Welcome to Cardiovascular Imaging (CVI) rotation. Trainees will gain experience in CT and MR based imaging of the heart and vascular system while being exposed to a wide variety of pathologies. Residents will be evaluated based on progress along the CVI Milestone spectrum. Competency based goals and objectives based on these benchmarks for each level of training are listed below. In addition, all trainees are expected to attend morning conferences and noon conference. As part of the IR division, residents on CVI are expected to attending Friday morning Vascular conference (7:30 am in the Orthopedics Conference Room, 5th floor Bed Tower).

On each CVI rotation, it is expected that the resident will progressively develop abilities in cardiovascular imaging interpretation and learn to manage relevant patient cases in the interventional radiology setting. Residents will learn the value of CT and MRI protocols including timing and rate of injection of intravenous contrast agents, slice thickness, reconstruction, cardiac gating, and phases of contrast. In this way, they will be trained to choose the correct protocol to answer the clinical question.

In is expected that residents will participate in the performance and interpretation of the full range of examinations covered on this rotation. They will learn indications and contraindications for contrast administration and to recognize and treat adverse reactions. They will learn to adjust protocols to fit individual patient needs. Residents will protocol all CVI studies and learn to dictate concise, clinically relevant reports and act as consultants to referring physicians.

Cardiac imaging goals and objectives will be sited separately.
Patient Care

1) Residents should be familiar with the relevant Criteria as developed by the American College of Radiology.

2) Residents should be able to prescribe appropriate CT and MRI vascular protocols.

3) Residents should be able to discuss and utilize basic radiation safety and utilize x-ray dose reduction measures (ALARA).

4) Residents should be able to discuss and utilize contraindications to IV iodinated based contrast materials as well as pre-treatment regimens and acute treatment of contrast reactions.

5) Residents should be able to gather appropriate clinical information relevant to patients’ imaging studies.

6) Residents should know when to ask for help when clinical questions exceed their knowledge.

Medical Knowledge

1) Residents should be able to identify normal CT and MRI anatomy of the chest, abdomen, pelvis and extremities.

2) Residents should be able to identify normal vascular variants that simulate disease and abnormal findings that are not clinically significant.

3) Residents should be able to discuss basics of CT versus MRI vascular imaging.

4) Residents should be able to identify urgent and emergent findings such as aortic dissections, aortic transections, enlarging aortic aneurysms, active extravasation, and arterial occlusions.

Practice Based Learning and Improvement

1) Residents should be able to use the online and written sources to confirm initial impressions and develop a differential diagnosis for observed findings.

2) Residents should keep a log (written or electronic) of interesting cases and missed diagnoses for later study and further reading.

Systems Based Practice

1) Residents should be able to access and utilize EPIC, PACS, the dictation system, hospital paging system and Internet to integrate knowledge and practice into a cohesive Radiology report that includes pertinent positives, pertinent negatives and a relevant differential diagnosis.
2) Residents will attend the weekly combined IR/Vascular surgery conferences.

Professionalism

1) Residents are expected to arrive to work on time and should not leave until work is finished.

2) Residents’ whereabouts should be known to others when not in assigned area and they should be available via pager.

3) Residents should cover other residents when circumstances require.

4) Residents are expected to attend and be prepared for Attending readout sessions except when excused for other educational commitments.

5) Residents are expected to maintain a professional demeanor, be thorough and complete, and see problems through to resolution.

6) Residents are expected to report emergent and urgent findings in a timely fashion.
   a) Report emergent findings directly and immediately. Always document the exchange of emergent information to the covering physician in the patient’s dictation.
   b) If a report is changed after review with attending, resident should dictate addendum, notify the requesting clinician of the change, and document in the patient’s dictation.

7) Residents are expected to set a good behavior and attitude example for other residents and medical students. They represent the section and department to outsiders.

8) Residents should teach other residents and students, as sharing knowledge is important both for others as well as their own learning.

Interpersonal Skills and Communication

1) Residents should develop and utilize skills of communication with Radiology attending staff, referring clinicians, fellow residents, radiology technologists, support staff and patients.

2) Residents should answer the phone promptly and courteously and identify themselves when answering the telephone.

