Radiology Clerkship Student

Greetings:

Please find attached to this cover memo, the MSU Radiology Clerkship curriculum. The document should be reasonably self-explanatory.

This curriculum is extremely flexible consisting of 16 online education modules as well as access to an educational web site hosted by the MSU Department of Radiology that will offer other resources to assist you obtaining the maximum value from your radiology rotation.

You will be asked to participate in a brief pre-test and post-test. As well we would like you to prepare a short presentation to be given members of the faculty at your facility. Please forward a copy of that presentation to Dr. Aben in East Lansing (aben@msu.edu).

A suggested outline schedule is provided based on the experience that we provide here at MSU for the rotation. Please feel free to use this as a guide or to modify as needed to meet the needs of your facilities resources.

We do suggest several texts as indicated in the curriculum. There are coordinated reading assignments in those texts. Hopefully the department where you are taking the rotation will make those texts available to you as a resource. If not available, please avail yourself of other texts reading similar content (content of the suggested readings is included in the documents). We also suggest suitable ACR digital teaching file references for you to review during your rotation. If the ACR files are not available in your facility, the listing can be used as a guide for you as you pursue the abundant imaging resources available on the internet.

Your feedback regarding the curriculum would be appreciated so that I can work to revise and tweak the program to meet the needs of all the students participating in the RAD 609 experience.

Regards:

Gerald R. Aben, MD, FACP
Course Director
RAD 609 – MSU Radiology Clerkship
Course Syllabus

Gerald R. Aben, MD FACR
Associate Professor
Department of Radiology
Michigan State University
1. **Educational Purpose and Goals**
   Students must have the opportunity to improve their understanding of the radiological aspect of medicine. The purpose of this rotation is to familiarize the student with common radiological investigational modalities, their indications and basic interpretation. They are expected to gain an understanding of the most appropriate use of radiological examinations in patient management including sequence of examinations, monetary costs, patient inconvenience and discomfort. Additionally the student will develop an understanding of the impact of diagnostic imaging on the patient and society.

2. **Principal Teaching Methods**
   A. Students will rotate in the designated radiology department for the designated time of the rotation.
   B. Daily assignments involve observing clinical work in the department, review of the components of a cross campus 16 unit on-line course, utilization of; departmental library, MSU library, book, periodical, and digital resources
   C. Weekly Seminars and Lectures – Attend appropriate conferences within the institution where radiology content may be presented in discussed. (i.e. Grand Rounds, Tumor Board, CPC, M&M Conferences, Radiology Conference etc.
   D. Students may participate in the Tuesday Didactic session in East Lansing if approved by the supervising radiologist.
   E. Students will observe plain film Conventional Radiology (CR) images, Ultrasonograms, Computed Tomography (CT) scans, Magnetic Resonance Imaging (MRI) images and Nuclear Medicine (NM) and Positron Emission Tomography (PET) scans where available. Additionally, the students may observer the performance of the actual scans and procedures that may take place in the department. The student will observe interpretations as performed by attending radiologists, fellows, and residents dependent on resources in the designated radiology department.

3. **Educational Content**
   A. Mix of diseases: The disease mix includes all patients, inpatient and outpatient, who are undergoing radiological testing.
   B. Patient characteristics: Radiology cases include both outpatient and inpatient cases as determined by the patient mix at the host department. Demographic and ethnic mix approximates that of the local community. The extensive socioeconomic diversity of the various participating institutions and patient populations support a stimulating training experience with broad diagnostic challenges.
   C. Learning venues: Each of the participating radiology departments provides a stimulating and balanced exposure to the patients in that community.
   D. Procedures: The types of radiological examinations and procedures available for observation are listed below:
      - Chest X-Rays
      - Computed Tomography
      - Magnetic Resonance Imaging
      - Ultrasonography
      - Nuclear Imaging
      - Positron Emission Tomography(not available at all sites)
      - Fluoroscopy
E. Ancillary individuals interacted with may include residents, fellows, technologists, and staff.
F. Duration: The rotation is intended for a 2-4 week block.
G. Structure: Typically 8 AM to 5 PM daily. The assignment may vary according to the individual departments’ clinical schedule. A schedule of daily assignments will include at minimum:
   • Clinical time 5 days a week.
   • Reading educational materials with daily assignments
   • Viewing of the MSU Radiology On-line module series and other on-line resources such as the Harvard University Radiology online teaching series and the RSNA resources for medical students.
   • Attend hospital and department conference including interdisciplinary and radiology specific conferences.
   • Students are expected to continue to attend any mandatory conferences and didactic sessions of their college during the rotation.

