



# Integration of MRI into Radiation Therapy

Enhanced practice authorization program  
for Radiation Therapists

Updated December 2022

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## This guide is designed to provide radiation therapists with information about the Integration of MRI into Radiation Therapy enhanced practice authorization program approved by the Alberta College of Medical Diagnostic and Therapeutic Radiation therapists (ACMDTT).

The *Health Professions Act* (HPA) identifies the practice of radiation therapy to be uniquely distinct from the practice of magnetic resonance imaging technology. As such, radiation therapists registered on the radiation therapy register are not authorized to apply magnetic resonance imaging in conjunction with radiation therapy.

Under the provision of the HPA and s.19(1) of the *Medical Diagnostic and Therapeutic Radiation therapists Profession Regulation*, a regulated radiation therapist who has completed advanced training approved by ACMDTT Council may be authorized by the Registrar to apply magnetic resonance imaging specifically within the confines of a radiation therapy setting.

The objective of the College in authorizing a program in Integrated MR into Radiation Therapy is to prepare radiation therapists to apply magnetic resonance imaging (MRI) safely and competently within the confines of radiotherapy in an MR RT environment. The information contained in this guide describes the expectations and goals, both academically and experientially, that the radiation therapist must achieve to be successful in this program.

As this technology is deployed across Alberta, this program will be re-evaluated by 2025.

The ACMDTT Integrated MR in RT enhanced practice authorization program consists of both academic and clinical components. These components are outlined and further broken down in the next column.

A radiation therapist must have completed the courses of the academic component of the program prior to commencing the clinical component.

### **Maintenance of enhanced practice authorization**

Each year, during renewal, the radiation therapist with the Integration of MRI into Radiation Therapy enhanced practice authorization will be required to apply for renewal of this authorization. In addition to the online renewal of their practice permit, the radiation therapist will be required to submit a *Renewal of Additional and Enhanced Practice Authorization* form.

### **Program components**

Through this program to achieve enhanced practice authorization, the College is standardizing the additional education required for a radiation therapist to perform MR in radiation therapy safely and competently. In addition, due to differing demographics and experiences among the radiation therapist registrants, the following addresses the learning and experiences of both new graduates and practiced radiation therapists. As such, this modular approach to the program has been instituted.

It is the responsibility of the radiation therapist to set up a clinical practicum site prior to enrolling in the training program.

To successfully complete the program, the radiation therapist must complete the appropriate didactic and clinical requirements for the program.

## Program Requirements

All radiation therapists must apply to the College for enhanced practice authorization. In addition to providing a completed Application for Additional and Enhanced Practice authorization, please provide evidence of completion of the following:

### 1. Didactic Requirement

One of the following academic institutional programs is required:

<b>Academic Resource Options</b>	<b>Didactic Components</b>
Northern Alberta Institute of Technology (NAIT)	PHYS1110 MRI Physics I MRID1280 MRI Cross Sectional Anatomy I MRID1230 MRI Equipment and Safety PHYS1210 MRI Physics II MRID1330 MRI Techniques and Application
OR	
University of Toronto-Faculty of Medicine Radiation Oncology (UTDRO)	MR-integrated Radiation Therapy Training Program (MRIRT)

Alternative equivalent courses or training must be pre-assessed by the ACMDTT before clinical training is approved and arranged.

### 2. Clinical Requirement

Successful completion of the clinical component.

### 3. Final Submission

All the applicable items must be submitted to the Registrar, for review, prior to receiving the authorization to apply magnetic resonance imaging in conjunction with radiation therapy.

Submit the full package, including the following completed documents:

- completed Additional and Enhanced Practice Authorization Application
- proof of successful completion of the academic component
- proof of successful completion of the clinical component

#### **Submit to:**

Registrar  
Alberta College of Medical Diagnostic and Therapeutic Radiation therapists  
Suite 800, 4445 Calgary Trail  
Edmonton AB T6H 5R7

F| 780.432.9106  
E| info@acmdtt.com



# Integrated MRI into Radiation Therapy

## ACMDTT Clinical Manual



## Applicant Information

Name: \_\_\_\_\_

ACMDTT #: \_\_\_\_\_

Address: \_\_\_\_\_

Email: \_\_\_\_\_

\_\_\_\_\_

Phone #: \_\_\_\_\_

\_\_\_\_\_

## Practicum Information

Facility: \_\_\_\_\_

Department(s): \_\_\_\_\_

Primary Clinical Supervisor: \_\_\_\_\_

Email: \_\_\_\_\_

Phone #: \_\_\_\_\_

Start Date: \_\_\_\_\_

End Date: \_\_\_\_\_

## Proficiency Assessment

### Performance expectations

The applicant who is placed in the clinical environment will be assessed according to the following performance expectations:

