R T 71B: ADVANCED CLINICAL EXPERIENCE: MAGNETIC RESONANCE IMAGING II

Foothill College Course Outline of Record

Heading	Value
Effective Term:	Fall 2026
Units:	14
Hours:	16 lecture, 480 laboratory per quarter (496 total per quarter) 40 hours clinical laboratory per week for 12 weeks, with 16 hours of didactic content.
Prerequisite:	R T 71A.
Degree & Credit Status:	Degree-Applicable Credit Course
Foothill GE:	Non-GE
Transferable:	CSU
Grade Type:	Letter Grade Only
Repeatability:	Not Repeatable

Student Learning Outcomes

- Critique and distinguish relevant sectional anatomy and pathology related to magnetic resonance imaging
- Demonstrate proper equipment manipulation and assist in the performance of magnetic resonance imaging procedures, applying appropriate patient care and magnetic safety principles in the clinical setting

Description

Continuation of R T 71A, with emphasis on patient safety in the MRI clinical environment, pelvic procedures, and musculoskeletal procedures.

Course Objectives

The student will be able to:

1. Demonstrate knowledge in magnet safety for the patient, personnel, and self.
2. Demonstrate application of knowledge and understanding in the proper use of the MRI equipment.
3. Adhere to standards of attendance, punctuality, and dependability.
4. Conduct themselves in a professional manner.
5. Apply theory to practice by exhibiting ongoing, satisfactory job performance skills.
6. Select proper scanning techniques and patient positioning as outlined by the department protocols.
7. Demonstrate knowledge and application of various patient care techniques.
8. Differentiate anatomy and pathophysiology as it relates to MR imaging, with an emphasis on pelvis and musculoskeletal procedures.
9. Critique and evaluate MR images for good diagnostic quality.

Course Content

1. Safety issues in MRI
    a. MRI screening and safety
        i. Screening and education
            1. Implants
            2. Ferrous foreign bodies
            3. Medical conditions
            4. Prior procedures
            5. Topical or externally applied items
    b. Electromagnetic fields
        i. Static field
        ii. Radiofrequency field
        iii. Gradient field
    c. Equipment
        i. Placement of conductors
        ii. Cryogen safety
        iii. Ancillary equipment
    d. Environment
        i. Climate control
        ii. Designated MR safety zones
        iii. Gauss lines
        iv. Emergency procedures
2. Physical principles of image formation
    a. Instrumentation
        i. Electromagnetism
        ii. Static magnet
        iii. Radiofrequency (RF) system
        iv. Gradient system
    b. Fundamentals
        i. Nuclear magnetism
        ii. Tissue characteristics
        iii. Spatial resolution
    c. Artifacts
        i. Aliasing
        ii. Gibbs
        iii. Chemical shift
        iv. Chemical misregistration
        v. Magnetic susceptibility
        vi. RF
        vii. Motion and flow
        viii. Partial volume averaging
        ix. Cross-talk
        x. Cross-excitation
        xi. Moire pattern
        xii. Parallel imaging artifacts
        xiii. Eddy current
        xiv. Dielectric effect
    d. Quality control
        i. Slice thickness
        ii. Spatial resolution
        iii. Contrast resolution
        iv. SNR (signal to noise ratio)
        v. Center frequency

