bay - Vending Machines	Yes	1	3(o)	1	3(o)	Optional, depending on local approaches and service location.
	Volunteers' Workroom		1	12 (o)	1	12 (o)	Optional, depending on overall approach to volunteers across the facility. May be included as part of a Wellness Centre where provided.
	Discounted Circulation		25%		25%		

Space allocations provided assume a stand-alone Radiation Oncology Unit. The organisation of space and opportunities for sharing may be possible if provided as part of a cancer centre.

OUTPATIENT CLINICS

AusHFG Room Code	Room / Space	SC / SC-D	2 Bunkers		4 Bunkers		Remarks
			Qty	m2	Qty	m2	
WAIT-20	Waiting	Yes			1	20	For 2 bunker scenario outpatients assumed to share main waiting area.
CONS	Consult Room	Yes	4	12	7	12	14m2 recommended for paediatric services. Indicative number noted only, requirements will depend on clinical services planinng and collocation of other cancer services. Planning also to consider allied health requirements. Dual egress may be required depending on local jurisdictional policies.
CONS	Consult Room	Yes	2	14	3	14	Indicative number, refer to note above. Larger sized consult rooms eg for paediatric services.
PROC-16	Procedure Room	Yes	1	20	1	20	E.g. for head and neck examinations, pleural taps, peritoneal drains.
INTV	Interview Room	Yes	1	12	1	12	
	Office – Workstation			4.4		4.4	Number dependent on staffing profile and local jurisdictional policies.
	Discounted Circulation		32%		32%		

The number of consult rooms allocated above is indicative and assumes dedicated use by a radiation oncology services. The arrangement and number of rooms will be different if provided as part of an integrated cancer centre.

PLANNING AREAS

AusHFG Room Code	Room / Space	SC / SC-D	2 Bunkers		4 Bunkers		Remarks
			Qty	m2	Qty	m2	
WAIT-SUB	Waiting - Sub	Yes	1	5	1	10	
CHPT-D	Change Cubicle - Accessible		1	4	2	4	
WCPT	Toilet - Patient	Yes	1	4	1	4	
INTV	Interview Room	Yes	1	12	2	12	
CTPR	Radiation Oncology CT Planning Room		1	45	2	45	Simulation and planning. Second planning modality may be provided as an MR Simulator.
	CT Planning Control Room	Yes	1	21	2	21	A number of image review workstations may be separated through glazing for acoustic privacy.
	CT Equipment Room		1	10 (o)	2	10 (o)	Optional. Requirement if equipment to be stored outside the CT room.
	Bay - Patient Trolley		1	4	1	6	For wheelchairs / unoccupied patient trolleys. Requirements will depend on the anticipated volume of inpatients / external patients accessing the unit.
BLIN	Bay - Linen	Yes	1	2	1	2	
BRES	Bay - Resuscitation Trolley	Yes	1	1.5	1	1.5	
STEQ-14	Store - Equipment	Yes	1	9	1	12	
	Patient Accessory Fabrication Room		1	12	1	20	Noisy machinery used.
	Planning Workroom		1	42	1	84	Area allocation will depend on number of staff to be accommodated. Some planning work may be undertaken remotely depending on local policies. Assume 6m2 per workstation.
	Planning Workroom - Brachytherapy					12 (o)	Optional planning workroom for services providing brachytherapy. Assumes 2 workstations per brachytherapy procedure room.
OFF-S9	Office - Single Person	Yes		9		9	Requirements dependent on staffing profile
	Office – Workstation			4.4		4.4	Requirements dependent on staffing profile
	Discounted Circulation		35%		35%		

Notes:

- increasingly MRI is being used to plan treatment. Should this modality be approved as part of the clinical services plan, refer to HPU 440 Medical Imaging Unit for details on planning and space requirements;
- additional information related to CT room requirements is contained in HPU 440 Medical Imaging Unit;
- assumes cannulation where required, occurs in the CT room; and
- space allocated for the planning workroom is indicative and needs to be tested against staffing numbers. 6m2 per workstation should be assumed in line with AHFG 'Reporting Workstation' (REPW).