### Application of theoretical knowledge

1. adheres to high standards of magnetic resonance imaging safety while performing procedures
2. accurately interprets the procedure order
3. accurately and independently produce images
4. provides for accurate patient procedure in an orderly progression of tasks
5. ensures operational readiness of equipment for a procedure/study
6. determines and selects optimal factors based on individual case variables
7. accurately critiques the magnetic resonance images which are produced
8. correctly performs quality control procedures according to manufacturers' operational standards
9. exemplifies a strong understanding of professional and regulatory standards of practice

### Patient relationships

1. identifies self and explains the provider's role
2. confirms the identity of the patient
3. demonstrates respect for patients' rights to make choices and to be fully informed
4. responds appropriately and in a timely manner to all patient inquiries
5. protects the patient's confidentiality and takes measures to ensure patient privacy
6. demonstrates sensitivity when dealing with diverse patient populations
7. provides accurate information and checks for understanding

### Work team relationships

1. supports the work of the team and shares the workload equitably
2. demonstrates a willingness to learn from various members of the team
3. displays efforts which are clearly focused and on task
4. exemplifies communication that is meaningful and relevant to the work
5. demonstrates flexibility in changing routines
6. seeks and responds appropriately to feedback

## **Program Sequencing**

It is required that the radiation therapist complete foundational didactic requirements in MR in RT prior to commencing the clinical component.

## **Criteria for competence**

By having verifiable competence in these documented procedures of the clinical component, it is imperative that the radiation therapist has demonstrated, through independent actions, the ability to perform magnetic resonance imaging in conjunction with radiation therapy.

## **Competency substitutions**

In acknowledgement of differences in practice, both regionally and from site to site, limited flexibility in the attainment of competence will be allowed in the MR in RT category. The frequency of the procedure and regional and facility differences will dictate the assessment environment. However, every attempt must be made to assess performance in the clinical environment when possible.

The College reserves the right to accept, modify or decline substitutions, you are encouraged to get approval from the College prior to making them.

## **Clinical timeframe**

In completing this program, the radiation therapist is expected to spend a minimum of 230 clinical hours in an MRI RT environment. This may be on an MR Linac, MR Brachytherapy, or an MR Simulation unit in whole or a combination of experience. Radiation therapists will record the hours worked in these areas on the *Clinical Time Log* that can be found in this manual.

## Clinical Competencies

For the competencies listed below, the radiation therapist is to be evaluated according to the Performance Expectations outlined on Page 1 of this manual. To achieve competence assured for each procedure below, it is expected that the radiation therapist will have performed the procedure more than once and will maintain competence in the procedure post competence assurance.

### I. Competency List

Competency		Description	Examination Date	Verifier Signature
<b>MRRT.1</b>  <b>Integrate safe work principles and procedures into practice</b>	MRRT.1.1	Define MR zones, access issues, and implement procedures for screening/safety breach		
	MRRT.1.2	Recognize and respond to a CODE RED emergency and identify special conditions in the event of a fire in or near the MR environment		
	MRRT.1.3	Recognize and respond to a CODE BLUE emergency and identify special conditions in the event of a patient emergency in the MR RT environment		
	MRRT.1.4	Recognize and respond to an emergency that requires a magnet shutdown procedure		
	MRRT.1.5	Ensure safe practices in radiofrequency coil and equipment cable placement		
	MRRT.1.6	Provide safety instructions, hearing protection and call bell to patients		



<b>MRRT.2</b>  <b>Integrate safe screening principles and procedures into practice</b>	MRRT.2.1	Determine suitability of items for admission into MR RT environment		
	MRRT.2.2	Determine suitability of implants, devices, and other objects in/on patient's body for MR RT environment		
	MRRT.2.3	Provide education to all persons entering the MR RT environment about MR safety		
	MRRT.2.4	Take appropriate action when safety concerns are identified during screening process		
	MRRT.2.5	Demonstrate proper documentation of screening process		
<b>MRRT.3</b>  <b>Recognize and respond to MR safety hazards</b>	MRRT.3.1	Take appropriate action when hazards of the static magnetic field are identified		
	MRRT.3.2	Take appropriate action when hazards of the time-varying (gradient) magnetic fields are identified		
	MRRT.3.3	Take appropriate action when hazards of the radiofrequency field are identified		

