What Topics Are Essential in Teaching Medical Imaging?

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Learning Objectives

• At the conclusion of this live activity, participants will be able to:
  1. Describe the topics for medical student radiology education identified as essential in the medical literature.
  2. Debate those topics which should be essential in teaching radiology to medical students.
(adjective)
Date: 14th century
1. of, relating to, or constituting essence: inherent
2a. of the utmost importance: BASIC, INDISPENSIBLE, NECESSARY
   synonyms – fundamental

(noun)
Date: 15th century
1. something basic
2. something necessary, indispensable, or unavoidable
Why is this important?

- Radiology is integral to clinical management and it’s role continues to expand as fast as new technologies grow
- Radiology is not a required core clerkship in most US medical schools
  - 1994 Survey:
    - less than 1/3rd of responders indicate radiology clerkships were mandatory\(^1\)
  - 2000 Survey\(^2\):
    - 13 (26%) of 46 schools have required core radiology clerkship
  - 2010 Survey\(^3\):
    - 39 (25%) of 139 Allopathic and Osteopathic US medical schools require radiology as a standalone course during clinical years (curriculum data)

\(^2\)Samuel S and Shaffer K. Profile of Medical Student Teaching in Radiology: Teaching Methods, Staff Participation, and Rewards. Acad Radiol 2000;7:868-874
\(^3\)Poot Jd, Hartman MS, Daffner RH. Understanding the US Medical School Requirements and Medical Students’ Attitudes about Radiology Rotations. Acad Radiol 2012;19:369-373.
“Educational opportunities must be available in a medical education program in multidisciplinary content areas (e.g., emergency medicine, geriatrics) and in the disciplines that support general medical practice (e.g., diagnostic imaging, clinical pathology).”

http://www.lcme.org/standard.htm
Literature Review

• Recommendations/guidelines/curricula from individual institutions and by medical societies

• Surveys
  – Radiologists/Radiology educators
  – Non-radiologists/Clinicians
  – Trainees (medical students)

• Individual opinions/editorials
Players

- Radiologists
- Non-radiology physician colleagues/referring physicians
- Medical students
National Medical Student Curriculum in Radiology

Core radiology topics

1. Physics concepts important to the clinician
2. Limitations of modalities
3. Contrast media
4. Orientation to radiology department
5. Radiation safety and risks
6. Imaging in pregnancy and breast feeding
7. Other “risks” of radiology
8. Financial costs

Detailed organ-based curricula (Chest, abdominal, MSK, IR, emergency radiology, women’s imaging, neuroimaging, nuclear medicine, pediatrics)

• Technical aspects
• Normal anatomy
• Pathological conditions
• Invasive procedures
• Imaging algorithms
“Essential” Topics

- Appropriateness in selecting imaging exams
  - ACR Appropriateness Criteria
- Basic radiologic principles and physics
- Communication
  - Adequate clinical history
- Contrast agents
- Costs of imaging/Cost effectiveness
- How to access radiology and reporting systems (e.g., PACS)
- Imaging interpretation skills
  - System for viewing CXR, abdomen and bone films, abd/pelvis US, CT
  - Urgent, life-threatening, “Don’t Miss” findings
  - Common “Must see” findings
- Importance of radiologists as consultants and part of the clinical team
- Radiology of diseases
- Radiologic anatomy
- Radiation safety/protection
- Radiologic techniques
  - Common clinical uses
  - Limitations of imaging
- Utility of image-guided procedures
- Utilization of radiology department
- Vocabulary of imaging (image orientation, radiology reports)
Appendix 6: Clinical Testing

The ability to select, justify and interpret selected clinical tests and imaging

Generally, the preclerkship student should perform the following skill objectives at an advanced beginner or proficient level in the interpreter role.

