Magnetic Resonance Imaging

1. Introduction

Candidates applying for certification and registration under the primary eligibility pathway are required to meet the Professional Education Requirements specified in the *ARRT Rules and Regulations*. ARRT's *Magnetic Resonance Imaging Didactic and Clinical Competency Requirements* are one component of the Professional Education Requirements.

The requirements are periodically updated based upon a practice analysis which is a systematic process to delineate the job responsibilities typically required of magnetic resonance imaging (MRI) technologists. The result of this process is a task inventory which is used to develop the clinical competency requirements (see section 4 below) and the content specifications which serve as the foundation for the didactic competency requirements (see section 3 below) and the examination.

2. Documentation of Compliance

To document that the Didactic and Clinical Competency Requirements have been satisfied by a candidate, the program director (and authorized faculty member if required) must sign the ENDORSEMENT SECTION of the *Application for Certification and Registration* included in the *Primary Eligibility Pathway Handbook*.

Candidates who complete their educational program during 2020 or 2021 may use either the 2017 Didactic and Clinical Competency Requirements or the 2020 requirements. Candidates who graduate after December 31, 2021 must use the 2020 requirements.

3. Didactic Competency Requirements

The purpose of the didactic competency requirements is to verify that individuals had the opportunity to develop fundamental knowledge, integrate theory into practice and hone affective and critical thinking skills required to demonstrate professional competency. Candidates must successfully complete coursework addressing the topics listed in the ARRT Content Specifications for the MRI examination. These topics would typically be covered in a nationally-recognized curricula published by organizations such as the ASRT or SMRT. Educational programs accredited by a mechanism acceptable to ARRT generally offer education and experience beyond the minimum requirements specified in the content specifications and clinical competency documents.

4. Clinical Competency Requirements

The purpose of the clinical competency requirements is to verify that individuals certified and registered by the ARRT have demonstrated competency performing the clinical activities fundamental to a particular discipline. Competent performance of these fundamental activities, in conjunction with mastery of the knowledge and cognitive skills covered by the MRI examination, provides the basis for the acquisition of the full range of procedures typically required in a variety of settings. Demonstration of clinical competence means that candidates have performed the procedures independently, consistently, and effectively during their formal education. The following pages identify the specific procedures for the clinical competency requirements. Candidates may wish to use these pages, or their equivalent, to record completion of the requirements. The pages do NOT need to be sent to the ARRT.

4.1 General Performance Considerations

4.1.1 Patient Diversity

Demonstration of competence should include variations in patient characteristics such as age, gender, and medical condition.

4.1.2 Simulated Performance

The ARRT requirements specify that general patient care procedures may be simulated as designated in the specific requirements below. Simulations must meet the following criteria:

- The candidate must competently demonstrate skills as similar as circumstances permit to the cognitive, psychomotor, and affective skills required for performing the procedures on patients;
- The program director must be confident that the skills required to competently perform the simulated task will generalize or transfer to the clinical setting, and, if applicable, the candidate must evaluate related images.

Examples of acceptable simulation include: demonstrating CPR on a mannequin; performing venipuncture by demonstrating aseptic technique on another person, but then inserting the needle into an artificial forearm or grapefruit.

4.1.3 Elements of Competence

Demonstration of clinical competence requires that the program director or the program director's designee has observed the candidate performing the procedure independently, consistently, and effectively during the course of the candidate's formal educational program.

4.2 Magnetic Resonance Imaging Specific Requirements

As part of the education program, candidates must demonstrate competence in the clinical procedures identified below. These clinical procedures are listed in more detail in the following sections.

- Seven mandatory general patient care procedures
- Eight mandatory MRI safety requirements
- 17 mandatory MR imaging procedures
- 11 of the 30 elective MR imaging procedures and
- Seven mandatory MRI quality control procedures

4.2.1 General Patient Care Procedures

Candidates must have demonstrated competence in all seven patient care procedures listed below. The procedures should be performed on patients whenever possible, but simulation is acceptable if state or institutional regulations prohibit candidates from performing the procedures on patients.

General Patient Care Procedures	Date Completed	Competence Verified By
CPR		
Vital Signs (Blood Pressure, Pulse, Respiration)		
Sterile Technique		
Standard Precautions		
Transfer of Patient		
Care of Patient Medical Equipment (e.g., Oxygen Tank, IV Tubing)		
Venipuncture		

4.2.2 MRI Safety Requirements

Candidates must demonstrate competence in all eight areas of MRI Safety listed below.

