

12.1 MRI Registry Review

Part I

What do the Content Specifications say about the “MRI Boards” & What are the Clinical Requirements?



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Outline

- What is on the content specifications?
 - Post primary examination
 - Primary examination
- What are the clinical requirements?
 - Post primary examination
 - Primary examination
- How do I prepare for the boards?

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Objectives

Upon completion of this course, the attendee should...

1. Know what is on the content specifications?
Post primary examination
Primary examination
2. Understand how to complete the clinical requirements for the boards?
Post primary examination
Primary examination
3. Learn how to prepare for the boards?

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MRI Boards - Pathways

- Primary **Pathway**
 - Not yet registered
 - Completed an approved course
 - Met the clinical and didactic requirements
- Post Primary **Pathway**
 - Already Registered in ...
X-ray or Radiography (R), Radiation Therapy (RT),
Nuclear Medicine (N) or Nuclear Medicine (CNMT)
 - Met the clinical experience requirements
 - Be able to pass the written portion of the examination

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Primary Pathway: Clinical & Didactic Requirements

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Primary Pathway: Clinical & Didactic Requirements

Magnetic Resonance Imaging Client's Competence Expectations				
MRI Procedures	Standards on Elements	Done Completed	Partner or Specialist	Competence Verified by
Head and Neck				
basic with contrast	SA			
contrast without contrast	SA			
contrast without contrast	SA			
diffusion	SA			
perfusion	SA			
MRSA brain	SA			
cell toxin and including stroke, infection, and aneurysms	SA			
MRSA cervical	SA			
Spine				
lumbar	SA			
thoracic	SA			
lumbar	SA			
cervical	SA			
lumbar/thoracic	SA			
Thyroid				
thyroidal glands	SA			
thyroiditis	SA			
hyperthyroidism	SA			
hypothyroidism	SA			
Adrenal and Pituitary				
adrenal	SA			
pituitary	SA			
adrenal (MR angiography)	SA			
adrenal glands	SA			
adrenal glands	SA			
Other Imaging				
adrenal	SA			
adrenal	SA			
adrenal	SA			

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Content Specifications - Then

CONTENT SPECIFICATIONS FOR THE EXAMINATION IN MAGNETIC RESONANCE IMAGING

Content Specifications for the Examination in Magnetic Resonance Imaging

Introduction

The purpose of the ARRT Examination in Magnetic Resonance Imaging is to assess the knowledge and cognitive skills underlying the intelligent performance of the tasks typically required of staff technologists practicing in this specialized area. In order to identify the knowledge and skills covered by the examination, the ARRT conducted a job analysis study involving a nationwide sample of MRI technologists. The results of the job analysis are reflected in this document.

The table below presents the four major content categories covered on the examination, along with the number of test questions in each major category. The remaining pages of this document list the specific topics addressed within each major content category. The approximate number of test questions allocated to each topic appears in parentheses.

Content Category	Number of Questions
A. Patient Care	18
B. Imaging Procedures	54
C. Data Acquisition and Processing	65
D. Physical Principles of Image Formation	43
	180*

* An additional 20% of the test may be pilot questions.

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Categories of Questions - Now

CONTENT SPECIFICATIONS FOR THE EXAMINATION IN MAGNETIC RESONANCE IMAGING

Publication Date: November 2005
Implementation Date: January 2006

Content Category	Number of Questions ¹	Number of Questions ²
A. Patient Care	30	18
B. Imaging Procedures	62	54
C. Data Acquisition and Processing	65	65
D. Physical Principles of Image Formation	43	43
	200	180*

1. A special debt of gratitude is due to the hundreds of professionals participating in this project as committee members, survey respondents, and reviewers.

2. Each exam includes an additional 20 unscored (pilot) questions. On the pages that follow, the approximate number of test questions allocated to each content category appears in parentheses.

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Where did the board questions & the books come from ?

•Who wrote them?

- Radiologists
- MRI Techs
- Experts

•ARRT

- Committees
- Of techs
- Of other experts
- ?



