ACPSEM
Australasian College of Physical Scientists & Engineers in Medicine
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MEDICAL PHYSICIST SCOPE OF PRACTICE
Key Capabilities and Enabling components

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Introduction

This document contains the definition and foundational clinical scope of practice 'key capabilities and enabling components' for medical physicists (Domain 1A) as well as defining advanced scope of practice for credentialling subspecialty skills in Radiation Oncology Medical Physicists (ROMP), Radiology Medical Physicists (RMP) and Nuclear Medicine Medical Physicists (NMMP) (Domains 1B, 1C, 1D). The non-clinical professional skills required by all medical physicists are listed in Domains 2-4.

Background to medical physicist's professional capabilities

Two working groups (one for Radiation Oncology Medical Physicists 'ROMPs', and one for Diagnostic Imaging Medical Physicists 'DIMPs') were initially recruited for the scope of practice work. Each held 8 members. It was quickly identified that the DIMP group required division into 2 groups, one representing Radiology Medical Physicists 'RMPs' and one for Nuclear Medicine Medical Physicists 'NMMPs'.

Members worked with a project lead to develop the *general* medical physicist definition and develop each *subspecialty* definition. Each group considered examples of international and national definitions in current use and agreed to following a templated format to ensure definitions were succinct and used standardised terminology. Scope of Practice Working Group members met for 4 x 2hour Zoom meetings to define the profession and identify areas important for scopes of practice.

A full day scope of practice workshop was held with a smaller working group constituted of cross specialty members to develop foundational skills and competencies for general medical physicists. This work was guided by the ACPSEM new curriculums and the graduate learning outcomes from a number of national and international university master's courses. The format for the current AHPRA Medical Radiation Practice Board was used to guide the development.

In defining the skills and competencies required for subspecialty areas of practice, expressions of interest were sent to members and 6 speciality area sub-groups were formed under each specialty. Members of these sub-groups were selected based on their experience and knowledge of subspecialty skills under each specialty. These groups worked independently to develop key capabilities and enabling components, with reference to the learning outcomes of the 2022 ACPSEM curriculums.

A draft version of the Scope of Practice document was opened to a stakeholder consultation in October 2022. Feedback was considered by a cross specialty working group and further sub-specialty expert opinions were incorporated.

Professional Domains for non-clinical skills were developed for all Medical Physicists based on the current AHPRA guidelines and the learning outcomes identified in the new CTGs.

Format of the medical physicists' practice professional capabilities

Key capabilities – what registered medical physicists must be able to do

The key capabilities describe the areas/ topics for safe and competent practice in a range of contexts and situations of varied complexity and uncertainty. During any one procedure or treatment, practitioners are expected to demonstrate key capabilities from various domains. This recognises that competent professional practice is more than a sum of each discrete part and needs an ability to draw on and integrate the breadth of capabilities to support overall

performance. Key capabilities are directly linked to the curriculums of all ACPSEM specialty groups.

Enabling components – evidence of the key capabilities for general registration as a medical physicist

The enabling components describe the essential and measurable characteristics of the corresponding key capabilities and facilitate assessment of performance in the practice setting. Medical physicists must be able to demonstrate all enabling components for all key capabilities for safe and competent practice. This includes applying, adapting, and synthesising new knowledge from experience to continually improve performance.

The enabling components include different ways of demonstrating capability:

- **Apply knowledge / principles of** indicates a practitioner is expected to apply detailed knowledge in the practice setting.
- **Understand** indicates a practitioner is expected to apply broad knowledge and understanding of
  information for safe practice, however, may not need to understand or interpret detailed information or may not need to use their knowledge and understanding to perform certain procedures.
- **Performance e.g., 'perform', 'identify', 'respond' and/or 'operate'** are used for the majority of enabling components – these are abilities needed in the practice setting.

(Future) Uses of the medical physicist professional capabilities

An AHPRA Board has statutory functions as a regulator of the medical physicist profession in Australia.
One of the Board's statutory functions is to 'register suitably qualified and competent persons in the health profession.

An AHPRA Board will use the medical physicist professional capabilities as a reference point for a threshold of competence when exercising its statutory functions, including for:

- registration of individuals who complete an approved medical physicist program of study in Australia.
- registration of individuals who are relying on medical physicist qualifications issued in other countries to qualify for general registration in Australia
- re-registration of individuals who were previously registered as a medical physicist in Australia, and
- evaluation of a registrant whose level of competence to practise may pose a risk of harm to the public, for example, if the Board receives a concern or notification about that registrant.

The professional capabilities may also be also used:

- by universities for the development of medical physicist curricula (learning and assessment), and
- to communicate to the public, consumers, employers, insurance companies and other stakeholders the standards that they can expect from medical physicists.

The Board recognises that other organisations and individuals may use the professional capabilities as a reference point for a threshold of competence for other purposes. This may include the registrants' self-assessment of their competence, employers' performance

evaluation and management of registered medical physicists in the workplace and agencies responsible for health policy or health workforce strategy.

Concept of threshold professional capability and competence

In this document, the description of knowledge, skills, and professional attributes necessary for safe and competent medical physicists is described by key capabilities and enabling components.

Professional capability is the ability to take appropriate and effective action to formulate and solve problems in both familiar and unfamiliar, complex, and changing settings. Capability does not preclude the expression of competence, nor is capability a higher level of competence. Rather, competence is viewed as an essential part of being capable.