PATIENT TREATMENT AREAS

AusHFG Room Code	Room / Space	SC / SC-D	2 Bunkers		4 Bunkers		Remarks
			Qty	m2	Qty	m2	
WAIT-10	Waiting	Yes	1	8	1	16	Assume 3 people waiting per bunker (1 patient, 1 carer and 1 carer for patients currently undergoing treatment). Design to consider patient experience including options for separation of patient groups.
CHPT	Change Cubicle - Patient	Yes	2	2	4	2	Recommend 3 change areas per 2 bunkers.
CHPT-D	Change Cubicle - Accessible	Yes	1	4	2	4	
WCAC	Toilet - Accessible	Yes	1	6	1	6	
INTV	Interview Room	Yes	2	9	4	9	May also support private waiting. 1 interview room per bunker recommended, ideally collocated with bunker and control room.
WAIT-S	Waiting - Sub	Yes	2	3	4	3	Located outside each bunker for those changed into gowns.
LINAC	Linear Accelerator Treatment Room	Yes	2	165	4	165	Recommended area is based on indicative shielding requirements as represented in the LINAC Standard Component and includes the maze. The size required will vary depending on the service / equipment requirements and shielding assessment. Consider inclusion of an anaesthetic preparation room for paediatric services.
	Linear Accelerator Treatment Room - Shielding Allocation		2	10	2	10	Indicative allocation for additional shielding required at either end of a row of bunkers.
LINAC-CR	Linear Accelerator Control Room		2	21	4	21	
	Modulator		1	15 (o)	2	15 (o)	Optional. For arrangements with modulator located outside of the bunker (this is the preferred approach given the noise generated). If located within the linac treatment room no additional space is required.
	Superficial / Orthovoltage Room			-	1	45(o)	Optional, depends on service scope. Radiation shielding requirements will depend on modality provided.
	Control Room - Orthovoltage			-	1	12(o)	
BLIN	Bay - Linen	Yes	1	2	1	2	
BHWS-B	Bay – Handwashing, Type B	Yes	1	1	1	1	
STEQ-14	Store - Equipment	Yes	1	9	2	9	Includes space for patient specific immobilisation equipment.
	Discounted Circulation		35%		35%		

Notes:

- no patient lockers are provided. Assumes patients carry their belongings with them. Increasingly, patients are issued with a gown that they use and launder for the course of their treatment; and
- where children are treated, a separate waiting space should be provided.

BRACHYTHERAPY SUITE – OPTIONAL AREA FOR SPECIALISED SERVICES

The area allocations will be guided by the proposed model of care for brachytherapy services. Invasive brachytherapy procedures including LDR brachytherapy seed implantation will be undertaken in an operating room environment with access to anaesthetic services. The **brachytherapy procedure room** may be provided in the theatre suite or Radiation Oncology Unit depending on the local operational model.

Brachytherapy cavity insertions, e.g. for gynaecological applications, are less complex and can be undertaken in a **brachytherapy treatment room** which does not require an operating room environment, however radiation safety requirements are still essential.

AusHFG Room Code	Room / Space	SC / SC-D	2 Bunkers		4 Bunkers		Remarks
			Qty	m2	Qty	m2	
	Brachytherapy Procedure Room			-	1	60	For invasive brachytherapy procedures. This may be provided as part of an operating suite depending on proposed service model. Shielded room. To be equipped as an operating room. Access to patient holding and recovery as below.
	Control Room - Brachytherapy Procedure			-	1	20	
ANAE-16	Anaesthetic Preparation Room				1	16	To support brachytherapy procedure room/s.
SCRB-4	Scrub-Up	Yes		-	1	4	To support brachytherapy procedure room/s.
	Exit Bay				1	12	To support brachytherapy procedure room.
CLUP-10	Clean Up Room				1	10	To support brachytherapy procedure room/s. Can be shared between 2 rooms.
	Brachytherapy Seed Store and Loading			-	1	9 (o)	Optional, for specialised services providing prostate brachytherapy.
STSS-20	Store - Sterile Stock	Yes		-	1	9	Sterile consumables associated with procedures.
CHST-10	Change - Staff (Male/Female)	Yes			2	10	May be shared as part of an operating suite.
	Brachytherapy Treatment Room				1	40	For cavity insertions / less complex brachytherapy procedures not requiring a theatre environment. Shielded room.
	Control Room - Brachytherapy Treatment			-	1	15	
	Store - Brachytherapy				1	8	
	Toilet / Change - Patient			-	1	5	
	Discounted Circulation				40%		