4. Principal Ancillary Educational Materials
   A. Textbooks from which selected reading are assigned: (or suitable alternatives as suggested by on site faculty)
      • Felson’s Principles of Chest Roentgenology, A Programmed Text, Third Ed. by Lawrence R. Goodman
      • Essential Radiology, Second Edition by Richard B. Gunderman
      • Clinical Radiology, The Essentials, Third Edition by Richard H. Daffner
      • Chest, Abdomen, Bone and Clinical Skills, A Problem-Based Text, Third Edition by Amorosa, Novelline, and Squire.
   B. Textbooks, current radiology periodicals, and digital teaching series will be available in the onsite Radiology library and may vary somewhat by site.
   C. Full service, extended hour, libraries are present at Michigan State University with onsite medical librarians, web-based searchable medical databases, and standard medical journals in both print and electronic formats. In addition, all MSU students have 24-hour access to the extensive online Michigan State University electronic library, including databases and electronic journals.

5. Methods of Evaluation
   The radiologist supervising student education at each host department completes standard evaluations in place for the clerkship rotations.

6. Testing- and evaluation
   A. Pre-test at the beginning of the rotation (On-Line Association of Association of Medical Students in Radiology AMSER exam to be replaced by a MSU Desire to Learn Exam(pending))
   B. Competency test at the end of the elective. (AMSER or Desire to Learn(pending))
   C. Mandatory radiology related PowerPoint presentation to be presented as appropriate at the host department and submitted to the MSU Radiology Department education coordinator for review.

7. Rotation Specific Competency Objectives
   A. To increase the student's knowledge of the various diagnostic imaging modalities offered by a modern radiology department and achieve a better understanding of how to select and sequence the appropriate imaging examinations for specific clinical presentations.
   B. To gain additional insight into how diagnostic imagings fits into the multidisciplinary approach to patient care and understand the importance of communication, professionalism, and teamwork between clinicians and radiologists relating to patient management.
C. To offer the student the opportunity to observe diagnostic imaging exams, instill sensitivity towards the patient's needs and apprehension about particular procedures and discuss the results and interpretation with the radiologist.

D. To encourage correlation of diagnostic images with previously learned normal and pathologic anatomy and pathophysiology.

E. Increase the student's understanding and recognition of common processes and pathology available from diagnostic images.

F. Introduce students to the indications, contra-indications, patient preparation, post-procedure care, and relative radiation exposure for various diagnostic imaging exams.

G. Know the relative costs of different diagnostic imaging exams and be able to plan and sequence patient exams that optimizes outcome and cost-effective patient care.

H. Increase the students understanding of image digitization, how variables in digitization influence resolution and the computer's impact on diagnostic imaging (PACS).