Competence refers to the knowledge and skills being applied consistently to the standard of performance needed in the workplace. The definition of competence needed for the job will change as the job role evolves. Threshold professional capability is the point at which the minimum level of competence to perform the job safely and competently is reached (see *Figure 1*).

Capable people have high levels of self-efficacy, know how to learn, work well with others and are creative. A practitioner's capability will expand and improve as they gain professional experience. Professional capability reflects how a practitioner uses their professional judgement, decision-making skills, and experiential knowledge to apply their scientific knowledge, practical skills, and ability in any given situation.

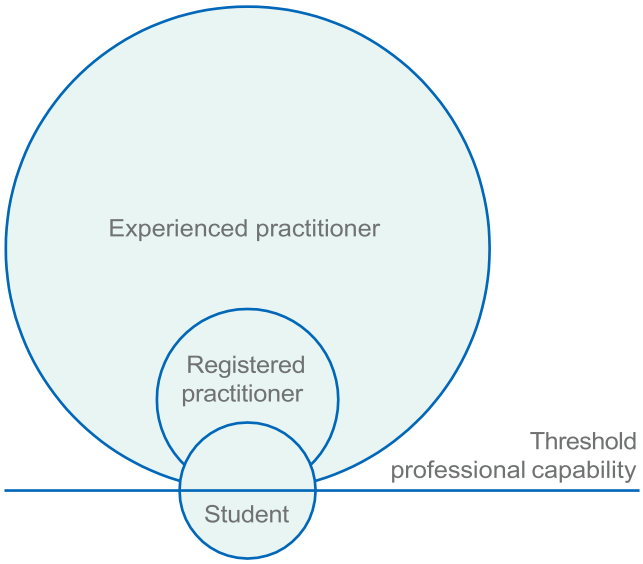
A capability framework can be pitched at the level of ongoing practice rather than being designed for a
specific point-in-time assessment. It focuses on activities at the broad level that apply across the profession
and allows individuals to develop their capabilities in complex and continually evolving work contexts. The enabling components in these professional capabilities describe the threshold behaviours for safe and competent practice.

The enabling components that describe behaviours for more advanced levels of practice are not covered in this document. That is, this document describes capability at the level of a novice practitioner, rather than an expert. Domains 1B, 1C and 1D for sub-specialty scopes of practice, do include tables of skills identified that require future credentialling at facility level.

Professional capability develops over time. The circles in Figure 1 below represent different levels of professional capability, synonymous with the different stages of a practitioner's career, from student through to highly experienced practitioner or expert:

- A person who has not reached or exceeded threshold professional capability across all aspects of practice is represented by the circle that lies only partially above the threshold level. For example, a student learning on the job through supervised clinical practice.
- A registered medical physicist is represented by the circle that sits entirely above the threshold capability level. Many practitioners develop a level of professional capability that is well beyond the threshold as they strive for excellence in their practice.
- A highly experienced practitioner or expert is represented by the largest circle which represents continued development and expansion of their professional capability throughout their practice career.

Figure 1:



Maintenance of professional capability

Professional capabilities are relevant throughout a registered medical physicist's career. Registered medical physicists are required to maintain at least the threshold level of professional capability in all areas relevant to their practice and maintain the currency of their skills and knowledge through continuing professional development (CPD).

The level of professional capability and scope of practice for practitioners are likely to change over time as the profession advances and as new roles emerge in the evolving healthcare environment. Practitioners may move into new roles with different responsibilities.

These roles may no longer include the direct provision of patient/client care, for example, in research, education or management. With changes to a practitioner's scope of practice, some of the key capabilities may no longer be relevant to their practice.

Many medical physicists strive to excel when providing services and maintain a level of professional capability above the threshold. If a medical physicist fails to maintain at least the threshold level of professional capability in all areas relevant to their practice, they could pose a risk to the public.

Guiding Principles

The foundational medical physicist key competencies listed in 1A are documented skills required for *all* medical physics, regardless of sub speciality area or area of practice (i.e. Education, research, management).

All Domains have been linked to the new curriculums developed and thus reflect the level of experience required at the time of future Training Education and Assessment Program (TEAP) graduation.

Some advanced skills that have been removed from the new CTGs have resulted in the Scope of Practice Subspecialty Domains requiring additional credentialing skills information. An example is brachytherapy for ROMPs. The new curriculum acknowledges that advanced skills are not able to be taught in many training sites. As such, foundation levels of knowledge are only required under the new training program. Advanced skills needed to work in brachytherapy, will require fellowship training programs (as yet not developed).

Supervision standards, recency of practice and CPD are the next formal position documents to follow this work.

Four definitions for Medical Physicist have been developed. One general 'Medical Physicist' definition and 3 definitions for the subspecialist of the profession that are to be registered.

Key Capability Domains

The 4 Domains consist of key capabilities that are thematically arranged and describe the essential characteristics of a competent registered medical physicist in Australia. Domain 1A Medical Physicist, constitutes the foundational skills that evidence the key capabilities of a medical physicist. Domains 1B, C and D, provide the subspecialty skills required to be evidenced to use the titles of Radiation Oncology Medical Physicist, Radiology Medical Physicist and Nuclear Medicine Medical Physicist.