Recommend Reading Material

- Common and Rare Collateral Pathways in Aortoiliac Occlusive Disease: A Pictoral Essay. AJR 197, September 2011.
- CT in Nontraumatic Acute Thoracic Aortic Disease: Typical and Atypical Features and Complications. Radiographics 23 October 2003
- Vascular Emergencies of the Thorax after Blunt and Iatrogenic Trauma: MDCT and 3-D Imaging. Radiographics 24 (5) September-October 2004
CVI Rotation 2 Goals and Objectives-Arranged by ACGME 6 Competencies

**Patient Care**

1) Residents should be familiar with the relevant Criteria as developed by the American College of Radiology.

2) Residents should be able to prescribe appropriate CT and MRI vascular protocols.

3) Residents should be able to discuss and utilize basic radiation safety and utilize x-ray dose reduction measures (ALARA).

4) Residents should be able to discuss and utilize contraindications to IV iodinated and gadolinium based contrast materials as well as pre-treatment regimens and acute treatment of contrast reactions. Residents should be familiar with alternative contrast agents, such as Feraheme for contrast-enhanced MRI in renal insufficient patients.

5) Residents should be able to gather appropriate clinical information relevant to patients’ imaging studies.

6) Residents should know when to ask for help when clinical questions exceed their knowledge.

**Medical Knowledge**

1) Residents should be able to identify normal CT and MRI anatomy of the chest, abdomen, pelvis and extremities.

2) Residents should be able to identify normal vascular variants that simulate disease and abnormal findings that are not clinically significant.

3) Residents should be able to discuss basics of CT versus MRI vascular imaging.

4) Residents should be able to identify urgent and emergent findings such as aortic dissections, aortic transections, enlarging aortic aneurysms, active extravasation, and arterial occlusions.

5) Residents should be able to identify common vascular pathologies such as DVT, vascular compression syndromes, vasculitis, aneurysms, and peripheral arterial disease and develop basic differential diagnoses when relevant.

6) Residents should be able to identify post-operative complications such as pseudoaneurysm, endoleaks, and occlusions/stenosis.

7) Residents should be able to interpret pre-planning imaging studies and provide useful surgical planning reports.

**Practice Based Learning and Improvement**
1) Residents should be able to use the online and written sources to confirm initial impressions and develop a differential diagnosis for observed findings.

2) Residents should keep a log (written or electronic) of interesting cases and missed diagnoses for later study and further reading.

**Systems Based Practice**

1) Residents should be able to access and utilize EPIC, PACS, Dictation system, hospital paging system and Internet to integrate knowledge and practice into a cohesive Radiology report that includes pertinent positives, pertinent negatives and a relevant differential diagnosis.

2) Residents will attend the weekly combined IR/Vascular surgery conferences (7:30 am Friday, Orthopedic Conference Room 5th Floor Bed Tower).

**Professionalism**

1) Residents are expected to arrive to work on time and should not leave until work is finished.

2) Residents’ whereabouts should be known to others when not in assigned area and they should be available via pager.

3) Residents should cover other residents when circumstances require.

4) Residents are expected to attend and be prepared for Attending readout sessions except when excused for other educational commitments.

5) Residents are expected to maintain a professional demeanor, be thorough and complete, and see problems through to resolution.

6) Residents are expected to report emergent and urgent findings in a timely fashion.
   a) Report emergent findings directly and immediately. Always document the exchange of emergent information to the covering physician in the patient’s dictation.
   b) If a report is changed after review with attending, resident should dictate addendum, notify the requesting clinician of the change, and document in the patient’s dictation.

7) Residents are expected to set a good behavior and attitude example for other residents and medical students. They represent the section and department to outsiders.

8) Residents should teach other residents and students, as sharing knowledge is important both for others as well as their own learning.

**Interpersonal Skills and Communication**
1) Residents should develop and utilize skills of communication with Radiology attending staff, referring clinicians, fellow residents, radiology technologists, support staff and patients.

2) Residents should answer the phone promptly and courteously and identify themselves when answering the telephone.

