

Goals and Objectives for Thoracic Radiology Rotation: R1

Nuts and Bolts

Rotation begins at 7:30 AM and goes until 5 pm. Please try to have reports drafted to the attendings by 4:30 pm, so that they have time to edit. Use the remaining 30 mins to review edits to your report and protocol cases. If all caught up please review cases from Chest Teaching File (this is something that cannot be done remotely).

Vacation and Absences: Please adhere to the Residency Program policy regarding requesting vacation and time off. For last minute and unforeseen absences, send an email to the relevant personnel (program director, chief residents, program coordinator) and scheduled Chest attending(s) for the day.

Clinical Responsibilities

Dictation: When starting a new rotation, it can be intimidating to know where to begin. Jumping in feet first is the only way to go. Taking the time to look at a study and make the relevant findings is important. However, seeing more cases will help train your radiologic eye and increase your knowledge base. Even in a monthlong rotation, most of the cases you read day to day will not cover the breadth of knowledge required. Increasing the volume of cases you read will increase the likelihood of finding a case worth a teaching point or discussion.

Helpful dictating tips when starting out:

- Check to see if attendings have preferred personal templates
- Know patient history and why the exam is being performed (cancer staging, nodule follow-up, shortness of breath, etc)
- Describe your findings in the body of the report
- Answer the clinical question in the impression
- Are there priors you should compare to?
 - Look for PETCT, Body CT, and Neck CTs (these studies capture parts of the chest)
 - If reading a Radiograph, is there a Chest CT to compare to?
- Draft cases to the attending. As an R1 you cannot prelim cases without first discussing with your attending
- If there is a critical finding, notify the attending so that there is not a delay in patient care (i.e. attending may ask you to alert the team that there is a pneumothorax while you are still dictating the case)

Protocols: In short, protocols are how CTs and MRs are performed. They can vary based on contrast usage and timing, patient positioning, and different sequences. The different protocols are designed to answer various clinical questions. All CT and MR studies must be protocolled. Residents are expected to keep an eye on the list and protocol studies in a timely manner. Stat inpatient and ED cases pop up throughout the day. If there are any questions, please first ask your senior resident for guidance. If they cannot answer or there is no senior resident, please ask the attending.

Occasionally a study is ordered where the correct protocol is not clear cut. This is a great learning opportunity. Ask yourself what is the dilemma from a radiology standpoint? Gather the relevant clinical information (why are they doing the study? what are the symptoms?) Have they had any prior imaging to address their concern (CXR was negative). Get the contact information (name and number) so that you can reach the ordering physician if needed. Synthesize all the information. Then present the case and propose a solution to the attending for a discussion.

PICC Confirmation: PICC access team will call the reading room to confirm placement of PICCs (peripherally inserted central catheters). Ask for assistance from either your senior resident or attending until you feel comfortable. Check with the attending for permission prior to confirming PICC placement independently. Complete the modules on CV Catheter Position and Complications on the website linked below.

https://www.radiologymasterclass.co.uk/tutorials/chest/chest_tubes/chest_xray_central_line_anatomy

Readouts: Always check in with your attending at the start of the day regarding their preferences. Most attendings will have you draft reports directly to their queue. Some attendings will do formal readouts with residents, especially at the beginning of your R1 chest rotation.

Education Curriculum

The amount of thoracic radiology knowledge is vast and constantly expanding. New or rare diseases may emerge and there is an ever-growing list of medical treatments and devices to recognize. Yet the length of radiology residency is unchanged, requiring residents to be intentional and diligent with their education.

During the 4-week rotation the general expectation is that residents are independently studying outside of clinical service hours. Learning that occurs during clinical service hours is not sufficient to prepare residents for the CORE examinations or independent practice (i.e. being an attending). PGY appropriate journal articles and books are recommended in another section. Required weekly videos are listed below. They can be accessed free of charge from the Society of Thoracic Radiology website. If the links do not work, access the Society of Thoracic Radiology

website and navigate to the Education section to find the Resident Boot Camp videos. No account or login is necessary.

The 4-week plan outlined below is meant to serve as a guide and not strict requirements. Residents will vary in their radiology experiences and progression. Some residents may move quickly while others with less experience may require more time. Additionally what studies residents interpret is also determined by the attending for the day and their expectations. If working with an attending for the first time, check with them to see what they would like you to focus on.

4-week R1 Curriculum

- Pre-rotation: Basic understanding of how to approach and interpret a Chest Radiograph (CXR) is essential prior to starting of the rotation. The Felson's textbook (linked below) is a great place to start. Additionally, there are 2 required videos to watch. Both are short and can easily be completed before the rotation.