Domain 1	**Medical Physicist** ▪ **Domain 1A Medical Physicist** ▪ **Domain 1B Radiation Oncology Medical Physicist** ▪ **Domain 1C Radiology Medical Physicist** ▪ **Domain 1D Nuclear Medicine Medical Physicist**
Domain 2	**Communicator and Collaborator**
Domain 3	**Leader and Health Advocate**
Domain 4	**Educator and Professional**

Domain 1A Medical Physicist

Definition
A Medical physicist is a health professional with ACPSEM recognised education and training in the specialised application of physics applied to medicine (subspecialties include nuclear medicine, radiology, and radiation oncology).

Scientific and Clinical Practice
Medical physicists have the necessary skills to manage equipment that produces, detects, and/or employs radiation along with other technologies that process, interpret, and explain data. They oversee specialist tests for diagnosing and managing diseases. They advise multidisciplinary teams and patients on tests, interpret data, and undertake research to understand illnesses and optimise radiation use in patient care. They provide expert care and advice in multidisciplinary settings and for patients to improve diagnosis and treatment outcomes.

Clinical Leadership
A medical physicist works both collaboratively and independently to determine and protect the safety of colleagues, patients and the public when radiation is used in a healthcare setting. They guide health organisations in the procurement, commissioning, decommissioning, optimisation of use of diagnostic and therapeutic equipment and radiation sources relevant to their speciality.

Quality and Safety
Medical physicists are specialists who facilitate the safe use of radiation in hospitals and other settings and are the authority responsible to advise on and oversee the safety, accuracy, and quality of therapeutic and diagnostic procedures.

Domain 1A Table of Key Capabilities for Medical Physicists

Key Capabilities What a Medical Physicist must be able to do	**Enabling Components** Evidence of this capability for General Registration as a Medical Physicist
1. Understand and apply knowledge of anatomy, physiology, and pathology to the practice of radiation diagnosis and treatment	a. Discuss the anatomy and physiology of the human body b. Describe how disease and injury impacts the human body and apply this knowledge to facilitate the safe use of radiation for purposes of diagnosis, examination, and treatment c. Identify anatomical structures, physiological processes, injuries, and diseases of the human body and utilize this knowledge to facilitate specialist diagnostic testing, and or treatment, research, and the interpretation of images
2. Understand and operate clinical information management systems	a. Work in accordance with relevant state, territory and/or federal legislation regarding data privacy, storage, ownership and disposal of practice documentation such as patient records and treatment information b. Use clinical information management systems appropriately including maintaining accurate patient information (history, examination, and treatment) c. Identify appropriate multidisciplinary collaboration requirements and ensure that clinical information is made available to all relevant persons involved in the care of the patient d. Maintain relevant clinical information and ensure timely and appropriate identification of clinical documentation that is

	incorrectly associated with the identity of a patient and/or examination and treatment e. Respond appropriately to data errors/system failures f. Discuss workflow between different clinical information management systems
3. Understand how radiation interacts with matter and how this applies in the context of medicine	a. Describe the principles involved in the creation of radiation b. Discuss the principles involved in the detection of radiation c. Describe particle and photon interactions with matter and how this applies in a medical context
4. Apply physics principles to clinical imaging	a. Discuss the basic design and operating principles of clinical imaging equipment and how these impacts on disease diagnosis and treatment b. Apply quantitative and qualitative image quality metrics in clinical practice c. Recognize common image artefacts and their causes and advise on techniques to reduce their impact on clinical practice d. Optimise patient radiation dose in clinical imaging
5. Apply knowledge of the biological effects of radiation and determine risk	a. Describe and discuss the biological effects of radiation b. Apply radiobiological knowledge to perform risk estimates resulting from radiation exposure
6. Understand the different methods of imaging and treatment	a. Detail the differing imaging and therapeutic pathways in medical radiation practice b. List the modalities and equipment used in the different imaging and treatment pathways across medical radiation practice c. Describe the use of diagnostic and interventional imaging to a range of patient presentations for diagnosis and treatment
7. Apply skills to investigate, analyse, interrogate, and process data in healthcare	a. Apply technical and research skills to analyse current practice, and new developments in diagnostic and therapeutic technologies and processes b. Apply principles of basic statistical analysis as relevant to healthcare c. Perform basic image and data processing and analysis
8. Understand and apply knowledge of quality control, assurances, and management	a. Discuss technology assessment and the requirements for acceptance testing b. Describe patient workflow development and refinement within a multidisciplinary team environment c. Ensure quality control, assurance, and optimisation of devices and processes d. Ensure safe and appropriate audits of radiation dose, practice safety, and image quality
9. Apply radiation safety and protection principles and risk management	a. Comply with and advise on radiation safety and protection in accordance with relevant local legislation and safety guidelines. b. Discuss and practice radiation protection methods c. Comply with appropriate patient identification procedures and ensure the intended examination/ treatment is correctly provided d. Identify non-optimal radiation practices and propose remediation strategies and initiatives e. Practice appropriate radiation safety performance management and monitoring f. Apply knowledge and appropriately advise on radiation safety risk and precautions to patients, healthcare professionals, and the general public g. Participate in reporting of errors, near misses and adverse outcomes including the contributing factors that have impacted the event and the associated consequence to the environment, patients, and staff

	h. Facilitate a safe environment for patients and staff while providing radiation procedures i. Ensure that protocols and records of routine equipment checks are performed and report on non-conformance of any faulty equipment j. Ensure appropriate radiation shielding k. Discuss requirements for the safe transport of sealed and unsealed sources of ionising radioactive sources.

