Response template for providing feedback to public consultation – draft revised professional capabilities for medical radiation practice

Stakeholder details

Name:	1. Professor Marilyn Baird PhD 2. Mrs Imelda Williams 3. Dr Cynthia Cowling PhD 4. Ms Kristal Lee 5. Mr John McInerney 6. Ms Ruth Druva 7. Mr Richard McIntyre 8. Ms Ingrid Klobasa 9. Mr Scott Plowman 10. Associate Professor Sarah Lewis PhD 11. Professor Patrick Brennan PhD 12. Mr John Robinson 13. Dr Warren Reed PhD 14. Ms Amanda Punch 15. Ms Sheryl Foster 16. Associate Professor Jenny Sim PhD 17. Mr Chris Evans 18. Mr Hung Do 19. Mr Tony Mulcahy 20. Mr John Ryan 21. Mr Sasko Kadiev
Organisation Name:	1) Foundation Head Department Medical Imaging and Radiation Sciences Monash University February 1997 – June 2019 & Foundation Chair Accreditation Committee MRPBA February 2013 - June 2018 2) Coordinator Bachelor of Radiography and Medical Imaging (Hons) Department of Medical Imaging and Radiation Sciences, Monash University 3) Senior Lecturer and Special Projects Coordinator, Department of Medical Imaging and Radiation Sciences Monash University (4 – 6) Part - time lecturers, Department of Medical Imaging and Radiation Sciences, Monash University and part time radiographers. 7) Sessional Lecturer, Department of Medical Imaging and Radiation Sciences, Monash University and senior MR radiographer Monash Medical Centre

	8) Adjunct Senior Research Fellow, Medical Imaging and Radiation Sciences, Monash University. 9) Senior CT radiographer, I-Med Radiology Network, Victoria 10) Head of Discipline Medical Radiation Science The University of Sydney 11) Chair of Diagnostic Imaging The University of Sydney (12 – 14) Lecturers in Diagnostic Imaging The University of Sydney 15) Sessional lecturer The University of Sydney and employed as a senior research MR radiographer at Westmead Hospital 16) Programme Director, Medical Imaging/Department of Anatomy and Medical Imaging School of Medical Sciences/ Faculty of Medical and Health Sciences/ The University of Auckland/ New Zealand (Incoming Head of Department of Medical Imaging and Radiation Sciences, Monash University) 17) Chief Medical Imaging Technologist, Peter MacCallum Cancer Centre Victoria 18) Radiographer and Acting Clinical Educator, Peter MacCallum Cancer Centre 19) CT supervisor radiographer, Peter MacCallum Cancer Centre 20) Retired Chief Radiographer, Victoria 21) Chief Radiographer at the Children's Hospital Westmead, Chair of the MRS Ministry of Health Chief MRP Advisory Group

Your responses to the preliminary consultation questions

1. Does any content need to be added to any of the documents?
Yes. **Domain 1: Medical Radiation Practitioner** **Key Capability** **1 Apply knowledge of anatomy, physiology and pathology to practice** Enabling Components: Why is the capability repeated in a) "*apply knowledge of anatomy and physiology of the human body to practice"*? We suggest enabling component (a) should be replaced with *"apply knowledge of gross anatomy, surface anatomy and sectional anatomy of the body and knowledge of the biomechanical, bioelectrical, and biochemical functions of the healthy body to practice".* We also suggest that (c) should include the words highlighted *"Identify anatomical structures and physiological processes, injuries and diseases of the human body in planar and sectional medical images".* **2 Use clinical information management systems appropriately**. There should be an enabling component included relating to 'protecting patients' rights and privacy'. This should reflect the AHPRA 'Social Media' policies. **4. Confirm the procedure according to clinical indicators.** Correct terminology must be used: 'apply principles of justification'. In (a) the word "imaging" needs to be added to "drawing on knowledge of other treatment pathways". It is included in the other sections and unless it is put here as well the requirement makes no sense to diagnostic radiographers. **5 Assess the patient's/client's capacity to receive care** Enabling components: a, b and c require practitioners to identify psychological and medical conditions that might affect a patient's ability etc to undergo the examination/procedure as well as identify patient preparation requirements. However what does the Board expect practitioners to do once they have completed these tasks? Given the increasing level of violence exhibited by patients there appears to be a need to incorporate within these enabling components reference to the health service policies related to the protection of staff from aggressive behaviour by patients. *d. Select appropriate equipment and triage patients/clients according to their clinical presentation, national standards and other factors.* What are the national standards being referred to and what does the Board envisage as constituting "other factors"? *e. Identify contraindications and limitations of medical radiation services, determine appropriate adjustments to procedures, and communicate these to the patient/client.* Engagement with patients needs to be qualified. Referral to either radiologist, radiation oncologist or nuclear medicine physician may be necessary for high risk patients. What is the intention of the concluding statement? "***Selecting appropriate equipment and triaging patients/clients*** *must be undertaken with the application of the Principle of Justice to ensure the fairest distribution of care"?* Is to remind those responsible for the purchasing of equipment and the management