MRI Safety Requirements	Date Completed	Competence Verified By
Screening Patients, Personnel, and Non-Personnel for MR Safe, MR Conditional, and MR Unsafe Devices and Objects		
Identify MR Safety Zones		
Static Magnetic Field (e.g., Translational and Rotational Forces)		
Radiofrequency Field (e.g., Thermal Heating [SAR], Coil Positioning, Patient Positioning, Insulation)		
Gradient Magnetic Fields (e.g., Inducted Voltages, Auditory Considerations)		
Communication and Monitoring Considerations (e.g., Sedated Patients, Verbal and Visual Contact, Vital Signs)		
Contrast Media Safety (e.g., NSF, Renal Function)		
Other MRI Safety Considerations (e.g., Cryogen Safety, Fire, Medical Emergencies, Laser Alignment Lights)		

* The abbreviation “e.g.,” is used to indicate that examples are listed in parenthesis, but that it is not a complete list of all possibilities.

4.2.3 MR Imaging Procedures

Candidates must demonstrate competence in the 17 mandatory procedures listed on the following page. For the mandatory procedures, candidates must be evaluated while scanning actual patients. Candidates are also required to demonstrate competence for 11 of the 30 elective procedures. Elective procedures should be performed on patients; however, up to five of the elective procedures may be performed on volunteers, as long as your institution has a policy that assures the protection of both the volunteer's and the institution's interests.

When performing the MR imaging procedures, the candidate must independently demonstrate appropriate:

Patient skills including:

- evaluation of requisition and/or medical record
- identification of patient
- documentation of patient history including allergies
- safety screening
- patient education concerning the procedure
- patient care and assessment
- preparation of examination room
- Standard Precautions
- preparation and/or administration of contrast media
- MRI safety procedures and precautions
- patient discharge with post-procedure instructions

Technical and procedural skills including:

- selection of optimal imaging coil
- patient positioning
- protocol selection
- parameter selection
- image display, networking, and archiving
- post-processing
- documentation of procedure and patient data in appropriate records
- completion of acquisition

Evaluation skills including:

- analysis of the image for technical quality
- demonstration of correct anatomic regions
- proper identification on images and patient data
- recognition of relevant pathology
- exam completeness

4.2.3 MR Imaging Procedures (continued)

Head and Neck	Mandatory	Elective	Date Completed	Patient or Volunteer	Competence Verified By
Brain	✓			Patient	
IACs	✓			Patient	
Pituitary	✓			Patient	
Orbits		✓			
Cranial Nerves (Non IACs)		✓			
Vascular Head MRA	✓			Patient	
Vascular Head MRV		✓			
Brain Perfusion		✓			
Brain Spectroscopy		✓			
Soft Tissue Neck		✓			
Vascular Neck	✓			Patient	
Spine					
Cervical	✓			Patient	
Thoracic	✓			Patient	
Lumbar	✓			Patient	
Spinal Trauma		✓			
Sacrum-Coccyx		✓			
Sacroiliac (SI) Joints		✓			
Brachial Plexus		✓			
Thorax					
Chest (Non Cardiac)		✓			
Breast		✓			
Vascular Thorax		✓			
Abdomen and Pelvis					
Liver	✓			Patient	
Pancreas		✓			
MRCP	✓			Patient	
Adrenals		✓			
Kidneys		✓			
Enterography		✓			
Vascular Abdomen		✓			
Female Soft Tissue Pelvis (e.g., Uterus)		✓			
Male Soft Tissue Pelvis (e.g., Prostate)		✓			

4.2.3 MR Imaging Procedures (continued)

Musculoskeletal	**Mandatory**	**Elective**	**Date Completed**	**Patient or Volunteer**	**Competence Verified By**
Temporomandibular Joints (TMJs)		✓			
Sternum/Sternoclavicular (SC) Joints		✓			
Shoulder	✓			Patient	
Long Bones (Upper Extremity)		✓			
Elbow		✓			
Wrist	✓			Patient	
Hand		✓			
Finger/Thumb		✓			
Bony Pelvis		✓			
Hip	✓			Patient	
Long Bones (Lower Extremity)		✓			
Knee	✓			Patient	
Ankle	✓			Patient	
Foot	✓			Patient	
Arthrogram		✓			
Additional Imaging Procedures					
Image Post-Processing (MIP Reformation, MPR, Subtraction)	✓				
CINE (e.g., CSF Flow Study, TMJs)		✓			

4.2.4 MRI Quality Control Procedures

Candidates must demonstrate competence in the seven quality control activities listed below. The first four procedures are performed on a QC phantom.

MRI Quality Control Procedures	Date Completed	Competence Verified By
Signal to Noise Ratio		
Center Frequency		
Transmitter Gain or Attenuation		
Geometric Accuracy		
Equipment Inspection (e.g., Coils, Cables, Door Seals)		
Monitor Cryogen Levels		
Room Temperature and Humidity		