By the end of the preclerkship curriculum, the medical student should be able to:

<table>
<thead>
<tr>
<th>*Competency Goals</th>
<th>Skill Objectives</th>
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<tbody>
<tr>
<td>Select &amp; justify clinical testing</td>
<td>Describes the components and clinical relevance of the following basic tests:</td>
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<tr>
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<td>- complete blood count and differential</td>
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<td>Identifies common disorders that are associated with abnormalities in these tests using references.</td>
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<td>Demonstrates proper use of test ordering in common case-based scenarios</td>
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<td>Identifies the components of routine urinalysis and lists normal findings</td>
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<td>Describes normal and selected abnormal finding on a blood smear</td>
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<td>Describes observations of a specimen gram stain</td>
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</table>

<table>
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<tr>
<th>Interpret selected clinical tests and imaging</th>
<th>Interprets pulse oximetry</th>
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<tbody>
<tr>
<td><em>Demonstrates an organized approach to interpreting:</em></td>
<td><em>Interprets a normal electrocardiogram (rate, rhythm, intervals, axes and wave forms)</em></td>
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<tr>
<td>• a normal chest xray</td>
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<tr>
<td>• an abdominal xray including identification of normal bony, soft tissue and solid organ structures</td>
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<tr>
<td>• normal limb x-rays</td>
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Recommendations for Clinical Skills Curricula for Undergraduate Medical Education

Clinical Skills Taskforce Organizations:

- AAMC (Association of American Medical Colleges)
- AAPP (American Academy on Physician & Patient)
- ACE (Alliance for Clinical Education)
- ADMSEP (Association of Directors of Medical Student Education in Psychiatry)
- APGO (Association of Professors of Gynecology & Obstetrics)
- ASE (Association for Surgical Education)
- AANS (American Academy of Neurological Surgeons)
- CDIM (Clerkship Directors in Internal Medicine)
- CNCD (Consortium of Neurology Clerkship Directors)
- AAN (American Academy of Neurology)
- COMSEP (Council on Medical Student Education in Pediatrics)
- STFM (Society of Teachers of Family Medicine)
- Cardiovascular
  - Chest x-ray interpretation (5,6,8)
  - Central venous catheter placement (5)

- Gastrointestinal
  - Paracentesis technique (5)
  - Abdominal plain x-ray interpretation (5,6)
  - Barium swallow result interpretation (5,6)
  - Abdominal ultrasound result interpretation (5,6)
  - Abdominal CT result interpretation (5,6)
  - Abdominal MRI result interpretation (5,6)

- Musculoskeletal
  - Limb x-ray interpretation (incl epiphyses) (5)
  - Back x-ray (5,6)
  - Bone mineral density interpretation (4)
  - CT, MRI result interpretation (5,6)

- Neurological
  - Skull film interpretation (1,5)
  - CT, MRI basic interpretation (1,5)
  - Lumbar puncture

- Reproductive
  - Basic mammographic interpretation (4,5)
  - Interpret pelvic CT (5)
  - Interpret pelvic ultrasound (5)

- Respiratory
  - Chest x-ray interpretation (5,6,8)
  - Pleural aspiration (5)
  - Chest tube insertion (5)
  - Interpret pulmonary angio result (6)

- Renal/Urinary
  - Abdominal plain film (kidneys, bladder, stones) interpretation (5,6)
Appendix B: Mental & Physical Examination Skills Clinical Testing and Procedural Skills

- **Cardiovascular**
  - Chest x-ray interpretation (5,6,8)
  - Central venous catheter placement (5)

- **Gastrointestinal**
  - Paracentesis technique (5)
  - Abdominal plain x-ray interpretation (5,6)
  - Barium swallow result interpretation (5,6)
  - Abdominal ultrasound result interpretation (5,6)
  - Abdominal CT result interpretation (5,6)
  - Abdominal MRI result interpretation (5,6)

- **Musculoskeletal**
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- **Renal/Urinary**
  - Abdominal plain film (kidneys, bladder, stones) interpretation (5,6)

ANS=1 AAPP=2 ADMSEP=3 APGO=4 ASE=5 CDIM=6 CNCD=7 COMSEP=8 STFM=9
Some “Orphan” Topics