of patient appointments that their decisions need to reflect the Principle of Justice? If so what are the consequences for these practitioners if this doesn't happen? Are entry level practitioners in a position to enact these requirements? If the intention is to remind all practitioners that all patients should be treated fairly and equitably then why not re-phrase Capability 7 Deliver patient/client care? and remove the statement from its current place in the document. The principle of applying Justice (as in the Four Principle Approach) also relates to macro allocation of resources and this is not a reasonable capability of new practitioners or practitioners that do not have a say in the allocation of funding for equipment purchases or having reasonable access to a number of appropriate equipment choices.

6. Implement equipment and techniques for patient/client immobilisation and reproducibility of procedures and outcomes.

Notwithstanding the fact that overwhelmingly the expectations for this key capability only apply to radiation therapy (which raises the question as to why it appears in this section), enabling component (d) is a restrictive statement as it is inevitable that immobilisation may be required during the procedure. Therefore this should read, perform appropriate immobilisation of patients.

7 Deliver patient/client care. Consider changing to **7 *"Deliver fair and equitable patient care"***

With regard to the statement: *"Recognising and responding to a patient's/client's deteriorating condition must be consistent with the National consensus statement: essential elements for recognising and responding to clinical deterioration.*" This needs clarification because in its current form the consensus statement is quite clearly directed at physicians and nursing staff. There is also a need to include the requirement to document actions undertaken e.g. conveying significant findings.

(b) It is one thing to apply quality criteria to assure image quality (whatever this means) and another to evaluate medical images and identify any urgent and/or unexpected findings. Medical images is a very broad term is the Board expecting entry level practitioners to apply their interpretation skills across the full range of medical images?

In the statement: **Taking appropriate and timely action** (p11) the following directive is included:

"Medical radiation practitioners must ensure information is conveyed to, and understood by, the appropriate persons who may include the requesting practitioner or other practitioners, for the immediate and appropriate management of the patient/client. The patient/client and their family/carers should also be informed". The requirement to inform patients and family/carers represents a significant and profound change from previous practice. Is this legally permissible? There may be serious legal issues related to privacy to inform family or carers of information or management. This may contravene cultural safety and contradicts the MRPBA Code of Conduct. It may not be safe to convey such information within medical imaging or cancer care facilities. For life threatening or unconscious patients, this statement is not appropriate either. It is extremely difficult to ensure that information is "understood" by practitioners as this relies on the cognition of other parties who may not choose to accept such information or have difficulty understanding it.

8 Apply knowledge of safe and effective use of medicines to practice.

It is unclear if this includes the preparation, use and delivery by radiographers of oral and intravenous iodinated and non-iodinated radiographic contrast agents, as well as gadolinium-based contrast agents This seems to us to be a serious omission. A definition of medicines needs to be included.