Domain 1B Radiation Oncology Medical Physicist

Definition

Medical physicists in radiation oncology are members of the multi-disciplinary clinical teams responsible for radiation therapy treatment of patients. Their role is to provide critical scientific input on the physical processes and technology that underpin the whole radiation therapy pathway.

Radiation oncology medical physicists perform and supervise calibration, dosimetry, and quality assurance, including the acceptance, commissioning, and ongoing quality assurance of radiation oncology equipment. They provide the expertise required for radiation safety related to radiation oncology (including imaging and therapy), as well as identifying risks to the patients, staff, public and the environment.

The medical physicists in radiation oncology collaboratively design and develop the framework of radiation dosimetry, treatment planning, and quality assurance of individual patient's treatments, of the radiation therapy equipment, of the radiation therapy sources, of the software used to support radiation therapy services and other aspects of the treatment process including the radiation safety of the patient, staff and public.

Medical physicists in radiation oncology also provide expert advice on the procurement, development, implementation and improvement of treatment techniques, equipment, and processes and the integration with clinical systems. This includes having a leading role in the strategic planning, technical specification, technical evaluation, commissioning, safe utilisation, and optimisation of advances of radiation therapy technologies and techniques.

Medical physicists in radiation oncology provide expert input and can directly participate in the treatment planning and delivery for individual patients. They participate in research and development along with teaching and training of medical and clinical staff. In summary, radiation oncology medical physicists play a key role in assuring the delivery of safe, quality, state-of-the-art radiation therapy.

Domain 1B Table of Key Capabilities for Radiation Oncology Medical Physicists

Key Capabilities What a Radiation Oncology Medical Physicist must be able to do	Enabling Components Evidence of this capability for registration as a Radiation Oncology Medical Physicist
1. Understand the foundations of Radiation Oncology	a. Explain the foundations of radiation oncology including: • The basics of cancer, its diagnosis and treatment • The aims and effects of radiation therapy in the management of cancer • Connect the foundations of medical physics to a radiation oncology setting including: • Radiation oncology medical physics as defined by the ACPSEM • Medical physics ethical and legal responsibilities • The responsibility associated with working in a clinical setting • The importance of advocating for patient and staff safety and in wider capacity educate, teach, and communicate radiation safety • The importance of applying professionalism in the workplace • Lines of communication in a department • The organisational structure within the department with respect to other professionals. • Operating alongside peers and patients
2. Understand and apply radiation safety and protection as it relates to radiation oncology	a. Understand retreatment and risk of secondary cancers b. Determine shielding requirements for radiation oncology facilities c. Perform radiation dose and risk assessments and or verifications for research involving radiation exposure above the normal clinical management of participants due to external beam radiotherapy or brachytherapy d. Understand acute events including avoidance, investigation into assessments, and reporting
3. Deliver the appropriate prescribed dosage of radiation (Dosimetry)	a. Provide appropriate dosimetry services including: • Correct measurement of high energy photon, electron, sealed radiation sources and particle radiation beams • Appropriate selection of radiation detection equipment for high dose radiation • Commissioning and quality assurance of detectors • Working directly with patients and radiation therapists to perform in vivo patient dose measurements and make recommendations for clinical decisions
4. Understand and manage equipment performance testing	a. Understand operation principles of radiation treatment units including linear accelerators, brachytherapy after-loaders, Gamma Knife, superficial, orthovoltage, and proton units b. Understand operation principles of imaging tools used for patient simulation, including but not limited to CT, Simulators, MRI, and ultrasound c. Perform and evaluate measurements used in acceptance testing, commissioning and quality assurance of radiation treatment and simulation units d. Recommend and perform tests after treatment or simulation unit repair or maintenance

5. Ensure optimised therapy outcomes through clinically applied patient positioning strategies	a. Evaluate the differences between systematic vs. random errors for patient positioning and their relative effect on treatment delivery accuracy b. Recognise and connect measurement deviations for quality assurance tests with the tolerances used for patient position and monitoring systems c. Recognise and connect Image Guided Radiation Therapy (IGRT) and motion management strategies to the determination of clinical margins d. Understand acceptance, commissioning, and clinical implementation of patient positioning, IGRT and motion management devices e. Understand, plan, and perform appropriate quality assurance tests for patient positioning, IGRT and monitoring systems both routinely and after fault repair
6. Management of treatment-planning for optimised patient outcomes	a. Perform management of treatment planning software, including acceptance, commissioning, and quality assurance. b. Create/measure radiation data for treatment planning systems c. Apply and calculate radiobiological data for patient treatment planning d. Discuss radiobiological implications of dose discrepancies and their impact on a patient e. Apply appropriate dose calculation algorithms for patient treatment planning f. Ensure quality assurance is performed on patient treatment plans
7. Participate in service development	a. Participate in implementation of new, specialist, or novel treatment techniques in the department
8.Understand and Optimise imaging for radiation oncology	a. Provide advice on the use of imaging in treatment planning and delivery, including segmentation, registration, and deformation. Provide quality assurance for registration and deformation b. Optimally use medical imaging for radiation oncology planning and treatment delivery including surface guidance, motion management, magnetic resonance imaging (MRI), *computerized tomography (CT),* radiography, nuclear medicine imaging, and ultrasound
9. Optimise and assess information and Communication Technology for clinical use in radiation oncology	a. Provide advice on installation, acceptance testing, commissioning, and ongoing use of software, hardware, and computer systems a. b. Compare and contrast the quality, regulatory and ethical issues of data utilisation, with the advantages of automation and software development processes.
10. Understand foundation knowledge of Brachytherapy	a. Recognize radioactive sources in the department b. Understand radiation safety State/Federal regulations for brachytherapy c. Understand and apply emergency procedures d. Understand acceptance, commissioning and ongoing testing QA and patient plan checks