Westbrook & Roth

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Let's dissect the Categories

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Patient Care & Safety Category, Then (only MR)

- Only 18 questions of 180 total questions on the test

- Only questions pertaining to MRI safety and patient care

•Categories

- Screening
- Assessment & Monitoring
- Safety precautions
- Biological considerations

A. PATIENT CARE AND MRI SAFETY (18)	
1. Screening (6)	4. Biological Considerations (6)
a. Patients	1. Patient Transport
b. Medical Equipment	2. Patient Positioning
c. Personnel	3. Patient Preparation
d. Screening (e.g., safety, preparation, etc.)	4. Patient Care
2. Assessment & Monitoring (6)	5. Patient Care
a. Patient Preparation	6. Patient Care
b. Patient Care	7. Patient Care
c. Patient Care	8. Patient Care
d. Patient Care	9. Patient Care
e. Patient Care	10. Patient Care
f. Patient Care	11. Patient Care
3. Safety Precautions (6)	12. Patient Care
a. Patient Care	13. Patient Care
b. Patient Care	14. Patient Care
c. Patient Care	15. Patient Care
d. Patient Care	16. Patient Care
e. Patient Care	17. Patient Care
f. Patient Care	18. Patient Care

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Patient Care Category (30 questions)

A. PATIENT CARE (30)

1. Legal and Ethical Principles

2. Safety and Patient Care

3. Patient Care

4. Patient Care

5. Patient Care

6. Patient Care

7. Patient Care

8. Patient Care

9. Patient Care

10. Patient Care

11. Patient Care

12. Patient Care

13. Patient Care

14. Patient Care

15. Patient Care

16. Patient Care

17. Patient Care

18. Patient Care

19. Patient Care

20. Patient Care

21. Patient Care

22. Patient Care

23. Patient Care

24. Patient Care

25. Patient Care

26. Patient Care

27. Patient Care

28. Patient Care

29. Patient Care

30. Patient Care

Content Category	Number of Questions ¹
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Patient Care Category ... New Content

I. Legal and Ethical Principles (4)

A. Confirmation of Exam Requestion

1. verification of patient identification
2. comparison of request to clinical indications

B. Legal Issues

1. common terminology (e.g., negligence, malpractice)
2. legal doctrines (e.g., respondent superior, res ipsa loquitur)

C. Patient's Rights

1. informed consent (written, oral, implied)
2. confidentiality (HIPAA)
3. Patient's Bill of Rights (e.g., privacy, access to information, health care proxy, research participation)

D. ARRT Standard of Ethics

III. Patient Assessment, Monitoring and Management (6)

A. Routine Monitoring

1. vital signs
2. physical signs and symptoms

V. Infection Control (4)

A. Terminology and Basic Concepts

1. types of asepsis
2. sterile technique
3. pathogens (e.g., fungi, viruses, vectors)
4. nosocomial infections

B. Cycle of Infection

1. pathogen
2. source or reservoir of infection
3. susceptible host
4. method of transmission (contact, droplet, airborne, common vehicle, vector borne)

C. Standard Precautions (general patient contact)

1. handwashing
2. gloves, gowns
3. masks
4. medical asepsis / disinfection

D. Additional or Transmission-Based Precautions (e.g., Hepatitis B, HIV, tuberculosis)

1. airborne (e.g., negative ventilation)
2. droplet (e.g., particulate mask)
3. contact (e.g., gloves, gown)

E. Disposal of Contaminated Materials

1. linens
2. needles
3. patient supplies

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Patient Care Category, MRI Safety Issues

II. MRI Screening and Safety (11)

A. Screening

1. biomedical implants (e.g., pacemakers, clips)
2. ferrous foreign bodies
3. medical conditions
4. prior diagnostic or surgical procedures

B. Equipment Safety

1. placement of conductors (e.g., ECG leads, coils, cables)
2. oxygen safety
3. ancillary equipment in proximity
4. emergency procedures (e.g., quench, fire)

C. Environment

1. climate control (temperature, humidity)
2. gauss lines
3. magnetic shielding
4. RF shielding

D. Biological Considerations

1. RF-Field
 - a. specific absorption rate (SAR)
 - b. biological effects
 - c. FDA guidelines

III. Patient Assessment, Monitoring and Management (6)

A. Routine Monitoring

1. vital signs
2. physical signs and symptoms
3. claustrophobic patients
4. claustrophobic patients

B. Emergency Response

1. reactions to contrast
2. other allergic reactions (e.g., latex)
3. cardiac/respiratory arrest (CPR)
4. physical injury, trauma, or RF burn
5. other medical disorders (e.g., seizures, diabetic reactions)
6. life-threatening situations (e.g., quench, projectiles)

C. Patient Transfer and Body Mechanics

1. implantable devices (e.g., infusion catheters, pumps, pacemakers, others)
2. oxygen delivery systems
3. other (e.g., nasogastric tubes, urinary catheters)

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MRI Safety... What could they ask?