8. **RAD 609 Curriculum Access** (MSU Desire to Learn Pending)
   A. [http://connect.rad.msu.edu](http://connect.rad.msu.edu)
   B. Self registering site – student to create own login and password
   C. Access to the MSU Radiology Specific content and links to other on-line resources from this website
Chest

Pre-test Exam:
http://radiology.examweb.com or

MSU Desire to Learn (pending)

Clinic 2-6 hours daily (site dependent)

Radiology Educational Website:
- Chest Modules 1 - Intro (Dr. Gerald Aben)
  2 - Inflammatory Processes
  3 - Neoplasms and Tumors
  4 - Cardiovascular System

Review ACR Chest CD*
- Normal variants
- Pulmonary infection
- Neoplasms and tumors
- Pleural, Cardiac diseases
- Pediatric chest

Text Readings Assignments
Chapters 1-10 / Felson - Chest
- The Radiographic Examination
- Cross-Sectional Imaging Techniques
- The Normal Chest X-Ray: Reading Like the Pros
- Chest CT: Putting It Together
- Lobar Anatomy
- The Silhouette Sign
- The Air Bronchogram Sign
- Signs of Lung and Lobar Collapse
- Patterns of Lung Disease
- The Mediastinum
- The Pleural and Extrapleural Spaces
- Cardiovascular Disease

Chapters 4, 5, 7 / Daffner
- Pulmonary Imaging
  Anatomy
  Pathology
- Air Space Disease
- Atelectasis – Collapse
- Pleural Fluid Accumulation – Effusion
- Masses
- Emphysema
- Interstitial vs. Acinar Disease
- Pneumothorax

Pulmonary Embolus
Post-surgery
Newborn Disorders

Cardiac Imaging
Abdominal Radiographs
Physiologic abnormalities
Abnormalities
- Gas and mucosal patterns
- Soft tissue images
- Calcifications
- Ascites
- Bone and Joint
Postoperative
- Lung surgery
- Cardiac surgery
- Esophageal surgery
- Mastectomy
- Other: radiation, AIDS-related, tuberculosis, Adult respiratory distress syndrome
- Pediatric
  - Upper airway obstruction
  - Disorders of newborns
  - Bronchiolitis
  - Asthma

Chapter 1 / Gunderman
Introduction to Radiology
- Visual characteristics of images
- Three modes of image production
- Contrast agents
- Angiography
- Interventional radiology
- Principles of medical imaging
  - Clinical context of medical imaging
  - Uncertain, low probability of pathology
  - Known diagnosis
  - Confirming or Disconfirming a hypothesis
  - Radiological thought process
  - Detection
  - Description
  - Differential diagnosis (CITIMIITV)
    - Congenital
    - Inflammatory
Tumorous
Infectious
Metabolic
Iatrogenic
Traumatic
Neoplastic
Traumatic
Vascular
Radiologic error
Abdomen (GI/GU)

Clinic 2-6 hours daily (site dependent)

Radiology Educational Website:
- GI/GU Online Modules 1 – Inflammatory Processes
- 2 - GI Evaluation
- 3 - Hepatobiliary
- 4 - Kidney, Ureter, Bladder (IUB), Calculi

Review ACR GI CD*
- Plain film
- Pharynx
- Esophagus
- Stomach
- Small intestine
- Colon, rectum
- Biliary tract
- Liver/Spleen/Pancreas

Text Readings Assignments
- pp. 88-95, 120-137 / Squire
- Abdominal pain, distension, constipation, Masses, fever, elevated white count, nausea, vomiting, decreased peristalsis
- Chapters 8, 9 / Daffner

Review ACR GU CD*
- Renal transplantation
- Vesicoureteral reflux

Chapter 4 / Gunderman - The Digestive System
- Anatomy
- Basic patterns of gastrointestinal tract abnormalities
  - Filling defects
  - Polyps
  - Masses
  - Intrinsic wall abnormalities
  - Extraluminal projections
    - Ulcers
    - Diverticula
    - Distention
    - Narrowing
- Endoscopy versus radiology
- Select Pathologies
  - Esophagus
  - Stomach
  - Small Bowel
  - Colon and rectum
- Solid organs of digestion
  - Liver
  - Pancreas
- Abdominal trauma

Review ACR GU CD*
- Renal disease - adult, pediatric
- Prostate disease
- Male external genitalia
- Adrenal
- Pediatric lower urinary tract
- Retroperitoneum
- Gynecologic disease