Optional key capabilities and enabling components: Perform MRI and Perform Ultrasound Imaging

We understand in this age of hybrid imaging, modalities that were once in the realm of diagnostic radiology may now be situated within radiation oncology and nuclear medicine departments but not all of these departments. However, the implication of the draft statements prefacing Key capabilities 9 and 10, is that radiographers will never be in a position to operate PET-CT or PET-MRI. Surely with appropriate training diagnostic radiographers can be able to extend their practice into the delivery of these hybrid modalities? This

omission should be rectified. The words “optional key and enabling components” of MRI and Ultrasound do not make sense grammatically and are confusing. We do not agree that MRI should be excised from DR 1A and contend there is a very strong imaging link between DR, US and MRI.

Domain 4: Medical radiation practitioners (MRPs) need to go beyond what is suggested in

d. Recognise opportunities to contribute to the development of new knowledge through research and enquiry

We argue that if MRPs are to practice safely then they need to be involved in the research, not just recognise it. "The proposed wording for 1.b: should include the phrase “credible research evidence”.

We strongly recommend retaining elements c - f from *Domain 3: Evidence-based practice and professional learning* of the approved *Professional capabilities for medical radiation practice*. This also applies to the statement about ‘Reflective practice’ from the approved *Professional capabilities for medical radiation practice*

https://www.medicalradiationpracticeboard.gov.au/Registration/Professional-Capabilities.aspx

Domain 5: **Radiation Safety and risk manager**

The Board may wish to review this section in the light of the fact that according to the APRANSA Code of Practice. Radiation Protection in the Medical Applications of Ionizing Radiation No 14 in Section 1.2 (d) there are definitions of roles and responsibilities of Responsible Person, Radiation Medical Practitioner, and Operator. What is being proposed runs counter to these ARPANSA groupings and covers the Responsible Person and Radiation Medical Practitioner neither of which is widely accepted to be a diagnostic radiographer. The ARPANSA is a regulatory document and there should be harmony in the requirements of ARPANSA and the MRPBA.

4: Maintain safety of the workplace and associated environments.

The descriptor from the approved *Professional capabilities for medical radiation practice* is more appropriate: include a: about legal responsibilities, etc; Include ‘apply radiation safety guidelines and attach documents from ARPANZA and ICRP. Should include e.g. DRLs.

We believe that consistent language use is essential throughout the document e.g. "Review the patient’s/client’s clinical history, referral and current medical information to confirm the requested or prescribed procedure is appropriate" elsewhere it is "requested examination/treatment."

The inclusion of ultrasound needs clarity: It is stated in the draft document that "It is important to note that sonographers are not regulated under the National Law, and the medical radiation practice capabilities do not establish frameworks or capabilities that seek to enforce any regulation of sonographers". If Ultrasound practice is now to be included in the *Professional capabilities for medical radiation practice* it behoves the MRPBA to state that sonographers need to have an approved program of study.

2. Does any content need to be amended or removed from any of the documents?

- EMR is included twice "**Clinical information management systems** may include, but are not limited to, picture and archiving communication system (PACS), radiation oncology information systems, radiology information system (RIS), electronic medical records, risk management systems, radiation dose tracking systems, radiation oncology information systems (ROIS), or electronic medical records (EMR). (p8)
- It is our opinion that Key Capability 3 of Domain 1 Medical Radiation Practitioner “***Understand the different methods of imaging and treatment to determine the most appropriate option”.*** should be removed from Domain 1 especially given the title of the capability is repeated as an enabling component. There is no argument each of the divisions of practice i.e. diagnostic radiography, nuclear medicine technology and radiation therapy should have a very good idea about what their colleagues are doing however there are other ways of achieving this aim. As it stands this key capability appears

to be requiring medical imaging/ radiography programs to include substantial elements of radiation therapy and nuclear medicine in the curriculum. Why does the Board require radiography students to learn about CT and MRI based simulation? As per Enabling Component *(d) "understand the use of CT, MRI and PET datasets in radiation therapy simulation".* Which practitioner is expected to *(e) Operate equipment and apply knowledge of laboratory procedures to practice when necessary*? A definition of Laboratory equipment should at least be supplied otherwise this component makes no sense.