- Barium studies
- Breast imaging
- Nuclear medicine
  - PET/CT
  - Molecular imaging
- IR
- US Training
Barium Studies/GI

• Editorials
  – Future of GI fluoroscopy/barium radiology
  – Residency education
    • Teachers
    • Trainees
• Change in role of “luminal” GI radiology
  – Increase in morbid obesity in US resulting in increase in post-op leak evaluation (s/p bariatric surgery procedures)
  – CT and MR colonography AKA Virtual colonoscopy
  – Video esophagrams for evaluation of oropharyngeal dysphagia
    • Common in elderly; more widespread as population ages
  – Diagnostic workup of GI infections
    • Common in developing countries; non-Western world
Breast Imaging

• Society of Breast Imaging
  – ACR Breast Imaging Training Curriculum
    • Residency and fellowship training programs

• Controversies in screening recommendations

Women make up half of the population….what should we teach???
Nuclear Medicine

- Literature
  - Mostly articles on radiation safety awareness/knowledge/education
  - Feasibility study of internet e-learning nuclear medicine module
  - Society of Nuclear Medicine task force
    - Molecular imaging (PET/CT, SPECT, MR, US, etc.) curricula for graduate or professional students

- Functional multimodality imaging such as PET/CT provides platform to teach anatomy, physiology, and pathological processes
  - Way to use imaging to teach/reinforce basic sciences to medical students?
Interventional Radiology

• Literature
  – Awareness and perceptions of the specialty
  – Earlier exposure of students to IR
    • Increased awareness and improved perception of the specialty
    • Increased recruitment into the specialty?
  – SIR Educational exhibit and AUR poster: “Interventional radiology for the medical student: A novel curriculum”

• SARC (Student and Resident Committee) agenda
  – SIR equivalent of AMSER
  – Medical Student SIR Curriculum (not formally published)

• Alternate pathways
  – DIRECT
  – Clinical
  – Primary certificate

• Many of clinical skills recommended in the AAMC report performed by Interventional radiologists rather than surgeons or internists
Ultrasound Training

• Ultrasound used and taught by numerous non-radiology specialties
  – OB/GYN
  – Emergency medicine
    • ACEP recommendations for emergency ultrasound education in medical school
  – Cardiology
  – Surgery (FAST exam; intraoperative US)
  – Anesthesia
  – Internal medicine (thyroid, central lines)
  – Family medicine (AAA screening)
  – Vascular surgery (non-invasive vascular labs)
Ultrasound Training

- Point of care testing
- Teaching tool for anatomy, physiology, physical diagnosis skills
Ultrasound Training

- Point of care testing
- Teaching tool for anatomy, physiology, physical diagnosis skills
Ultrasound Training

• Numerous medical schools teaching ultrasound
  – Experience ranges to elective clerkships to integrated 4 year curriculum

• Co-sponsored the First World Congress on Ultrasound in Medical Education in 2011 with WINFOCUS (International organization)

• Partnership with AIUM
  • Plenary Session: “Medical Education: Ultrasonography as a Basic Clinical Competency”

• Update session at AAMC meeting

• 4 year Integrated Ultrasound curriculum published on website

www.susme.org
Summary

- Radiology is integral to clinical management and it’s role continues to expand as fast as new technologies grow
- Importance in clinical medicine not reflected in undergraduate medical education
- In the literature, general consensus by radiologists, nonradiologists, medical students of some topics
- Other topics are less clear/controversial to categorize as: “essential”; “important but not essential”, “elective”

> Ultimately the goal of teaching students about imaging is to provide them the skills and knowledge to help patients and provide the best patient centered care
References


3. Poot Jd, Hartman MS, Daffner RH. Understanding the US Medical School Requirements and Medical Students’ Attitudes about Radiology Rotations. *Acad Radiol* 2012;19:369-373


5. Gunderman RB, Stephens CD. Teaching Medical Students About Imaging Techniques. *AJR* 2009;192:859-861


References


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