Text Readings Assignments
- pp. 96-119, 150-171 / Squire, Abdominal Pain
- Chapter 11 / Daffner, Musculoskeletal Imaging
  - Fracture
  - Arthritic conditions
  - Pathologic categories
Musculoskeletal

Clinic 2-6 hours daily (site dependent)

Radiology Educational Website:
Musculoskeletal Modules 1-4
  Normal bone radiographs
  Bone scan
  MRI
  Bone fractures
  Bone tumors and tumor-like conditions
  Arthritis and aging
  Normal bone and ossification
  Fractures in children

Review ACR Musculoskeletal CD*
  Trauma
  Arthritis
  Tumors
  Metabolic
  Congenital

Text Readings Assignments
pp. 173-229 / Squire
  Arthritis
  Bone
  Lesions
  Soft tissues
Chapter 13 / Daffner, Vertebral Imaging
  Anatomy
  CT, MR, and plain imaging
Abnormalities
  Developmental
  Degenerative and arthritic
  Traumatic
  Neoplastic
  Infectious
  Postoperative
Chapter 8 / Gunderman - The Musculoskeletal System
  Technical
    Radiography
    CT
    MR imaging
    Myelography
    Diagnostic ultrasound
    Discography
    Nerve blocks
Abnormalities
  Same as in Daffner, Ch 13, above
Head & Neck, Pediatrics, US

Clinic 2-6 hours daily (site dependent)

Radiology Educational Website
   Head and Neck Module 1, 2
   Neuroradiology Module 4 - Neurological evaluation

Review ACR Head and Neck CD*
   Sinus
   Orbit
   Mouth & salivary
   Dental & mandible
   Neck
   Nasopharynx

Text Reading Assignments
Chapters 9  Gunderman – Neuroimaging
   Anatomy and physiology
   Imaging
      Modality
      T1 and T2-weighted MRI
      Contrast enhancement in CT and MRI
      Search Pattern in MRI
   Pathology
      Congenital
      Inflammatory
      Tumorous
      Infectious
      Traumatic
      Vascular
      Low back pain

Review ACR Neuroradiology CD*
   Spine and cord
   Vascular
   Neoplasms
   Infections/Inflammatory
   White matter, degenerative
   Congenital/developmental
   Trauma
   Skull and scalp

Radiology Educational Website
   PEDS Module 4
      Spine evaluation
      Neurological evaluation
      Facial and neck abnormalities
      Pelvic and ultrasound

Review of ACR Pediatric CD*
   Chest

Text Readings Assignments
Chapter 10 / Gunderman - Pediatric Radiology
   Circulatory System, Congenital Heart Disease
   Respiratory System
      Neonatal Respiratory Distress
      Childhood Respiratory Distress
   Nervous System
      Neonatal Intracranial Hemorrhage
   Abdomen
      Acute Abdomen
      Masses
   Musculoskeletal System
      Developmental Dysplasia of the Hip
      Trauma
      Rickets
      Child Abuse
   Urinary Tract
      Infection

Final Examination
http://radiology.examweb.com

Desire to Learn (in development)

*or equiv. material utilizing site resources or internet
Radiology Clerkship 609 Curriculum Resources

Connect Radiology Education website: https://connect.rad.msu.edu/

MSU Desire to Learn RAD 609 Course – Pending

American College of Radiology CD-Rom Series Learning Files. (Disks are no longer available, must subscribe online.)

Recommended Texts: (or other suitable texts as recommended by faculty at each individual site)


Alliance of Medical Student Educators in Radiology
http://radiology.examweb.com
Create an account in the Welcome page. Current code is 4SPARTAN.

Supplementary material

Lieberman’s Interactive Tutorials in Radiology at
http://www.bidmc.org/MedicalEducation/Departments/Radiology/MedicalStudents.aspx