Required Videos:

1. Cardiothoracic Anatomy: CXR with CT Correlation
<https://veritastv.org/programs/cardiothoracic-anatomy>
2. CXR – Lines, Stripes, and Interfaces
https://thoracicrad.org/?page_id=4360

- **Week 1:** Focus on PA and Lateral Chest Radiographs in the outpatient settings. Many of these examinations will be normal and performed with good technique.

- o **Goals: 15-25 CXR Per Day**

Required Videos:

1. Lateral CXR
<https://veritastv.org/programs/the-lateral-cxr>
2. CXR Mediastinum and Hilum
https://thoracicrad.org/?page_id=4364
3. CXR The Pleural Space
https://thoracicrad.org/?page_id=4441

- **Week 2:** In addition to outpatient CXR, begin to add CXR performed in the acute care setting. These will be the portable plain films from the ED and ICU. Early in the week start with CXR marked with an "I" for inpatient. Gradually incorporate CXR marked STAT from the ED. Confirm with your attending urgent findings and the need to communicate results to the provider.

- Goals: **20-30 CXR Per Day**

Required Videos:

1. ICU Imaging Primer
<https://veritastv.org/programs/icu-imaging-primer>
2. Portable CXR Acute Disease
<https://veritastv.org/programs/portcxracutedisease>
3. Postoperative Patient CXR and CT
<https://veritastv.org/programs/bootcampkavitha-yaddanapudi-bootcamp-yaddanapudi-910-final-vmp4-c9e23e?categoryId=33056>

- **Week 3:** Focus will be on outpatient Chest CTs. Aim for routine Chest CTs (with or without contrast). Feel free to ask the attending to assign cases. Familiarize yourself with CT anatomy. Begin to use proper descriptors and terminology for abnormal findings.

- Goals: **2-3 Chest CT and 10-20 CXR Per Day**

Required Videos:

1. The Fleischner Glossary
https://thoracicrad.org/?page_id=4445
2. CT Thoracic Lymph Nodes
https://thoracicrad.org/?page_id=4443
3. Solitary Pulmonary Nodules
<https://veritastv.org/programs/solitarypulmonarynodule>

Required Articles:

1. Fleischner Society: Glossary of Terms for Thoracic Imaging
<https://pubs.rsna.org/doi/full/10.1148/radiol.232558>

- **Week 4:** Focus will be on adding Chest CTs performed in the acute care settings. Aim read CT Pulmonary Embolus, CTA Aortas, and ED or Inpatient Chest CTs.

- Goals: **3-5 Chest CT and 15-25 CXR Per Day**

Required Videos:

1. STR Workshop Diagnosing Pulmonary Embolism on CT (this will take some time to complete)
https://thoracicrad.org/?page_id=5449
2. Pulmonary Edema Cardiogenic/Non-cardiogenic
<https://veritastv.org/programs/strbootcamp-session1-edmister>

3. Pulmonary Disease Pattern Recognition – Edema, Infection, Aspiration, Hemorrhage
<https://veritastv.org/programs/strbootcamp-session1-sharma>

Case Review and Interpretation

Pearls and Pitfalls

1. Priors: Always check to see if prior studies are available for comparison. Sometimes PACS will not autoload them.
2. Remote Priors: We often look at scans of patients who have had their diseases for many years, be it cancer or fibrosis. Be sure to look at their earliest scan to get a sense of what the disease looked like at the time of diagnosis. What did the lung cancer look like before it was taken out? Check eDH for the pathology to see what kind of cancer (adenocarcinoma or squamous). Was it FDG avid if a PET-CT was performed? What did their pulmonary fibrosis look like initially? How has the fibrosis progressed?
3. CX and CT Anatomy Correlation: Chest Radiographs are hard! When looking at a CT with an abnormality (nodule, pulmonary edema, etc), be sure to see if there was a CXR obtained around the same time. See if it's possible to make the finding on radiographs. If a Chest CT was obtained to evaluate for pneumonia, did they have a same day radiograph that questioned something? Use these opportunities to train your eyes on what can be hard to see findings.

Interdisciplinary Conferences

R1s are not required to attend multidisciplinary conferences. If there is interest, ask your attending to forward the email links to attend.

Comprehensive Thoracic Oncology Program (CTOP) occurs Tuesday from 8-9 am. Conference room will vary. Join via WebEx or in person (there's usually free food). If there is one Chest attending scheduled for the morning, we will often present cases remotely. WebEx link will be emailed the Monday before conference.

Interstitial Lung Disease occurs the 3rd Friday of every month from 12-1 pm. Given this conference overlaps with Resident Noon Conference, attendance is not required/expected.

Additional Resources

Articles: "Radiographics Top 10 Reading List" for Thoracic Imaging. Residents should aim to read the 10 "Basic" articles during the 4-weeks.

https://pubs.rsna.org/page/radiographics/rgteam/top10_thoracic

Books: “Felson's Principles of Chest Roentgenology, A Programmed Text” is a great first rotation book. This is an excellent place to start for all residents starting their chest rotation.