- Remove from Domain 1 Medical Radiation Practitioner the following: Key Capability 6. Implement equipment and techniques for patient/client immobilisation and reproducibility of procedures and outcomes. It resides primarily within the remit for radiation therapists.
- Replace the **Enabling Components for 9 Perform Magnetic Resonance Imaging (MRI)** as follows
  a) Apply knowledge of the physical principles that contribute towards the generation of the MRI field to design and maintain a safe and functional site for patients/clients and staff.
  b) Apply knowledge of the physical principles underpinning image acquisition in order to determine safety and subsequently select safe parameters used to scan patients with a variety of pathologies and a variety of MRI conditional implants.
  c) Select and adjust appropriate parameters that will result in the most advantageous combination of signal-to-noise ratio, contrast-to-noise ratio, resolution and scan time.
  d) Design protocols based on knowledge of the advantages and limitations of sequence selection in all clinically indicated pathologies that may benefit from this modality.
  e) Select and utilise additional techniques and equipment such as respiratory and cardiac gating that will aid image acquisition.
  f) In conjunction with radiologists, apply knowledge of clinical indications and radiographic findings that may or may not benefit from administration of contrast media and evaluate risk factors that may preclude contrast administration.
  g) Recognise normal from abnormal anatomy and pathology as viewed in the different weightings and sequences in order to determine the most appropriate action whilst imaging.
  h) Effectively select and perform post processing procedures in order to maximise the quality of information acquired.

The entire content of Domain 1A: Diagnostic Radiographer needs to be reconceptualised as follows

Domain 1A: Diagnostic radiographer

This domain covers the additional knowledge, skills and attributes a diagnostic radiographer requires to practise independently. Diagnostic radiographers are responsible for the outcome of the diagnostic imaging examination, for patient care before, during and after the examination, and for the timely authorised distribution of medical images to allow for consultation with other health practitioners. Diagnostic radiographers produce high quality diagnostic medical images and perform diagnostic procedures using ionising and non-ionising radiation, often in a team setting of health practitioners.

Key capabilities – *What registered medical radiation practitioners must be able to do*	**Enabling components –** *Evidence of this capability for general registration as a medical radiation practitioner*
1. Perform projection diagnostic radiography	Exercise clinical judgment: a. Review the imaging request, justify selection of imaging projections in light of the clinical indications. b. Accurately position the patient's body area according to the clinical presentation and modify when appropriate. c. Apply exposure factors relative to the patient's presentation, apply anatomical and directive markers and collimation.

	d. Determine whether repeat or additional projections are required in light of the clinical indications, and if required, understand how to manipulate the beam and patient to improve diagnostic quality. e. Critically evaluate images against radiographic criteria, including exposure index assessment and determine the appropriateness of the examination prior to sign off and submission to the RIS/PACS. **Projection diagnostic radiography** includes radiography of the appendicular and axial skeleton and associated soft tissues; chest and abdomen performed on patients from across the life span using fixed radiographic imaging equipment. It may also include DXA, mammography, OPG and dental imaging.
2. Perform projection diagnostic mobile imaging in a range of settings	Exercise clinical judgment: a. Communicate effectively with the interprofessional team, review the request, previous images, the level of urgency and capacity of the patient to cooperate with instructions. Assess the level of safety for other persons nearby to radiation exposure. b. Apply a collaborative approach to patient positioning for the best diagnostic outcome, determine exposure factors and apply appropriate collimation, anatomical and directive markers. c. Comply with sterility, cleanliness and other protocols when undertaking examinations in restricted areas such as operating theatres, resuscitation bays and intensive care environments d. Remove unnecessary staff from the scatter radiation zone, or ensure appropriate personal protection gowns are worn by those inside the zone. e. Determine whether repeat projections are required in light of the clinical indications, and if required, understand how to manipulate beam and patient to improve diagnostic quality. f. Critically evaluate resultant images against radiographic criteria including exposure index assessment and communicate any urgent findings to the interprofessional team prior to sign off and submission to the RIS/PACS. **Range of settings** may include but not limited to an emergency department, hospital wards, operating suite, mobile van or other facility where a mobile x-ray unit may be used.
3. Perform diagnostic computed tomography (CT) imaging.	Exercise clinical judgment: a. Operate the CT scanner safely and competently. b. Evaluate the clinical request form to determine if the clinical question can be answered on CT and when required, seek confirmation of justification from the radiologist and/or referring clinician. c. Prepare the patient/client for the examination, including positioning the patient/client for the best diagnostic outcome. Determine the applicability of contrast medias, including oral, intravenous, retrograde and administer these contrast medias where applicable. d. Justify, perform and evaluate contrast and non-contrast CT examinations of the body for image quality. Problem solve when