PATIENT HOLDING AREA

AusHFG Room Code	Room / Space	SC / SC-D	2 Bunkers		4 Bunkers		Remarks
			Qty	m2	Qty	m2	
SSTN-10	Staff Station	Yes	1	12	1	12	Open plan with Treatment Bays.
PBTR-H-9	Patient Bay - Holding	Yes	4	9	8	9	Open plan with observation from Staff Station. Two holding bays per bunker recommended (additional required where brachytherapy is provided). Total number of bays required should be informed by the anticipated volume of inpatients and external transfers requiring a trolley bay. Stage 1 recovery bays will be required for post anaesthetic care in specialist services - refer to PBTR-RS1.
1BR-H-12	1 Bedroom – Holding		-	-	1	12 (o)	Optional depending on service profile eg to support paediatrics.
BHWS-B	Bay - Handwashing, Type B	Yes	1	1	2	1	
ENS-ST	Ensuite - Standard	Yes	-	-	1	5 (o)	Optional collocated with 1 bedroom - holding where provided.
WCPT	Toilet - Patient	Yes	1	4	1	4	
BBEV-OP	Bay - Beverage, Open Plan	Yes	1	4	1	4	
BLIN	Bay - Linen	Yes	1	2	1	2	Part of open plan area.
BRES	Bay Resuscitation Trolley	Yes	1	1.5	1	1.5	Part of open plan area.
CLN-MED-20	Clean Store / Medication Room	Yes	1	12	1	14	Accessible to other areas of the Unit.
DTUR-10	Dirty Utility	Yes	1	10	1	10	Accessible to other areas of the Unit.
DISP-8	Disposal Room	Yes	1	8	1	8	If combined with Dirty Utility, 1 x 14m2.
CLRM-5	Cleaner's Room	Yes	1	5	1	5	
	Discounted Circulation		32%		32%		

MEDICAL PHYSICS AND ENGINEERING

The area allocations below are indicative and will depend on local requirements including specific service provider / vendor contracts in place.

AusHFG Room Code	Room / Space	SC / SC-D	2 Bunkers		4 Bunkers		Remarks
			Qty	m2	Qty	m2	
	Medical Physics Laboratory		1	20	1	30	
	Dosimetry Laboratory		1	15	1	25	
	Store - Medical Physics		1	15	1	20	Locate close to bunkers so access to water tank is facilitated.
	Engineering Workshop		1	20	1	30	Includes write-up space for technicians / visiting contractors and storage for spare parts.
	Discounted Circulation		30%		30%		

