Postgraduate Diploma in Health Sciences in Medical Imaging (MRI Pathway)

Introduction

The Magnetic Resonance Imaging (MRI) pathway of the Postgraduate Diploma in Health Sciences (Medical Imaging) provides an opportunity for Medical Imaging Technologists/radiographers to extend their professional knowledge enabling them to adapt to and contribute confidently within a rapidly changing health care environment.

Note: This pathway is intended for international students who want to study the theoretical aspects of MRI. As there is no clinical competency assessment included in this pathway, graduates from this programme will NOT be eligible for registration with the regulatory body, the New Zealand Medical Radiation Technologists Board (MRTB), in the MRI scope of practice.

Programme Overview

The specialisations in the Postgraduate Diploma in Health Sciences consist of 120 points of taught coursework (eight 15-point courses) and can be completed in between two and four years of part-time study. Students will be expected to spend approximately 150 hours of study for each 15-point course. All courses will be delivered fully online.

Each student is required to complete eight 15-point courses of which six are compulsory (90 points); 30 points (two courses) being common to all Medical Imaging specialisations and 60 points (four courses) specific to the MRI specialisation.

Students are also required to complete both an Approved Research Methods Course, of which a range is available dependent on experience and interest, and an elective course selected from the Master of Health Sciences Schedule (including all courses from the Medical Imaging programmes). For students on the MRI pathway, the course MEDIMAGE 721: MRI Safety is highly recommended as the elective choice (this course is delivered in semester one).

Schedule of courses:

Postgraduate Diploma in Health Sciences in Medical Imaging (MRI pathway)

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<td>Imaging Anatomy and Pathology</td>
<td>✔</td>
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<td>MEDIMAGE 702</td>
<td>Professional Issues in Medical Imaging</td>
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<tr>
<td>MEDIMAGE 714</td>
<td>Fundamentals of Clinical MRI*</td>
<td>✔</td>
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<td>MEDIMAGE 715</td>
<td>MRI Technology</td>
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<td>MEDIMAGE 721</td>
<td>MRI Safety (elective)</td>
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<td>CLINIMAG 710</td>
<td>MRI Clinical Applications</td>
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<td>CLINIMAG 711</td>
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<td>Approved Research Methods course</td>
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<td>Dependent on student choice</td>
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*As this course is a pre-requisite for all of the other MRI-specific courses, it is expected that students complete this in the first semester of their programme of study*
Course Outlines

MEDIMAGE 701: Imaging Anatomy and Pathology 15 Points

Students will develop an integrated understanding of anatomy and pathology as it applies to Medical Imaging in the clinical context. The course introduces the principles of medical science at whole body, organ, tissue, cellular and sub cellular levels and includes the fundamentals of anatomy, physiology and pathophysiology of the major systems of the human body in relation to specific regions and pathologies.

Objectives of the course

This course aims to enhance the student's clinical reasoning skills and to enable them to evaluate the use of a variety of imaging modalities in patient diagnosis and management. It will extend students’ overall professional competence through an academically applied level of understanding of clinical science. Anatomical knowledge of various systems and associated pathological processes will be developed, linked to their functional and clinical relevance.

Learning outcomes

1. Demonstrate a comprehensive understanding of normal anatomy and selected pathological processes by explaining the clinical course of a disease/injury using supporting images from a range of imaging modalities.
2. Evaluate the advantages and limitations of a range of imaging modalities when applied to the investigation of specific pathologies.
3. Critically examine strategies for the selection of appropriate imaging modalities as part of the diagnostic, management and/or treatment pathway.

MEDIMAGE 702: Professional Issues in Medical Imaging 15 Points

Students will investigate the concept of professional practice leading to an exploration of current professional issues relevant to Medical Imaging including role development and advanced practice. The course will provide students with the knowledge to interact with individuals from a variety of backgrounds both ethically and with respect for their beliefs and values. The course also addresses medico-legal issues, decision-making and effective communication within the clinical setting.

Objectives of the course

This course aims to provide students with the ability to respond to the wide variety of professional, ethical, medico-legal and clinical workplace issues generated in a rapidly changing environment. Students will develop an awareness of personal, professional and interpersonal expertise thereby enabling them to reflect on their own clinical practice related to these issues in the context of fitness to practise.

Learning outcomes

1. Critically evaluate the development and evolvement of Medical Imaging as a profession and its place within the healthcare system.
2. Examine how communication, interpersonal and inter-professional dynamics impact on your role as a Medical Imaging practitioner.
3. Reflect on the role of critical thinking and reflective practice in the context of your clinical practice.
4. Critically examine a broad range of ethical and medico-legal issues relevant to professional and cultural competence within Medical Imaging practice.
5. Analyse the processes of clinical decision making and professional judgement, including the concept of autonomous practice.
6. Compare and contrast Medical Imaging role development in New Zealand and the progression of advanced practice within Medical Imaging and other healthcare professions.
7. Define fitness to practise in Medical Imaging by critically reflecting on each of the above topics within your clinical practice.

**MEDIMAGE 714: Fundamentals of Clinical MRI**

Provides a fundamental understanding of MRI technology and applications and addresses scientific principles of the modality including resonance and relaxation, image contrast, spatial encoding and digital image formation. Students will examine components of the clinical environment including MRI equipment, contrast agents, bio-effects and safety. In addition, students will analyse standard imaging protocols of the lumbar spine, knee and brain and normal and abnormal MR imaging appearances of these areas.