	appropriate, modify them to consider patient/client presentation and clinical indications. e. Apply and manipulate CT imaging parameters in accordance to the patient/client presentation in order to answer the clinical question(s) and in accordance with the complexity of imaging including interventional CT examinations such as biopsies and embolizations. f. Adjust the relative dose levels based on the range of patient/client presentations as per the ALARA principle. g. Apply knowledge of sectional anatomy and pathology to the evaluation and critique of the images for image quality and to answer the clinical question(s). h. Inform appropriate health practitioner of any findings that require urgent medical intervention. i. Collaborate in the design and evaluation of CT protocols. **CT imaging parameters** must include but not limited to selection of tube current, tube voltage, tube rotation time, table pitch, number of slices, single and dual energy mode, kernel and algorithm, windowing level and centering, and axial or spiral acquisition mode. **Post-processing techniques** include but not limited to multi-planar reformats, volume and shaded surface reformats, vessel tracing, orthopaedic measurements, surgical planning and organ segmentation, dual energy (spectral) imaging overlays, perfusion mapping and iodinated contrast enhancement. **Diagnostic CT** also includes Cone beam CT, CT Fluoroscopy, EOS imaging and mobile intraoperative CT imaging.
4. Perform diagnostic medical imaging examinations	a. Apply knowledge of digital image processing and beam geometry, including fixed and mobile digital fluoroscopy systems to a range of contrast and non-contrast medical imaging examinations. b. Use appropriate beam limiting devices, radiation dose reduction options and radiographic protection approaches during diagnostic imaging examinations. c. Apply knowledge of the physics of ultrasound image production and appropriate scanning methods to a variety of clinically relevant examinations. d. Apply knowledge of MR physics to maintain a safe environment and implement pre-examination screening as a member of the MR team. e. Apply knowledge of technical parameters to a variety of standardised MR examinations as a member of the MR team. f. Apply knowledge of sectional anatomy and pathology to the evaluation of MR images. g. Apply knowledge of the neuro, cardiovascular, gastrointestinal tract, hepatobiliary system and genito-urinary tract to the evaluation of images obtained during examinations such as digital fluoroscopy (mobile and fixed), and DSA including cardiac catheterisation.

	h. Apply knowledge of medical imaging contrast agents including safety issues, catheters, guidewires, aseptic techniques, sterilization techniques, interventional and contrast delivery devices to a range of radiological interventional procedures. **Diagnostic medical imaging examinations** may include but not limited to: DSA; Fluoroscopic examinations, MRI brain and MSK, Ultrasound examinations for screening purposes or location of lines and catheters, small parts or MSK indications **Radiological interventional procedures** may include but not limited to: interventional procedures performed in the fluoroscopy, angiography, ultrasonography, CT, MRI, mammography suites and cardiac catheterisation laboratories.
5. Perform as an effective medical imaging advocate	a. Act as patient advocate by ensuring all imaging examinations are justified b. Conduct all imaging procedures under the ALARA principle c. Perform preliminary image evaluation to answer the clinical question/and or management plan d. Conduct, if required, image processing and image analysis as part of the imaging diagnostic workup e. Communicate preliminary image findings in a timely manner when appropriate, to referring clinicians/radiologists and or any other relevant healthcare practitioners f. Educate and inform healthcare practitioners and public on dosimetry and radiation safety g. Alert the referring team of any potential error or medically significant findings

3. Do the key capabilities sufficiently describe the threshold level of professional capability required to safely and competently practise as a medical radiation practitioner in a range of contexts and situations?