Domain 1C Radiology Medical Physicist

Definition

Radiology medical physicists are essential members of the radiology and multi-disciplinary clinical teams responsible for medical imaging and interventional procedures. Their role is to provide critical scientific input on the physical processes and technology that underpin the whole radiological imaging pathway.

Radiology medical physicists play a key role in the ongoing optimisation of image quality and radiation safety of the patient, staff, and general public, including radiology specific dosimetry.

Radiology medical physicists perform and supervise calibration, dosimetry, and quality assurance, including the acceptance, commissioning, and ongoing quality assurance of diagnostic and interventional radiological equipment.

Radiology medical physicists provide expert advice on the procurement, development, implementation and improvement of imaging and treatment techniques, equipment, and processes and their integration with clinical systems.

Radiology medical physicists participate in research and development along with teaching and training of medical and clinical staff. In summary, radiology medical physicists play a key role in assuring the delivery of safe, high quality, state-of-the-art radiology imaging.

Domain 1C Table of Key Capabilities for Radiology Medical Physicists

Key Capabilities What a Radiology Medical Physicist must be able to do	Enabling Components Evidence of this capability for registration as a Radiology Medical Physicist
1. Understand the foundations of Radiology Medical Physics	a. Explain the foundations of radiology medical physics • Describe patient workflow for radiology imaging • Discuss diagnostic and interventional radiology procedures , including the broad merits of each technique • Discuss clinical activities commonly used in radiology b. Connect the foundations of medical physics to a radiology setting including: • Radiology medical physics as defined by the ACPSEM • Medical physics ethical and legal responsibilities • The responsibility associated with working in a clinical setting • The importance of advocating for patient and staff safety and in a wider capacity educate, teach, and communicate radiation safety • The importance of applying professionalism in the workplace • Lines of communication in a department • The organisational structure within the department with respect to other professionals.
2. Understand and apply the relevant anatomy/pathology, physiological basis and protocols for common diagnostic and interventional radiology procedures.	a. Understand the clinical purpose of studies, relevant anatomy/pathology, physiological processes, and factors that affect the quality of the study for common diagnostic and interventional radiology procedures. b. Apply knowledge of clinical studies and imaging physics to the identification and solution of clinical image quality issues and the optimisation of diagnostic and interventional radiology protocols and procedures. c. Identify artefacts in images, and recommend appropriate preventative and remedial action
3. Understand and apply radiation shielding techniques for diagnostic and interventional radiology facilities	a. Discuss the principles and legislative requirements of shielding design for diagnostic and interventional radiology facilities b. Perform radiation shielding design processes for diagnostic and interventional radiology facilities
4. Understand and apply principles of patient dosimetry and detriment in radiological imaging practice	a. Discuss the main dosimetric quantities relevant to diagnostic and interventional radiology b. Explain the operation of dosimetric measurement devices used in radiological imaging c. Discuss the concepts associated with appropriate patient dose and risk estimation d. Define and perform measurement of dosimetric quantities in diagnostic radiology e. Calculate organ, effective and fetal dose in diagnostic radiology and understand associated limitations and uncertainties f. Calculate peak skin dose in interventional radiology g. State typical dose values for common radiological imaging applications.

5.Calculate and communicate radiation risks	a. Perform radiation risk assessments for diagnostic and interventional radiology, including fetal exposure b. Appropriately communicate radiation risks to patients, their families, staff, and the general public c. Perform risk assessments and verifications for research involving radiation exposure above the normal clinical management of participants due to radiology procedures and established diagnostic nuclear medicine and PET procedures.
6. Understand the design and operating principles of radiology imaging equipment and be part of the equipment procurement and management process as it applies to clinical practice and monitor on-going performance	a. Understand the design, application and operating principles and optimisation of: • Radiographic equipment • CT equipment • Mammography equipment • Dental radiography equipment • Fluoroscopy and interventional equipment • Ultrasound equipment • MRI b. Perform and oversee acceptance testing, commissioning and on-going quality assurance monitoring on radiology imaging equipment, display monitors and ancillary equipment. c. Participate in equipment procurement and management processes of equipment.
7.Understand and apply radiation safety and protection as it relates to radiology	a. Identify and quantify sources of radiation exposure in radiology facilities b. Discuss the design and principles of operation of radiation detection devices and apply them in a radiology facility c. Identify and understand MRI and Ultrasound safety
8 Apply appropriate metrics to patient dose audits to drive improvements in clinical practice	a. Perform dose audits for radiographic examinations b. Analyse, interpret and present relevant data from clinical dose audit and compare to diagnostic reference levels (where established) within facilities that perform diagnostic and interventional procedures. c. Perform optimisation for diagnostic and interventional radiology procedures

Domain 1D Nuclear Medicine Medical Physicist

Definition

Nuclear Medicine Medical Physicists are essential members of the nuclear medicine and multidisciplinary medical teams responsible for therapy and diagnostic procedures related to nuclear medicine services. Their role is to provide critical scientific input on the physical processes and technology that underpin the whole nuclear medicine imaging and therapeutic pathway.