- Safety Questions
- What could they ask?
 - Only 30 total questions
 - Review content specs
- Study FDA regulations
 - Bo = 8.0T & 4.0T
 - B1= 4.0 watts/kg
 - Gradients - discomfort
- Review Patient Care
- Review MRI Safety
- Study guides
 - Review books
 - www.mrisafety.com
 - Look at package inserts

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Where could the questions have come from?

- Safety Questions
- Look to the experts
 - Questions came from the experts in MRI Safety
- Publications & lectures by Sherlock & Kanal
 - Look for their books
 - Or look for their web pages

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Imaging Procedures... Then

- Only 54 questions of 180 total questions on the test
- Categories
 - Head & neck
 - Spine
 - Thorax
 - Abdomen
 - Pelvis
 - Musculoskeletal
- Questions pertaining to
 - Clinical protocols
 - Anatomy
 - Contrast
 - Patient positioning

TYPE OF STUDY	NUMBER OF QUESTIONS	TYPE OF STUDY	NUMBER OF QUESTIONS
1. Head & Neck (15)	15	5. Musculoskeletal (15)	15
2. Spine (15)	15	6. Thorax (15)	15
3. Thorax (15)	15	7. Abdomen (15)	15
4. Abdomen (15)	15	8. Pelvis (15)	15
5. Pelvis (15)	15		

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Imaging Procedures... Now

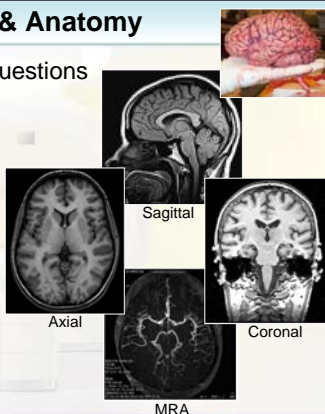
TYPE OF STUDY	NUMBER OF QUESTIONS	TYPE OF STUDY	NUMBER OF QUESTIONS
1. Head & Neck (15)	15	6. Musculoskeletal (15)	15
2. Spine (15)	15	7. Thorax (15)	15
3. Thorax (15)	15	8. Abdomen (15)	15
4. Abdomen (15)	15	9. Pelvis (15)	15
5. Pelvis (15)	15		

TYPE OF STUDY	NUMBER OF QUESTIONS	TYPE OF STUDY	NUMBER OF QUESTIONS
1. Head & Neck (15)	15	6. Musculoskeletal (15)	15
2. Spine (15)	15	7. Thorax (15)	15
3. Thorax (15)	15	8. Abdomen (15)	15
4. Abdomen (15)	15	9. Pelvis (15)	15
5. Pelvis (15)	15		

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Imaging Procedures & Anatomy

- Imaging Procedures Questions
- What could they ask?
 - Only 62 total questions
 - Review content specs
- Study
 - Anatomy
 - General protocols
 - Planes for pathology
 - Image contrast (T1, T2)
 - Contrast media
- Study guides
 - Review books
 - www.protocols.com



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Where did the board questions appear to come from? Anatomy

- Anatomy Questions
- Look to the experts
- Questions probably came from the experts in Anatomy
- Applegate / Peterson
- Look for their books



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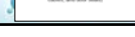
Data Acquisition and Processing

- Data Acquisition & Processing Questions
- What could they ask?
 - Only 65 total questions
 - Review content specs
- Study
 - Pulse sequences
 - Data manipulation
 - Special procedures
 - Imaging parameters
 - Imaging options
 - Artifacts
 - QC
- Study guides
 - Review books



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Parameters That Influence Image Quality (SNR & CNR)

Hardware	Voxel	Sampling	Contrast	Options
Static field	Thickness	NSA	TR	SAT
RF coil	FOV	Bandwidth	TE	GMN
	Matrix	#PE's	T1	Gating
		# Slices (3D)	Flip	Resp comp
		Rectangular FOV		MT
				anti-aliasing



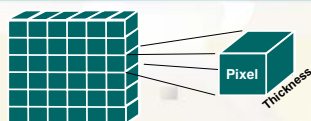
SNR ... "what we measure"
CNR ... "what we perceive"