Not in relation to diagnostic radiography. The draft key capabilities and enabling components ascribed to **Domain 1A: Diagnostic Radiography** conflict with the view held by the Royal Australian and New Zealand College of Radiologists (RANZCR) that *"Each component of a diagnostic imaging service shall be carried out under the professional supervision of a radiologist and if the radiologist is not present then all work must be informed by a written protocol"* (cf RANZCR Standards of Practice for Diagnostic and Interventional Radiology update 2017)

However, the draft threshold level of professional capabilities required to practice as a diagnostic radiographer belie the complexity of the work and the very high level of academic and practical achievements entry level radiographers achieve. From our perspective it appears the Board has crafted a set of capabilities that do not reinforce "the additional knowledge, skills and attributes a diagnostic radiographer requires to practise independently" as stated in the preamble to Domain 1a. The document lacks balance in that it identifies 5 Key Capabilities that entry level nuclear medicine technologists and radiation therapists are expected to demonstrate yet only 2 Key Capabilities to describe their expectations for entry level diagnostic radiographers (DRs).

The area of general radiography, fluoroscopy, mobile imaging, angiography and breast screening have all been "lumped" together in one overly-large and vague capability. A number of terms are unclear, such as equipment geometry (which could also vary greatly from one piece of equipment to the next) and application of this overly large capability is very problematic for educators and clinical partners to assess. For example, there are hundreds of DR imaging/examination items in the MBS, yet these appear to have been reduced to

one capability in this new draft. We believe our revised capabilities and enabling components more accurately reflect the nature of diagnostic radiography.

There is no capability related to image evaluation, that is the ability to determine image quality or interpretation of medically urgent findings. This capability has instead been reduced to "Take appropriate and timely action, to ensure the immediate management of the patient/client when any urgent and/or unexpected findings are identified". We do not believe this sets a threshold for knowledgeable and safe practice by diagnostic radiographers in relation to radiographic imaging, given that many DRs operate at the frontline of health and diagnosis.

The range of CT professional capabilities of DR is not reflective of the scope of practice. We believe that DRs undertake a very wide scope of practice in relation to CT imaging including very detailed vascular imaging and interventional CT imaging and the current description as applied to all divisions of MRP – DR, NM and RT, is not accurate or helpful. For example, although it may be asserted by some universities that all MRS students undertake the same CT imaging education there is significant differences in the students' clinical experiences and rotations through CT as clearly agreed upon by the NSW Chief MRS Advisory Group to the NSW Ministry of Health. Hence, we believe these differences in experiential learning indicate that there are different professional capabilities between the divisions and this should be clearer. There are also considerable differences in the level of CT understanding within the National Examination for overseas qualified practitioners wishing to practice in Australia. These key differences are in interpretation of CT imaging, modification of key CT parameters related to image quality and dose. As we have been involved in the development of the examination, we are very aware that the level of complexity of CT imaging questions is not equal and therefore the capabilities cannot also be equal across the 3 domains.

In conclusion, diagnostic radiography is the lynchpin of modern medical imaging services. It is unacceptable that the MRPBA diminish in such an overt way the role and function of their key registrant group. We strongly urge the Board to amend the existing draft capabilities with our evidence informed threshold level of professional capabilities for diagnostic radiographers which reflect the reality of modern diagnostic radiographic practice.

4. Do the enabling components sufficiently describe the essential and measurable characteristics of threshold professional capability that are necessary for safe and competent practice?

1. Not in relation to the use of CT by Radiation Therapists and Nuclear Medicine Technologists.

Whilst access to hybrid imaging and treatment is increasing in the nuclear medicine and radiation therapy workplace, what isn't an everyday reality is the requirement that CT in these work settings equate to the quality of the images produced for diagnosis in a radiology work setting. Indeed many would argue that the patient's best interests are not served if CT is used in the radiation therapy setting to produce diagnostic quality CT images. The Board is to be congratulated upon the future looking perspective it has taken to CT however a distinction needs to be made between the use of CT in a diagnostic radiology setting and that used in other settings. Approximately 90% of CT examinations that can be billed under the MBS are performed in the Diagnostic radiology setting, with NM hybrid imaging comprising of less than 5% of all diagnostic imaging. Indeed, although PET-CT is slowly growing, there is a large difference in the number of CT machines that are operated by DRs in a medical imaging setting, compared with PET-CT or standalone CT machines in a nuclear medicine setting. Furthermore, advanced hybrid imaging such as PET/MR is unlikely to be a mainstream imaging modality widely used in the next 10 years, with only a handful of machines currently in Australia and only 1-2 of these currently used for human imaging.