Nuclear medicine medical physicists perform and supervise calibration, dosimetry, and quality assurance, including the acceptance, commissioning, and ongoing quality assurance of nuclear medicine equipment. They provide the expertise required for radiation safety related to nuclear medicine (including imaging and therapy), as well as identifying risks to the patients, staff, public and the environment.

Nuclear medicine medical physicists provide expert advice on the procurement, development, implementation and improvement of imaging and treatment techniques, equipment, and processes and their integration with clinical systems.

Nuclear medicine medical physicists participate in research and development along with teaching and training of medical and clinical staff. In summary, nuclear medicine medical physicists play a key role in assuring the delivery of safe, high quality, state-of-the-art molecular imaging and therapy.

Domain 1D Table of Key Capabilities for Nuclear Medicine Medical Physicists

Key Capabilities What a Nuclear Medicine Medical Physicist must be able to do	Enabling Components Evidence of this capability for registration as a Nuclear Medicine Medical Physicist
1. Understand the foundations of Nuclear Medicine and PET	a. Explain the foundations of nuclear medicine and PET • Describe patient workflow for nuclear medicine and PET imaging and therapy • Discuss diagnostic imaging and therapeutic procedures in, nuclear medicine and PET, including the broad merits of each technique • Understand clinical activities commonly used in, nuclear medicine and PET imaging and therapy. b. Connect the foundations of medical physics to a nuclear medicine and PET setting including: • Nuclear medicine physics as defined by the ACPSEM • Medical physics ethical and legal responsibilities • The responsibility associated with working in a clinical setting • The importance of advocating for patient and staff safety and in a wider capacity educate, teach, and communicate radiation safety • The importance of applying professionalism in the workplace • Lines of communication in a department • The organisational structure within the department with respect to other professionals.
2 Understand and perform radiation shielding for nuclear medicine facilities	a. Understand the principles and requirements of shielding design for diagnostic imaging facilities. b. Perform radiation shielding design and verification for X-ray and nuclear medicine facilities, including for diagnostic and therapeutic applications.
3. Apply principles of patient dosimetry and detriment in nuclear medicine practice	a. Discuss the main dosimetric quantities relevant to nuclear medicine, including diagnostic and therapeutic applications. b. Explain the operation of dosimetric measurement devices used in nuclear medicine. c. Detail the concepts associated with appropriate patient dose and risk estimation. d. Calculate organ, effective and fetal dose in nuclear medicine and PET and be aware of associated limitations and uncertainties. e. State typical dose values for common nuclear medicine and PET applications. f. For radionuclide therapies: understand the radiation dose required to achieve a therapeutic effect, while sparing critical organs.
4.Calculate and communicate radiation risks	a. Perform radiation risk assessments for diagnostic and therapeutic nuclear medicine and PET procedures, CT, and basic radiology procedures, including fetal exposure. b. Appropriately communicate radiation risks to patients, their families, staff, and the general public c. Perform risk assessments and verifications for research involving radiation exposure above the normal clinical management of participants due to radiology procedures and established diagnostic nuclear medicine and PET procedures.

5. Understand and apply design and operating principles of nuclear medicine equipment as it applies to clinical practice and monitor on-going performance	a. Discuss the design, application, and operating principles of: • Dose calibrators • Gamma cameras • PET scanners • CT for Hybrid Imaging • Radiation monitors and survey meters • Gamma counters b. Perform acceptance testing, commissioning, and on-going quality assurance monitoring on nuclear medicine equipment.
6.Understand and apply the physiological basis and protocols for common diagnostic and therapeutic Nuclear Medicine procedures	a. Understand the clinical purpose of studies, relevant physiological processes and imaging factors, appearance of normal and abnormal studies and factors that affect the quality of the study for common diagnostic and therapeutic nuclear medicine procedures b. Apply knowledge of clinical studies and imaging physics to the identification of and solution for clinical image quality issues, the optimisation of imaging protocols and advice on development of new nuclear medicine procedures c. Identify artefacts in nuclear medicine images and recommend appropriate preventative and remedial actions.
7. Apply appropriate metrics to patient dose audits to drive improvements in clinical practice	a. Perform dose audits for nuclear medicine and PET examinations. b. Analyse, interpret and present relevant data from clinical dose audit and compare to diagnostic reference levels (where established) within nuclear medicine and PET facilities d. Perform optimisation for diagnostic nuclear medicine and PET procedures.
8. Understand and apply basic principles, legislative requirements, and clinical applications of radionuclide therapies	a. Understand the basic principles, legislative requirements, and clinical applications of common nuclear medicine therapies b. Understand the principles of nuclear medicine theranostics and examples of contemporary theragnostic treatments c. Manage patients undergoing nuclear medicine therapies appropriately from a radiation safety perspective, both pre- and post- therapy administration, to ensure compliance with legislative requirements and to ensure the safety of patients, their families, healthcare workers and the general public.
9.Understand and apply radiation safety and protection as it relates to nuclear medicine and PET	a. Identify and quantify sources of radiation exposure in nuclear medicine and PET facilities b. Discuss the design and principles of operation of radiation detection devices and apply them in a nuclear medicine facility c. Discuss and perform safe handling of sealed and unsealed sources d. Apply design principals and legislative requirements for areas used for unsealed sources e. Manage radioactive waste associated with the sources used in a nuclear medicine department f. Provide consultation about the impact of the radioactive waste release on the environment.