Recommend Reading Material

- Acute Traumatic Aortic Injuries: Posttherapy Multidetector CT Findings. Radiographics 30(4) July-August 2010
- Pathogenesis in Acute Aortic Syndromes: Aortic Dissection, Intramural Hematoma and Penetrating Atherosclerotic Aortic Ulcer. AJR 181 August 2003
- CT Diagnosis of Acute Mesenteric Ischemia from Various Causes. AJR 192 February 2009.
- CT and MRI in Disease of the Aorta. AJR 193 October 2009
- Thrombotic and Nonthrombotic Pulmonary Arterial Embolism: Spectrum of Imaging Findings. Radiographics 23(6) November-December 2003
CVI Rotation 3 Goals and Objectives-Arranged by ACGME 6 Competencies

**Patient Care**

1) Residents should be familiar with the relevant Criteria as developed by the American College of Radiology.

2) Residents should be able to prescribe appropriate CT and MRI vascular protocols.

3) Residents should be able to discuss and utilize basic radiation safety and utilize x-ray dose reduction measures (ALARA).

4) Residents should be able to discuss and utilize contraindications to IV iodinated and gadolinium based contrast materials as well as pre-treatment regimens and acute treatment of contrast reactions. Residents should be familiar with alternative contrast agents, such as Feraheme for contrast-enhanced MRI in renal insufficient patients.

5) Residents should be able to gather appropriate clinical information relevant to patients’ imaging studies.

6) Residents should know when to ask for help when clinical questions exceed their knowledge.

**Medical Knowledge**

1) Residents should be able to identify normal CT and MRI anatomy of the chest, abdomen, pelvis and extremities.

2) Residents should be able to identify normal vascular variants that simulate disease and abnormal findings that are not clinically significant.

3) Residents should be able to discuss basics of CT versus MRI vascular imaging.

4) Residents should be able to identify urgent and emergent findings such as aortic dissections, aortic transections, enlarging aortic aneurysms, active extravasation, and arterial occlusions.

5) Residents should be able to identify common and rare vascular pathologies such as DVT, vascular compression syndromes, vasculitis, aneurysms, and peripheral arterial disease and develop narrowed differential diagnoses when relevant

6) Residents should be able to identify post-operative complications such as pseudoaneurysm, endoleaks, and occlusions/stenosis.

7) Residents should be able to interpret pre-planning imaging studies and provide useful surgical planning reports.

8) Residents should be able to create clinically relevant, concise impressions.

9) Residents should be able to support diagnosis with reference material.
**Practice Based Learning and Improvement**

1) Residents should be able to use the online and written sources to confirm initial impressions and develop a differential diagnosis for observed findings.

2) Residents should keep a log (written or electronic) of interesting cases and missed diagnoses for later study and further reading.

**Systems Based Practice**

1) Residents should be able to access and utilize EPIC, PACS, Dictation system, hospital paging system and Internet to integrate knowledge and practice into a cohesive Radiology report that includes pertinent positives, pertinent negatives and a relevant differential diagnosis.

2) Residents will attend the weekly combined IR /Vascular surgery conferences (7:30 am Friday, Orthopedic Conference Room 5th Floor Bed Tower).

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   b) If a report is changed after review with attending, resident should dictate addendum, notify the requesting clinician of the change, and document in the patient’s dictation.

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8) Residents should teach other residents and students, as sharing knowledge is important both for others as well as their own learning.
Interpersonal Skills and Communication

1) Residents should develop and utilize skills of communication with Radiology attending staff, referring clinicians, fellow residents, radiology technologists, support staff and patients.

2) Residents should answer the phone promptly and courteously and identify themselves when answering the telephone.

3) Residents should use and respond appropriately to communication strategies developed by the department of defense patient safety program such as the two challenge rule, check-back, and CUS words.

Recommend Reading Material

- Between a Rock and a Hard Place: Clinical and Imaging Features of Vascular Compression Syndromes. Radiographics 32(1) January-February 2012
- Infected (Mycotic) Aneurysms: Spectrum of Imaging Appearances and Management. Radiographics 28(7) November-December 2008
- CT Diagnosis of Chronic Pulmonary Thromboembolism. Radiographics 29(1) January-February 2009
- Read all the ACR Appropriateness Criteria for appropriate conditions: https://acsearch.acr.org/list
**Suggested Textbook Reading**

- Vascular and Interventional Radiology. K Valji (relevant chapters for this rotation only)
- Vascular and Interventional Radiology: The Requisites. J Kaufman and MJ Lee. (relevant chapters for this rotation only)

**Additional Resources**

- Diagnostic Imaging: Cardiovascular. Suhny Abbara
- MRI and CT of the Cardiovascular System. Charles Higgins and Albert de Roos.