Videos: Videos are a great resource for quick didactic lectures that also incorporate image interpretation. These can often be of higher value than bullet point/summary type.

1. Resident Boot Camp videos on the STR website.
2. Medality website (access provided by residency).

Evaluation

No one test can accurately capture how residents are doing or assess their overall knowledge. Being a radiologist involves more than recalling facts and goes beyond image interpretation. Therefore, multiple metrics are used. Resident are assessed on their ability to meet Core Competencies described below. Additionally, please complete the thoracic imaging section of the RadExam in a timely manner at the end of the rotation.

Core Competencies

Patient Care

Skills/Goals

- Demonstrate basic knowledge of PACS, RIS, and (when available) VR utilization
- Select the correct protocol for diagnostic chest CTs based on clinical information and prior imaging results; this includes accurate data-gathering
- Knowledge of the items on the departmental lists of Critical Tests and Critical Findings pertinent to cardiothoracic imaging
- Understand indications for thoracic interventional procedures
- Recognize image quality problems for Quality Assurance and when images should be repeated /patient re-called due to technical inadequacy of images

Education/Objective

- Interactive participation with faculty in examination interpretation
- Aid technologist in performing the following safely and responsibly, using the ALARA principle
- View chest radiography in the Core
- View chest CT at the operator console

Medical Knowledge

Skills/Goals

- Understand the physical principles of chest radiography and CT
- Identify normal and normal-variant radiographic and cross-sectional chest anatomy, including cardiovascular structures
- Understand normal physiology and pathophysiology of pulmonary and cardiovascular systems
- Recognize appropriate positions for tubes, catheters, and other medical devices on chest radiography
- Recognize common conditions (e.g. collapsed lobe) and life-threatening conditions (e.g. tension pneumothorax) on chest radiographs
- Select special radiographic views (e.g. decubitus, lordotic, etc) and select special CT series (e.g. expiratory, prone, etc) when clinically appropriate for diagnosis and management
- Properly protocol non-contrast and contrast-enhanced chest CT examinations
- Understand how to estimate CT radiation dose from dose report

Education/Objectives

- Radiographics Top 10 Thoracic Imaging Articles (see above for link)
- Felson's Principles of Chest Roentgenology, A Programmed Text (required)
- Collins J, Stern RJ. Chest Radiology: the Essentials (advanced)
- Boxt L, Abbhara S. Cardiac Imaging: the Requisites. (advanced)
- Review articles related to cardiothoracic imaging in Radiographics and AJR.
- Attend noon conference didactic lectures
- View STR and Medality videos

Practice-Based Learning and Improvement

Skills/Goals

- Engage in self-directed education via a variety of available resources above and beyond assigned materials
- Synthesize assigned educational materials and discuss accrued knowledge with students and health care professionals in both formal presentation and informal venues, such as read-out session
- Demonstrate critical assessment of the scientific literature pertaining to chest radiology
- Apply principles of evidence-based medicine

Education/Objectives

- Use textbooks, peer-reviewed literature, on-line sources, as well as on-line sources specific to thoracic imaging
- Share good learning cases and missed diagnoses with others in the department
- Use the PACS based radiologic technologist QA folders to submit cases
- Consider doing a cardiac or thoracic imaging related QI project
- Demonstrate ability to search the literature according to the “EBM pyramid”

Interpersonal and Communication

Skills/Goals

- Generate a clear and concise report, containing all relevant information
- Review and incorporate attending feedback into reports in a timely manner
- Provide direct and rapid communication to referring providers or their appropriate representatives for critical, emergent, and important findings with supporting documentation in the dictated report (preferably) or in a separate eDH note
- Demonstrate verbal and non-verbal skills for effective listening to and speaking with physicians, families, and support personnel
- Demonstrate effective teaching of medical students, other trainees, or observers

Education/Objectives

- Review formal dictation evaluations
- Direct observation and participation in imaging consultation
- Feedback from technologists, providers, other staff

Professionalism

Skills/Goals

- Demonstrate altruism, compassion, honesty, integrity, confidentiality, and ethical behavior
- Demonstrate positive work habits including punctuality, timely report editing, and signage
- Demonstrate sensitivity and responsiveness to the cardiothoracic imaging needs and concerns of the individual patient

- Understand the broader societal ramifications and ethical principles surrounding decision-making with respect to the utilization and application of imaging examinations
- Demonstrate HIPAA compliance

Education/Objectives

- Direct observation
- Feedback from technologists, providers, other staff

Systems-Based Practice Skills

Skills/Goals

- Demonstrate ability to plan cost-effective imaging diagnostic workup and to plan cost-effective imaging surveillance

Education/Objectives

- Review consensus statements on Cardiac CT and MR
- Review ACR Appropriateness Criteria Cardiac and Thoracic imaging sections