2. Not in relation to the optional key capabilities and enabling components related to the performance of MRI by nuclear medicine technologist or radiation therapists

The suggestion by the Board that all medical radiation practitioners have the capacity to perform diagnostic MRI is highly problematic. There are evidence - based reasons why MRI remains firmly under the control of

radiologists and why radiographers are the most appropriate medical radiation practitioners to perform the requisite examinations. An MRI suite is unlike any other physical environment in the healthcare setting in that MRI uses a very strong magnetic field that in itself carries a very high risk for injury or worse for professionals who are not sufficiently aware of the dangers. This potential risk of injury or death is subsequently intensified both for patients and other ancillary staff members in the setting of inexperienced practitioner staff members who have not been adequately trained in MRI safety. Major risks include projectile injuries due to translation, torque, interference of electrical equipment (both inside and outside of the patient) potentially resulting in burns as well as the generation of currents in nerves, soft tissues and vessels within the body. All persons entering the magnet room must complete a safety questionnaire and undergo a screening interview and the MRI practitioner is responsible for ensuring that this occurs as the last line of defence. As a result, unique guidelines must be devised and followed in order to maintain a safe work place for staff and patients. An example of these guidelines include mandatory training for staff who work in this area as well as designated locked zones preventing passage of hazardous goods such as wheel chairs, oxygen bottles, ferromagnetic keys and other smaller articles that may cause significant damage to equipment or people in the vicinity. These barriers must also serve to prohibit entry to unscreened staff and patients.

Awareness of side-effects such as heating from other necessary physical processes such as the change in magnetic field and use of radio-frequency (RF) pulses also have the potential to severely injure or kill any patient who may have implanted medical devices. As a result, it is crucial that all practitioners performing MRI examinations have a thorough understanding of these principles and the limitations that they may pose on examining this group of patients. As it is not considered best practice to deny a patient the benefit of this modality simply because they may have an implanted device, the trained MRI practitioner is responsible for collating information regarding the implant type and the particular safety conditions under which the device may be scanned (if not considered to be ‘MR-Unsafe’). This information is then presented to the Radiologist who is responsible for making the final decision based on the MRI practitioner’s investigation Further to this, it is crucial the practitioner have a thorough understanding of how to meet the scanning conditions for each particular device such that a diagnostic examination can be safely performed. This requires a deeper knowledge of MR physics and equipment as well as a practical application of these principles.

Actions that must be performed in the case of a medical and instrumental emergency must also be learnt and continually revised so as to be performed in a controlled and methodical manner with consideration to all applicable safety requirements. This includes immediate evacuation of patients should deleterious clinical signs present and must involve extensive knowledge of the magnetic field as well as the physics of the superconducting magnet and liquid helium baths that help generate it.

It is worth noting that, in recognition of their comprehensive knowledge base in this field, MRI practitioners comprise a significant part of the RANZCR MRI safety panel that addresses safety issues within this modality. Thorough knowledge and dedicated training built from a strong base is required to understand the above safety guidelines and assist with maintaining a safe MRI department.

A detailed knowledge of the physics behind pulse sequences is also required in order to understand and maximise the use of the different acquisitions. MRI practitioners must also have the knowledge required to construct and alter these sequences. This knowledge must extend to the use and implications of changing the many parameters that combine to form these sequences in order to maximise the signal-to-noise, the contrast-to-noise, the resolution and minimise the scan time of each sequence such that a diagnostic study is achieved for every patient, regardless of their clinical presentation.