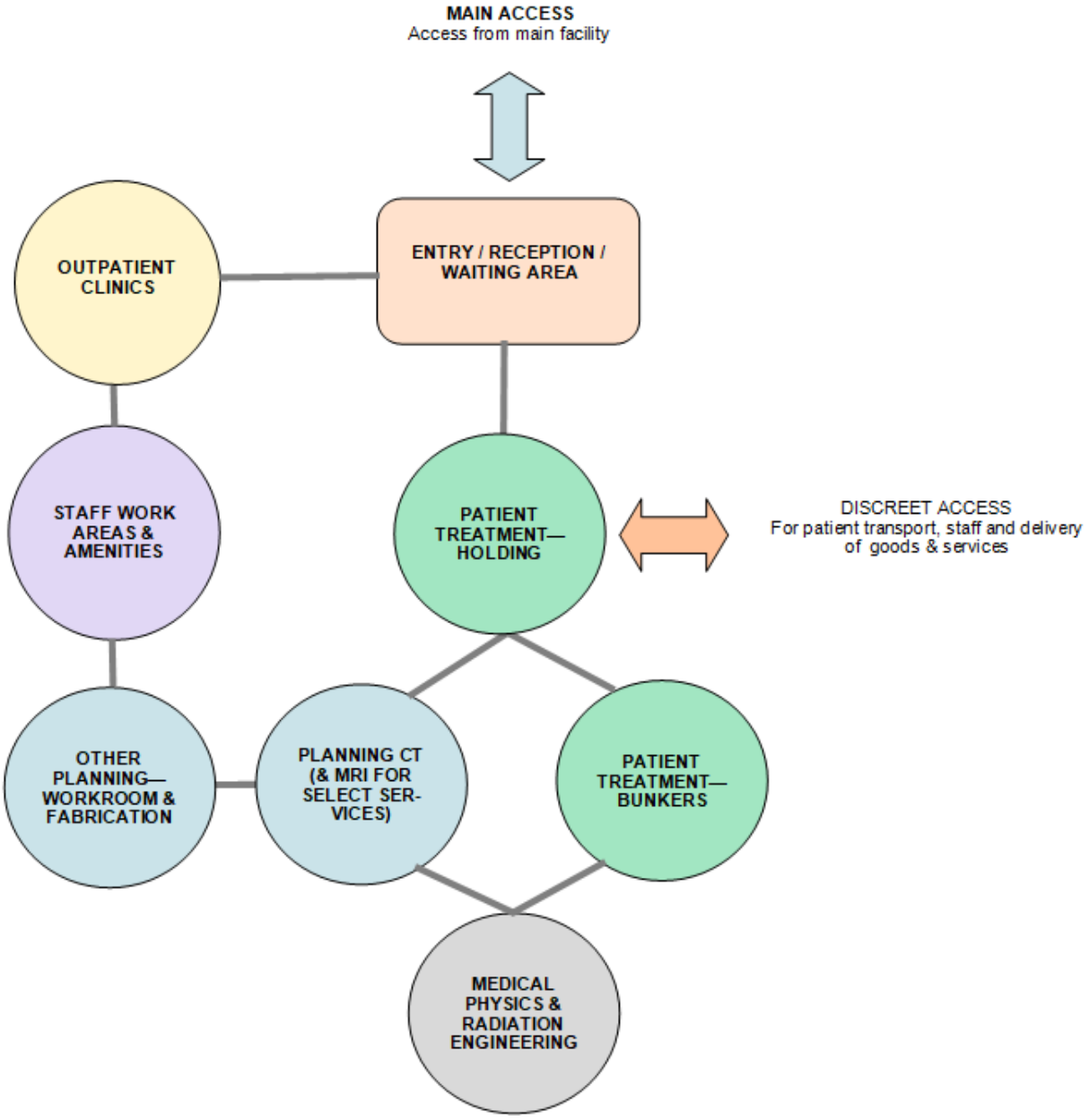
STAFF WORK AREAS AND AMENITIES

The allocation of staff work areas and amenities will depend on the projected staffing profile and local jurisdictional policies. The location of these areas should be considered to support close proximity to radiation therapy planning areas, as well as collaboration, interaction and knowledge sharing between disciplines.

AusHFG Room Code	Room / Space	SC / SC-D	2 Bunkers		4 Bunkers		Remarks
			Qty	m2	Qty	m2	
OFF-S9	Office – Single Person	Yes	1	9	1	9	Requirements dependent on staffing profile and local jurisdictional policies.
	Office – Workstation			4.4		4.4	Requirements dependent on staffing profile and local jurisdictional policies.
MEET-L-30	Meeting Room - Large	Yes	1	30	1	50	Size of room will depend on number of staff to be accomodated for MDT meetings and/or access to other meeting room as part of integrated cancer services. Requires AV equipment including videoconferencing systems. Use of operable wall between medium and large meeting rooms may be used for additional capacity.
MEET-L-20	Meeting Room - Medium	Yes	1	15	1	25	Requires AV equipment including videoconferencing systems.
INTV	Interview Room	Yes		9		9	Number dependent on service requirements. Requires AV equipment including videoconferencing systems.
STPS-8	Bay – Photocopier / Stationery	Yes	1	4	1	4	
SRM	Staff Room	Yes	1	20	1	35	Area will depend on staffing profile and operational policies.
BPROP	Property Bay – Staff	Yes	1	3	1	6	
WCST	Toilet - Staff	Yes	3	3	5	3	To be distributed throughout the Unit.
SHST	Shower - Staff	Yes	1	3 (o)	1	3 (o)	Optional depending on approach to end of trip facilities.
	Discounted Circulation		25%		25%		

5.2 FUNCTIONAL RELATIONSHIPS / DIAGRAMS

A diagram of key functional relationships is shown below.



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