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Pixel / Voxel



$$\text{Pixel Size} = \frac{\text{FOV}}{\text{Matrix}} \times \frac{\text{FOV}}{\text{Matrix}}$$

$$\text{Voxel Volume} = \frac{\text{FOV}}{\text{Matrix}} \times \frac{\text{FOV}}{\text{Matrix}} \times \text{Slice Thickness}$$

$$\text{Isotropic Voxel} \quad \frac{\text{FOV}}{\text{Matrix}} = \frac{\text{FOV}}{\text{Matrix}} = \text{Slice Thickness}$$

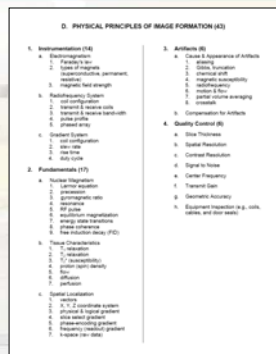
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Physical Principles of Image Formation

- Physical Principles of Image Formation Questions
- What could they ask?
 - Only 43 total questions
 - Review content specs
- Study
 - Instrumentation
 - Fundamentals
 - Artifacts
 - QC
- Study guides
 - Review books
 - Videos (on-line courses)
 - Live Courses



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Where did the board questions appear to come from? MRI Physics

- Physics Questions
- Look to the experts
- Questions probably came from those who teach MRI Physics
- Faulkner, Kaut, Roth, Westbrook, Friemarck
- Look for their books
- Or look for their web pages
- www.imaginged.com



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Outline

- What is on the content specifications?
 - Post primary examination
 - Primary examination
- What are the clinical requirements?
 - Post primary examination
 - Primary examination
- How do I prepare for the boards?

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What are the Prerequisites? (post primary exam) Clinical Experience Requirements

- 5 Categories
- 4 Sub-categories
- 3 Repetitions



Clinical Experience Requirements

- The Clinical Experience Requirements for MRI consist of 75 procedures in 7 different categories. The categories are:
- Head and Neck
 - Spine
 - Arthritis and Joints
 - Cardiovascular
 - Special Imaging Procedures
 - Special Imaging Procedures
 - Special Imaging Procedures



As a minimum, the applicant must have completed the following:

1. Complete a minimum of 3 repetitions of each procedure.
2. Complete a minimum of 3 repetitions of each procedure.
3. Complete a minimum of 3 repetitions of each procedure.

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What are the Categories, Sub-categories?

General Guidelines

- The applicant must complete and document the performance of a minimum of 75 procedures in 7 different categories.
- The applicant must complete and document the performance of a minimum of 3 repetitions of each procedure.
- The applicant must complete and document the performance of a minimum of 3 repetitions of each procedure.

Magnetic Resonance Imaging Clinical Experience Requirements

- Head and Neck
 1. Brain
 2. Neck
 3. Head and Neck
 4. Head and Neck
 5. Head and Neck
 6. Head and Neck
 7. Head and Neck
- Spine
 1. Cervical
 2. Thoracic
 3. Lumbar
 4. Sacral
 5. Pelvic
 6. Pelvic
 7. Pelvic
- Arthritis and Joints
 1. Hip
 2. Knee
 3. Shoulder
 4. Wrist
 5. Ankle
 6. Hand
 7. Foot
- Cardiovascular
 1. Aorta
 2. Heart
 3. Vessels
 4. Vessels
 5. Vessels
 6. Vessels
 7. Vessels
- Special Imaging Procedures
 1. MRI
 2. MRI
 3. MRI
 4. MRI
 5. MRI
 6. MRI
 7. MRI
- Special Imaging Procedures
 1. MRI
 2. MRI
 3. MRI
 4. MRI
 5. MRI
 6. MRI
 7. MRI
- Special Imaging Procedures
 1. MRI
 2. MRI
 3. MRI
 4. MRI
 5. MRI
 6. MRI
 7. MRI

**Let the categories chose you
Document everything!**

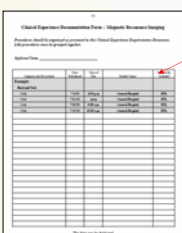
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Documenting Clinical

- Documentation for clinical comps
- Documentation for who knows



Category	Sub-category	Procedure	Repetitions	Completed	Verified
Head and Neck	Brain	1. Brain	3		
		2. Brain	3		
		3. Brain	3		
		4. Brain	3		
		5. Brain	3		
		6. Brain	3		
		7. Brain	3		

- Let the categories chose you
- Document everything!