<b>MRRT.4</b>  <b>Recognize MR RT-Local Rules and Conditions</b>	MRRT.4.1	Apply knowledge of all site-specific and MR RT-specific policies and procedures applicable to the operation of equipment, staff/patient safety and quality assurance.		
	MRRT.4.2	Demonstrate the patient preparation and screening process specific to MR RT, as it relates to patients who are required to attend multiple frequent sessions		
<b>MRRT.5</b>  <b>Manage the integrated MR in RT Equipment, imaging and/or treatment systems</b>	MRRT.5.1	Identify the components of an integrated MR RT equipment (MRLinac/MRSimulator)		
	MRRT.5.2	Demonstrate the start-up and shut-down procedures for the MR RT equipment and all associated systems		
	MRRT.5.3	Demonstrate the daily quality assurance procedures and safety checks required for the MR RT equipment and identify the necessary actions when recorded values are outside of specified tolerance		
	MRRT.5.4	Identify patient-specific quality assurance requirements for MR RT-Equipment in the RT workflow, including both the offline and online environments		

	MRRT.5.5	Apply knowledge of digital networking and archiving systems as they relate to MR RT		
	MRRT.5.6	Demonstrate appropriate documentation for administrative, imaging, and therapeutic procedures		
<b>MRRT.6</b>  <b>Demonstrate operation of the MR scanning platform to acquire MR images for use in radiation therapy applications</b>	MRRT.6.1	Position patient appropriately to visualize the target imaging/treatment areas		
	MRRT.6.2	Plan imaging procedure using all relevant clinical data		
	MRRT.6.3	Optimize radiofrequency coil selection and placement		
	MRRT.6.4	Optimize imaging planes		
	MRRT.6.5	Select and optimize appropriate imaging pulse sequence, parameters, and imaging options within the scope of practice of a Radiation Therapist		
	MRRT.6.6	Determine limit and extent of coverage		
	MRRT.6.7	Apply specific absorption rate reduction practices		

<b>MRRT.7</b>  <b>Analyze the quality and acceptability of acquired MR images for use in radiation therapy applications and respond</b>	MRRT.7.1	Identify MR in RT considerations specific to oncologic pathologies of the: <ul style="list-style-type: none"> <li>• Brain</li> <li>• Head &amp; Neck</li> <li>• Chest</li> <li>• Abdomen</li> <li>• Pelvis</li> <li>• Upper and lower extremities</li> </ul>		
	MRRT.7.2	Perform post-acquisition processing		
	MRRT.7.3	Differentiate anatomical structures, tissue types and pathologies within the radiation therapy context		
	MRRT.7.4	Perform multi-modal image registration and identify the acceptability of co-registration as it relates to isocentre position and treatment volume		
	MRRT.7.5	Recognize pathologies that may present as incidental findings		
	MRRT.7.6	Evaluate images for artifacts and respond		

## Practical Tasks

Use the appropriate practice sheets to follow the outlined process and record results on the accompanying worksheet for tasks 1-4 below.

### Task 1: Recognize characteristics and differences between T1TSE and T2TSE sequences.

#### Overview:

During this exercise, you will correctly identify a T1 and T2 weighted sequence and understand how each is used to characterize various tumor sites.

**Objectives:**

After completing this task, you will be able to identify when to appropriately use a T1TSE weighted sequence or a T2TSE weighted sequence.

Task 1	Completion Date	Signature of Verifier
Recognize T1TSE and T2TSE weighted imaging		

**Task 2: Adjustment of acquisition time (TA)**

**Overview:**

During this exercise you will adjust parameters that affect scan time.

**Objectives:**

After completion, you will be able to:

- Predict the influence of adjusting scan parameters (examples may include but are not limited to) matrix, number of slices, NSA, and scan mode on the TA)

Task 2	Completion Date	Signature of Verifier
Adjustment of acquisition time (TA)		

**Task 3: Clinical Anatomic Positioning and Coil Selection**

**Overview:**

During this exercise you will select the appropriate coil for the tumor site and position patient and equipment.

**Objective:**

After completing this exercise, you will be able to

- Correctly set up a patient with immobilization, by selecting the proper coil, and placing using anatomical land-marking, for all tumor sites (Head & Neck, Thorax, Abdomen, Pelvis, and Upper and Lower Extremities).

Task 3	Completion Date	Signature of Verifier
Demonstrate appropriate patient set up, immobilization, coil selection, and land-marking for placement.		

## Task 4: Identify and Correct Imaging Artifacts

### Overview:

During this exercise you will understand when an artifact is present on an image and adjust any factors to reduce artifacts effects.