vi. Transmit gain
vii. Geometric accuracy
viii. Equipment inspection

3. Punctuality and dependability
   a. Clinic time reporting
   b. Absenteeism
   c. Communicating whereabouts appropriately
4. Professional conduct
   a. Taking initiative
   b. Communicating effectively
   c. Conducting oneself in a professional manner
5. Job performance
   a. Scanning according to protocol
   b. Planning and organizing work efficiently
   c. Being alert and interested in examinations
   d. Reading and understanding requisition
   e. Communicating effectively
   f. Completing exam in a reasonable amount of time
6. Scanning techniques
   a. Patient positioning
   b. Pulse sequences
   c. Coil selection
   d. Documentation of procedure
   e. Imaging parameters
      i. Repetition time
      ii. Echo time
      iii. Inversion time
      iv. Number of signal averages
      v. Flip angle
      vi. Field of view
      vii. Matrix
      viii. Pixel
      ix. Voxel
      x. Number of slices
      xi. Slice thickness
      xii. Phase and frequency
      xiii. Echo train length
      xiv. Effective echo time
      xv. Bandwidth
      xvi. Concatenations
      xvii. B-value
      xviii. Velocity encoding
   f. Image contrast
      i. T1 weighted
      ii. T2 weighted
      iii. PD weighted
      iv. T2* weighted
      v. Diffusion weighted imaging
      vi. Susceptibility weighted imaging
   g. Imaging options
      i. 2-D and 3-D
      ii. Slice order
      iii. Spatial saturation pulse/band
      iv. Gradient moment nulling
      v. Suppression techniques
      vi. Physiologic gating and triggering
      vii. In-phase and out-of-phase
      viii. Rectangular field of view
      ix. Anti-aliasing
      x. Parallel imaging
      xi. Filtering
7. Patient care
   a. Patient Interactions and management
   b. Requisition/medical record evaluation
   c. Room preparation
   d. Patient assessment
      i. Patient history/allergies
      ii. Physical assistance and monitoring
         1. Patient transfer techniques
         2. Sedated patients
         3. Claustrophobic patients
      iii. Medical emergencies
   e. CDC standard precautions
   f. Infection control
   g. Patient discharge/post-procedure instructions
8. Procedures
   a. Pelvis
      i. Soft tissue pelvis (e.g., bladder, rectum)
      ii. Female soft tissue pelvis
      iii. Male soft tissue pelvis
      iv. Vascular penis
   b. Musculoskeletal
      i. Temporomandibular joints
      ii. Sternum
      iii. Sternoclavicular joints
      iv. Shoulder
      v. Long bones (upper extremity)
      vi. Elbow
      vii. Wrist
      viii. Hand
      ix. Fingers (non-thumb)
      x. Thumb
      xi. Bony pelvis
      xii. Hip
      xiii. Long bones (lower extremity)
      xiv. Knee
      xv. Ankle
      xvi. Foot
      xvii. Arthrogram
      xviii. Vascular extremities
      xix. Soft tissue (e.g., tumor, infection)
9. Image display/quality
   a. Data acquisition, processing, and storage
      i. Spin echo
      ii. Inversion recovery
      iii. Gradient echo

iv. Echo planar imaging
v. Diffusion weighted imaging
vi. Susceptibility weighted imaging
vii. Perfusion
viii. Spectroscopy

b. Data manipulation
i. K-space
ii. Fast Fourier transformation
iii. Nyquist theorum
iv. Postprocessing

c. Informatics
i. Hard/electronic copy
ii. Archive
iii. Picture archiving and communication system (PACS)/medical image management and processing system (MIMPS)
iv. Security and confidentiality
v. Networking

Lab Content

1. Radiologic technology (magnetic resonance imaging) clinical practice
   a. Imaging procedures
   b. Data acquisition
   c. Data processing
   d. Physical principles of image formation
   e. Patient care and safety in a clinical setting

Special Facilities and/or Equipment

1. Clinical setting: magnetic resonance imaging equipment.
2. Computer/internet access for online component.

Method(s) of Evaluation

Methods of Evaluation may include but are not limited to the following:

Presentation project: case study
Clinical performance evaluation

Method(s) of Instruction

Methods of Instruction may include but are not limited to the following:

Discussion
Demonstration
Clinical practice

Representative Text(s) and Other Materials

Westbrook, Catherine. Handbook of MRI Technique. 2021.

Westbrook, Catherine, and John Talbot. MRI in Practice. 2018.

Hashemi, Ray. MRI The Basics. 2017.

Although some of these texts are older than the suggested "5 years or newer" standard, they remain seminal texts in this area of study.

Types and/or Examples of Required Reading, Writing, and Outside of Class Assignments

1. Reading assignments as required by the Magnetic Resonance Imaging department.
2. Presentation of a case study.

Discipline(s)

Radiological Technology