Domain 2: Communicator and Collaborator

This domain covers medical physicists' responsibilities to communicate clearly, effectively, and appropriately with patients/clients and their families or carers. It also addresses their responsibility to work effectively with other health practitioners to provide safe, high quality, evidence-informed patient/client-centred care.

Key Capabilities What all Medical Physicists must be able to do	**Enabling Components** Evidence of this capability for Registration as a Medical Physicist (General and Sub-Specialty areas)
1. Communicate clearly, sensitively, and effectively with the patient, and their family/carers	In the case of face-to-face patient interaction: a. Establish professional relationships and boundaries with patients and their families b. Establish rapport with the patient to understand their issues and perspectives and how their individual needs may impact on proposed treatment plans and examinations c. Communicate effectively with patients, and their families to collect and convey information about proposed and available examinations/treatment d. Understand and identify communication barriers specific to patients needs and implement strategies to overcome these, including adjusting in communication style to suit the cultural and/or social needs of people from a variety of diverse backgrounds (i.e., Aboriginal and Torres Strait Islander Peoples) and or consulting third parties to facilitate effective and culturally safe communication when needed e. Understand and obtain informed consent, explaining the purpose, risk, and benefit of proposed imaging/examinations/treatments f. Understand confidentiality, privacy and dignity and maintain these values in all aspects of patient care, and treatment planning g. Convey knowledge and procedural information in ways that create trust, confidence, and respect.
2. Display professionalism when developing professional relationships that facilitate gathering and sharing of essential information, to provide effective health care	In the case of face-to-face patient interaction: a. Establish and maintain professional relationships with patients, their families and their support systems b. Document, synthesise and share accurate and relevant written information to enhance clinical decision-making and patient safety c. Ensure patient confidentiality, privacy and informed consent is maintained for patients and their support people.
3. Collaborate professionally with health practitioners	a. Establish and maintain effective and respectful working relationships with health practitioners b. Work with health professionals to promote understanding, manage differences and resolve conflicts. c. Understand, acknowledge, and respect the roles and responsibilities of healthcare team members and other service providers, and work effectively and collaboratively with them d. Work with and present information to multi-disciplinary teams that optimises clinical decision making, patient safety and patient treatment. e. Follow current protocols and procedures to provide relevant and timely verbal and written communication f. Make recommendations, where appropriate, to members of the healthcare team about the suitability and application of proposed examinations and treatment plans

4.Collaborate with healthcare professionals to provide safe, high-quality patient centred care	a. Work in collaboration with all members of the patient care team to ensure the best possible treatment is provided to the patient b. Work with fellow physicists in the provision of a physics service c. Work in collaboration with healthcare professionals to promote clinical and scientific understanding, manage differences, and resolve conflict d. Ensure handover of care to healthcare professionals is appropriate and effective to ensure that continuity of safe patient care is facilitated
5. Perform accurate and relevant documentation of patient treatment and care plans	a. Understand and ensure that privacy and confidentiality legislation is upheld and maintained within all aspects of patient care and documentation b. Document, synthesise and share accurate and relevant written information to enhance collaborative clinical decision-making and patient safety

Domain 3: Leader and Health Advocate

This domain covers medical physicists' responsibilities and commitment to the health and wellbeing of individual patients and to the community through leadership and advocacy in the Australian healthcare system. This includes high personal standards of behaviour, maintenance of personal health, and accountability to the profession and the public.

Medical Physicists engage with others to contribute to a vision of a high-quality healthcare system and take responsibility for the delivery of excellent patient care through their activities as scientists, administrators, scholars and/or teachers.

As health advocates, medical physicists contribute their expertise and influence as they work with communities or patient populations to improve health. Medical Physicists work with those they serve to determine and understand needs, speak on behalf of others when required, and support the mobilisation of resources to effect change.

Key Capabilities **What all Medical Physicists must be able to do**	**Enabling Components** **Evidence of this capability for Registration as a Medical Physicist (General and Sub-Specialty areas)**
1. Contribute to high-quality health care systems and take responsibility for the delivery of excellent patient care	a. Ensure effective and safe work practices and the development of relevant procedures and policies that contribute to the improvement of health care delivery in teams, organisations, and systems b. Contribute to and engage in the provision of high-quality health care resources and ensure optimal decisions and treatments are made within the framework of finite resources c. Demonstrate leadership in professional practice through engaging in activities that facilitate enhancement of services and outcomes.
2. Understand and comply with ethical and professional clinical practice, consistent with relevant legislation and regulatory requirements	a. Understand and comply with legal responsibilities b. Understand and comply with mandatory reporting guidelines and obligations c. Understand and comply with relevant hospital/workplace conduct of conduct, and professional behaviour policies d. Communicate appropriately with patients and their families to ensure that informed consent is maintained, and patients have a clear understanding of all required treatment plans and examinations e. Understand and comply with relevant local and federal codes of ethics and the basic principles appropriate to medical physics and its associated sub-specialities f. Recognise and respond appropriately to ethical issues encountered in practice g. Demonstrate the appropriate levels of autonomy and professional judgement in a variety of professional practice settings h. Respond appropriately to issues of misconduct that may arise that jeopardise personal and professional standards and participate in mandatory reporting of issues that impact on a practitioner's ability to perform to a high standard in the delivery of safe patient care i. Maintain appropriate personal standards and fitness to practice through personal, mental, and physical health maintenance.