**Objectives of the course**

This course aims to provide students with specialised theoretical knowledge and an understanding of the fundamental physical principles of MR technology. The student will develop the ability to apply this knowledge in the safe use of MRI equipment for clinical and/or research purposes. In particular, this course will investigate common pathologies and the use of standard protocols in relation to a selection of common MR imaging applications.

**Learning outcomes**

1. Demonstrate an understanding of theoretical concepts relating to MR technology.
2. Critically discuss specific issues relating to bio-effects and safety within the MR environment.
3. Differentiate and explain normal and altered MR imaging appearances of the lumbar spine, knee and brain.
4. Make informed clinical judgements with regard to the selection of standard imaging protocols and technical parameters in relation to the lumbar spine, knee and brain.
5. Apply an evidence-based approach to clinical decision-making and problem solving.

**MEDIMAGE 715: MRI Technology**

Provides an in-depth understanding of MRI technology and its applications and addresses scientific principles of the modality relating to standard clinical practice including pulse sequences, image quality and quality assurance, technical parameters and trade-offs, image optimisation, artefacts, parallel imaging, scanning at 3T, diffusion and MR angiography.

**Prerequisite:** MEDIMAGE 714

**Objectives of the course**

This course aims to extend students’ specialised theoretical knowledge and understanding of the underlying scientific principles of MR technology. The student will develop the ability to apply this knowledge to obtain images of optimal diagnostic quality.

**Learning outcomes**

1. Analyse the underlying physical principles of a range of MRI pulse sequences in order to manipulate factors appropriately and to demonstrate an understanding of their application to practice.
2. Analyse and integrate the principles and technology of MRI to enable image optimisation.
3. Critically evaluate the technical and diagnostic quality of a range of MR images.
4. Evaluate the importance of quality assurance and explain the associated impact on safety and image quality.
5. Critically discuss current developments in MR technology and assess the impact on clinical practice.
MEDIMAGE 721: MRI Safety (elective)  
15 Points
Extends students’ understanding of the underlying physical principles related to a range of MRI safety issues. The course will provide students with the opportunity to explore these safety issues in detail and to apply this knowledge in critically evaluating current policies and practices. New and emerging safety topics will also be examined.
Prerequisite: MEDIMAGE 714

Objectives of the course
This course aims to extend students’ theoretical knowledge underpinning MRI safety issues. Students will further develop their ability to contribute confidently to the clinical decision-making process when encountering safety issues in the MRI environment.

Learning outcomes
1. Apply a clinical decision-making framework to a range of clinical MRI safety scenarios.
2. Discuss the roles and responsibilities of various staff in relation to maintaining a safe MRI environment.
3. Critically evaluate MRI safety practices, justifying or suggesting modifications to these practices based on current literature.
4. Discuss emerging safety issues and assess their potential impact on current clinical practice.

CLINIMAG 710: MRI Clinical Applications  
15 Points
Addresses normal and abnormal imaging appearances, protocol selection and development, and applications associated with standard neurological, musculoskeletal and body MRI examinations.
Prerequisite: MEDIMAGE 714

Objectives of the course
This course aims to cultivate a critically questioning approach to MR imaging practice. An emphasis will be placed on integrating theory and clinical practice elements in order to facilitate clinical competence. The course will expect students to assimilate the underlying physical principles of MRI with relevant biological processes and imaging appearances.

Learning outcomes
1. Differentiate and explain normal and abnormal MR imaging appearances of the head, neck, spine, abdomen, pelvis and musculoskeletal system.
2. Make informed clinical judgements with regard to the selection of imaging protocols and technical parameters in relation to the head, neck, spine, abdomen, pelvis and musculoskeletal system.
3. Develop appropriate imaging protocols for specific pathologies of the head, neck, spine, abdomen, pelvis, and musculoskeletal system applications.
4. Critically evaluate a range of standard MRI techniques to investigate specific regions and pathologies.
5. Apply an evidence-based approach to clinical decision-making and problem solving.

CLINIMAG 711: MRI Specialised Clinical Applications  
15 Points
Addresses complex scientific principles of MRI relevant to a range of specialised applications. Students will examine advanced pulse sequences, and specialised procedures including breast MR, enterography, MR angiography functional MRI and cardiac MRI. Techniques such as perfusion, spectroscopy, diffusion tensor imaging (DTI) and tractography will be investigated in addition to new and evolving techniques.
Prerequisite: MEDIMAGE 714
Objectives of the course
This course aims to provide students with specialised theoretical knowledge and an understanding of the more complex scientific principles of MR technology. Students will continue to cultivate a critically questioning approach to MR imaging practice with an emphasis on integrating theory and clinical practice elements in order to facilitate clinical competence.

Learning outcomes
1. Analyse the underlying physical principles of a range of advanced techniques in order to manipulate factors appropriately and to demonstrate an understanding of their application to clinical practice and/or research.
2. Make informed clinical judgements on the selection of imaging protocols and technical parameters for a range of specialised MRI applications.
3. Critically evaluate a range of advanced MRI techniques to investigate specific anatomical regions, physiological processes and pathologies.
4. Critically discuss current developments in MRI applications and explore literature in relation to emerging initiatives.

Conclusion
Learning and teaching at the University of Auckland is informed by education theories and research-led. Students are encouraged to learn collaboratively, learning with and from their peers and the academic teaching team. The focus is not just on acquiring new knowledge. While the acquisition of new knowledge is seen as an essential part of postgraduate education, equally important is the development of clinical competence, critical thinking and reflective learning; essential attributes for modern healthcare practitioners.

Disclaimer: Although every reasonable effort is made to ensure accuracy, the information in this document is provided as a general guide only and is subject to alteration.