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Clinical Experience Documentation

Their Way

Category & Procedure	Date	Time	Facility Name	Verified By (Initials)
Head & Neck / Routine Brain	5/5/06	9:00 am	Hosp. Univ. Of PA	eSCR
Thorax / Breast	5/1/05	12:30 pm	Hosp. Univ. Of PA	eSCR
Musculoskeletal / Knee	2/5/06	4:00 pm	Hosp. Univ. Of PA	eSCR

Our Way

Category & Procedure	Date	Time	Facility Name	Verified By (Initials)	Patient ID
1. Routine Brain	5/5/06	9:00 am	U of P / HUP III	eSCR	000001
2. Routine Brain					
3. Routine Brain					
4. Routine Brain					
5. Routine Brain					
6. Routine Brain					
7. Routine Brain					
8. Routine Brain					
9. Routine Brain					
10. Routine Brain					

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Primary Programs

The ARRT Magnetic Resonance Imaging (MRI) primary pathway to certification requires candidates to complete an educational program that is accredited by a mechanism acceptable to the ARRT.

The current acceptable accreditation mechanisms for MRI are:

- The Joint Review Committee on Education in Radiologic Technology (JRCERT)
- Regional Institutional Accrediting Agency for post-secondary degree-granting institutions.

To verify the accreditation status of other programs or institutions, please consult the appropriate accrediting agency.

MAGNETIC RESONANCE IMAGING PROGRAM
NORTHERN ALBERTA INST OF TECH
11762 106TH ST NW
EDMONTON, AB T6C 1J1 CANADA, AB
Program Director: CRAIG BRIGGS Telephone: 780-378-5260

MAGNETIC RESONANCE IMAGING PROGRAM
MA COLLEGE OF PHAM HEALTH SCI
179 LONGWOOD AVE
BOSTON, MA 02115-5896
Program Director: MARYANN BLAINE Telephone: 617-732-2138

MAGNETIC RESONANCE IMAGING PROGRAM
MICHENER INSTITUTE
222 SAINT PATRICK ST
TORONTO, ONT M5T 1A4 CANADA, ON
Program Director: LORRAINE RAMSAY Telephone: 416-596-3101


MAGNETIC RESONANCE IMAGING PROGRAM
BRITISH COLUMBIA INST OF TECH
3700 WILLINGDON AVE
BURNABY BC V5C 3K4 CANADA, BC
Program Director: EUCLID SEERAM Telephone: 604-432-8631

MAGNETIC RESONANCE IMAGING PROGRAM
RED RIVER COLLEGE
2055 NOTRE DAME AVE
WINNEPEG, MB R3H 0J9 CANADA, MB
Program Director: LARRY KUSTRA Telephone: 204-632-2241

MRI PROGRAM/DPT OF RADIOLOGIC SCIENCES
THOMAS JEFFERSON UNIVERSITY
130 S 9TH ST SUITE 1005 EDISON
PHILADELPHIA, PA 19107-0000
Program Director: RICHARD H WEEKING Telephone: 215-503-0059

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 Imaging

What's the best Study Material?


- Books
 - Text Books
 - Study guides
 - Flash cards
 - Q & A
- Video Tapes
- CD's
- Mock Tests
- Lectures



Yes, this was my office!

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 Imaging

[illegible]

What About Videos?

- Principles
- Pulse Sequences
- Parameters
- Safety
- etc...



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What About Courses?

- Face time
- Ask questions
- See where you are weak
- Good for auditory learners
- Get from the lecture what you didn't get from reading
- Learn the tricks
- Bond with other techs
- Learn from their mistakes



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Tips for taking the exam...D-Day

- Don't tell anyone!
- Get rest
- Carefully read question
 - ONLY the question
 - Don't add anything
 - It's not about YOU, or your site
- Carefully read all of the answers (distracters)
- Don't change your answers
 - Always go with your 1st guess
 - Your 1st answer is generally right
- Upon completion count your guesses
- Find a Happy Place!



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Do it today! The longer you wait...

- The more they stuff put on it
- The more information you forget
- The more it costs
 - It will become mandatory
 - They will make you do it
 - This will add stress
- The more the requirements
 - Now clinical (documented cases)
 - Maybe classes (JRCERT approved)



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12.1 MRI Registry Review

Part I - What do the Content Specifications say about the "MRI Boards"
&
What are the Clinical Requirements?



Thank you for your attention!

Click to take your post test and get your credits

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