3. Work with patients and their families to provide treatment and examination that is fostered in respect, dignity, and care for the individual and their specific needs	a. Understand and comply with socio-cultural factors that may influence patient/client attitudes and responses to medical treatment and services b. Demonstrate cultural competence and culturally safe care for all patients and their families c. Demonstrate and maintain appropriate professional behaviour in patient and collaborative interactions with colleagues and staff d. Identify and respect appropriate boundaries between patients and health professionals.
4. Contribute to improving health outcomes in patient populations	a. Understand and communicate the benefits to health practitioners/patients against the risks and costs involved with a proposed treatment/examination b. Demonstrate best practice expertise of the profession to influence quality outcomes for patient populations c. Understand the needs of, advocate for, and support the deployment of resources needed to effect positive change within a patient population d. Advocate for system level change for achieving better health outcomes through the promotion of health, health surveillance, identification of population/community needs and trends and the application of continuous quality improvement.
5. Demonstrate professional responsibility and accountability in practice	a. Ensure that appropriate professional decisions are made to improve the quality of care of patients b. Recognise and respond appropriately to unsafe and unprofessional practice, in accordance with local legislation and policy.
6. Understand and advocate for the needs of the patient, and their family/carers	a. Understand the individual needs of each patient and ensure these are reflected in the proposed treatment/examinations suggested b. Ensure patient centred care and advocacy for equitable access to effective care, examination and treatment that includes available, affordable, and appropriate options where possible c. Understand and comply with the rights and interests of patients and support them to self-advocate where appropriate d. Recognise and advocate for patients and their families when it may be appropriate to intervene on behalf of the patient e. Understand and advocate when an alternative treatment pathway may be more appropriate and make required recommendations to ensure that optimal outcomes are available to the patient.
7. Contribute to the continued development and progress of the medical physics profession	a. Participate and contribute to peer assessment, standard setting, and mentorship within the medical physics sector and in external collaboration with other medical professionals b. Contribute to supervision and peer review of students and colleagues and provide appropriate and constructive feedback on individual and collaborative performance. c. Where appropriate, share advancements, progress, and techniques with the medical physicist community.

Domain 4: Educator and Professional

This domain covers medical physicists' responsibilities to engage in evidence-informed practice and to critically monitor their actions through a range of reflective processes. It also addresses their responsibilities for identifying, planning, and implementing their ongoing professional learning needs.

Medical Physicists demonstrate lifelong commitment to excellence in practice through continuous learning and by teaching others, evaluating evidence, and contributing to scholarship. Medical Physicists are committed to the health and wellbeing of individual patients and society through ethical practice, high personal standards, behaviour, accountability to the profession and society, profession-led regulation, and maintenance of personal health.

Key Capabilities What all Medical Physicists must be able to do	**Enabling Components** Evidence of this capability for Registration as a Medical Physicist (General and Sub-Specialty areas)
1. Utilise critical thinking and reflective practice to resolve and overcome challenges	a. Understand research design, methodology, analysis, review, and publication steps in the research pathway b. Understand workplace challenges and identify the information that is needed to make effective and appropriate resolutions c. Identify, critically appraise, interpret, and apply best available research and evidence to inform clinical reasoning and professional decision-making d. Use evidence-based practice and research to provide optimal patient centred care e. Contribute to the review and improvement of existing protocols and methods, which challenge clinical deficiencies and integrates new and existing knowledge into practice f. Contribute to the continued development of knowledge through research and enquiry g. Identify and/or propose solutions for any challenges that arise.
2. Demonstrate a commitment to lifelong learning through continuous professional development and contribution to the teaching and evaluation of students, peers, and colleagues	a. Participate in professional development for both personal improvement and the betterment of the physics community b. Understand the importance of research and where appropriate actively participate in the advancement of knowledge c. Contribute to the education of students, registrars, the public and other health care professionals d. Integrate evidence-based practice, recognise knowledge gaps, critically evaluate research and data, and integrate evidence into clinical decision making.
3. Undertake continual professional learning and participate in opportunities to develop clinical knowledge	a. Understand and comply with legal and professional responsibilities to complete continued professional development b. Identify personal learning needs and reflect on clinical strengths and limitations to improve and adapt to professional practice c. Collaborate with peers to identify personal and collective learning needs to better provide optimal patient care.
4. Demonstrate ethical practice, high personal standards of behaviour, and accountability to the profession and society	a. Apply best practice principles and adhere to a high level of ethical standards, integrity, respect, and compassion b. Demonstrate high standards of inter-personal behaviour c. Demonstrate a commitment to the profession by adhering to standards and participating in profession-led regulation

	d. Demonstrate a commitment to personal health and well-being to foster optimal patient care.