### Objectives:

After completing this exercise, you will be able to;

- Identify and correct patient related artifacts (breathing management, motion)
- Identify and correct implant or internally related artifacts by adjusting scan and machine parameters (Phase direction, magnetic susceptibility)

Task 4	Completion Date	Signature of Verifier
Recognize artifact on image and correct		

## Task 5: MRI Screening

### Overview:

During this exercise you will screen a patient for their MRI RT procedure.

### Objectives:

After completing this exercise, you will be able to

- Explain the difference between screening an inpatient vs. outpatient
- Explain how to look up implants
- Understand the importance of removing or clearing all metal and/or foreign objects on or inside your patients before the exam
- Handle patient's accessory equipment and the use of switching to MRI safe equipment

Task 5	Completion Date	Signature of Verifier
Perform MRI Screening		

## Task 6: MRI Patient Education

### Overview:

During this exercise, you will provide education to a patient prior to confirming consent to proceed with a procedure.

**Objectives:**

After completing this exercise, you will be able to

- Explain preparation for the procedure (ex: full bladder)
- Explain what the patient is expected to do during the procedure
- Describe any possible risks and explain how they are minimized with equipment, and technique.
- Explain how the patient should indicate a need for assistance during the procedure
- Explain how the patient is monitored for safety during the procedure.

**Scenarios:**

**Describe what you would do in each scenario to your preceptor.**

**Scenario 1:**

You are screening a patient and they have an implant that you don't recognize. The patient has had an MR before. What do you do?

	Completion Date	Signature of Verifier
Scenario 1		

**Scenario 2:**

A Radiation Oncologist arrives and says they have been screened before and is authorized to work unsupervised, what do you do?

	Completion Date	Signature of Verifier
Scenario 2		

**Scenario 3a:**

Choose three artifacts. Describe their appearance and consider what may have caused them and what strategy you might use to reduce their appearance.

	Completion Date	Signature of Verifier
Scenario 3a		

**Scenario 3b:**

Choose two other artifacts that you have encountered while imaging. Describe their appearance and consider what may have caused them and what strategy you might use to reduce their appearance.

	Completion Date	Signature of Verifier
Scenario 3b		

**Scenario 4:**

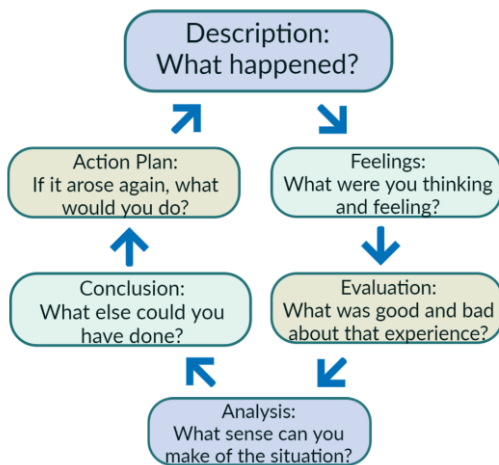
A request for a tour of the MR in RT environment has been approved for your site. What do you need to do in preparation for and at the time of the visit to ensure all staff and visitors are safe and site policies and procedures are adhered to?

	Completion Date	Signature of Verifier
Scenario 4		

**Case studies:**

Think of two cases that have interested you and write a reflective report. The template below is Gibbs’ cycle for reflective learning. Adapt it to suit your own style

	Completion Date	Signature of Verifier
<b>Case Study 1</b>		
<b>Case Study 2</b>		







## Signing Authority for Verification of Achievement

The following are authorized to attest to the clinical competencies achieved by the applicant:

- Magnetic resonance technologist.
- Radiation therapist authorized to perform *integration of MRI into Radiation Therapy* for a minimum of a consecutive 12 months.
- Medical Physicist proficient in the workings of MR in Radiation Therapy environment.

Questions regarding the appropriateness of supervision should be directed to the College.

Name of Verifier	Current Position	Email	Signature

### Verification of Successful Completion

#### Radiation Therapist Verification

I verify that I have successfully completed all aspects of the clinical learning experience outlined in the Integrated MR into Radiation Therapy enhanced practice authorization program.

\_\_\_\_\_  
Applicant Signature

\_\_\_\_\_  
Date

#### Clinical Practicum Site Verification

I verify that all aspects of the clinical learning experience have been successfully achieved by the applicant.

\_\_\_\_\_  
Signature of RT Supervisor or Clinical Educator

\_\_\_\_\_  
Date



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