MRI practitioners must also learn to master the use of additional instrumentation and techniques that are integral in certain examinations including those assisting with respiratory and cardiac gating as well as the importance of positioning and positioning aids required to maximise comfort and so limit movement throughout the scan, which can often take up to one hour or more. Extra important techniques that must be learnt and understood include the different physical principles behind the saturation of the fat signal and the advantages

and disadvantages of each. The use of contrast media in MRI is also a fundamental requirement of diagnostic radiographers as many contrast medias can react with each other or are compatible. These contrast agents are delivered by diagnostic radiographers.

A detailed knowledge of cross-sectional anatomy in all planes, weightings and presentations is crucial in order to maximise the effectiveness of this imaging modality. As an example, an understanding of the anatomy will ensure planes are aligned parallel or perpendicular to structures or specific features of structures and all required anatomy is contained within the field of view. A detailed understanding of the pathology is just as crucial in order to ensure all features are included and displayed in a way that will maximise the demonstration of relevant information. It is not just sufficient to understand the background and processes causing the pathology, but also understand the presentation and appearance of this pathology in cross sectional and different weighted images as well as the different pulse sequences that generate these images.

A detailed knowledge regarding the usage and possible immediate and long-term side-effects of available contrast agents is also necessary for radiographers in order to assess and implement their usage in the clinical environment. An experienced practitioner should have knowledge of alternative sequences or techniques to achieve a diagnostic examination in patients for whom it is considered unsafe to administer an MR contrast agent. We are well aware of the post processing tasks that must be used to better demonstrate the data acquired. Whilst many of these tasks are performed according to prepared instructions and guidelines, a large percentage are undertaken after thorough investigation of the images/data acquired and are subjective in nature. As a result, knowledge of primary and technical applications involved in these processes is directly proportional to the quality of information gained from the procedure. Because of the lack of ionising radiation and the multi-parametric information available, research benefits significantly from this modality. Like other medical imaging examinations (radiographic) however, the MR practitioner must have a thorough knowledge of all techniques possible and understand both the limitations and the implications of all tools available.

MRI is a modality in high demand, offering exquisite detail regarding so many different features and processes in the body both clinically and for research purposes. In order for every patient to have the highest quality diagnostic examination possible in a safe and secure environment.it is imperative that the practitioners supervising the MRI suite and operating the equipment have a thorough knowledge of the points outlined above, most especially MRI safety as well as MR physics and instrumentation. The depth of knowledge required must be built on a solid foundation, one that is offered to medical imaging students as part of a dedicated, diagnostic Medical Imaging undergraduate/ graduate entry course.

5. Is the language clear and appropriate? Are there any potential unintended consequences of the current wording?

We note the use of the term patient/client throughout the document. In reality there are only a few instances when someone presenting for a medical radiation examination/treatment may consider themselves a client e.g. a self-referral screening service. Whilst many will argue especially within psychology the use of the term client reminds those seeking health services they have a right to be involved in the overall decision-making, it is a moot point. The use of the term patient is more likely to remind health practitioners they are there to serve and care for those seeking their services often at times of great personal vulnerability. We are of the view the use of the term **patient** is sufficient and we fail to understand why the word client needs to be an option.

6. Are there jurisdiction-specific impacts for practitioners, or governments or other stakeholders that the National Board should be aware of, if these capabilities are adopted?

RANZCR and the universities offering stand alone programs in radiography and medical imaging (excluding nuclear medicine).

7. Are there implementation issues the National Board should be aware of?
There are considerable implementation issues for the accreditation of courses. It is currently clear that the same level of CT knowledge and assessment on clinical placement does not happen for NM and RT students. This information comes directly from clinical educator groups. The Board is implying that such changes can be easily translated to accreditation assessment and this is not the case as the curriculum in RT and NM currently does not include vital components in contrast media administration and on placement CT learning to the same extent as would be required for DR students. Experience from our group is that CT learning in NM and RT curricula is insufficient to meet proposed changes and is unlikely to be met to any degree that satisfied patient safety, especially for complex CT procedures including those with bolus tracking.
8. Do you have any other general feedback or comments on the proposed draft revised professional capabilities?
We believe the Board needs to reconceptualise the draft revised professional capabilities if it is to provide meaningful direction to both the profession and universities in respect to the role and function of the diagnostic radiographer who is at the end of the day the lynchpin of modern medical imaging.