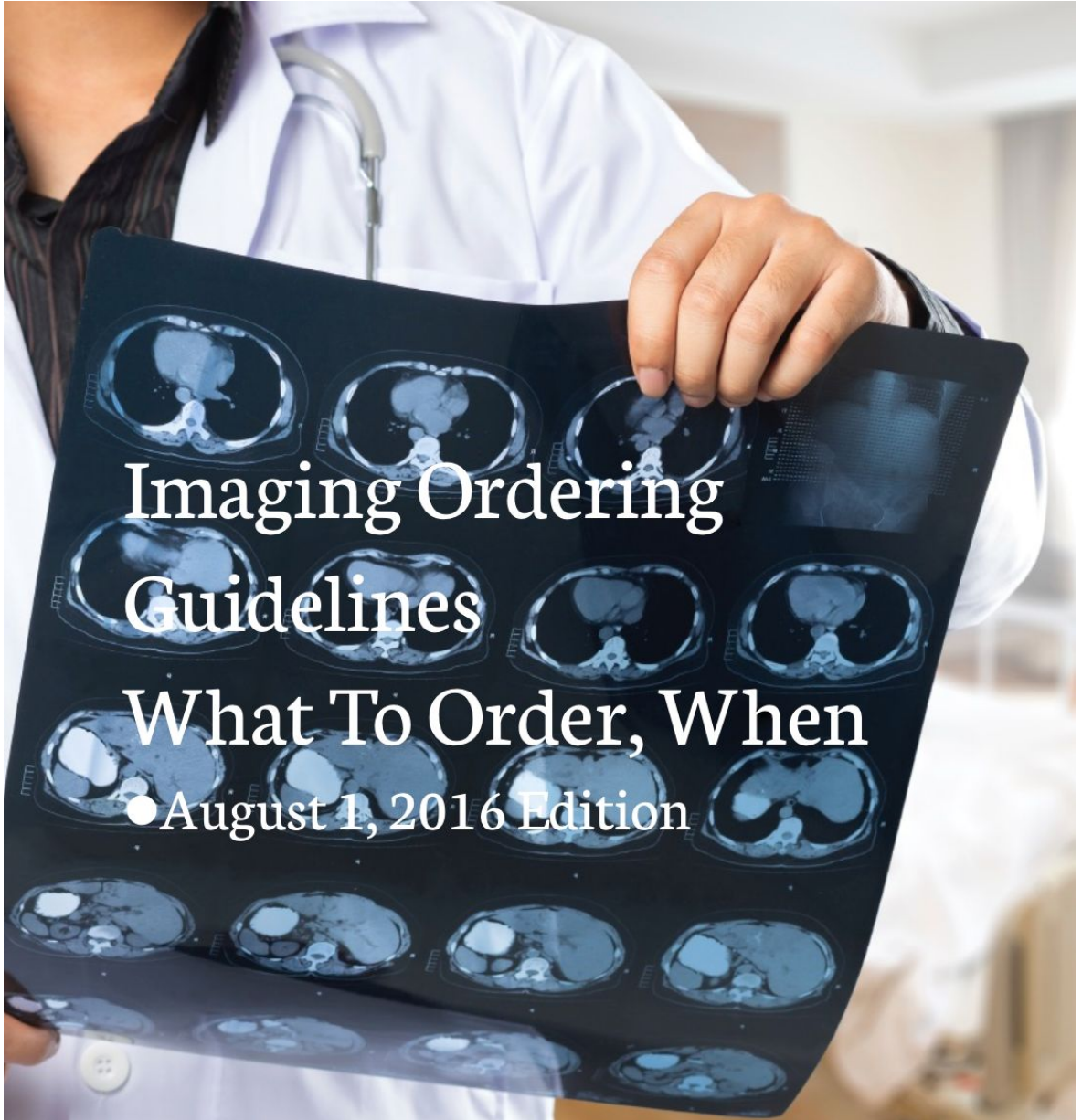




# CORA

CENTRAL OREGON  
RADIOLOGY ASSOCIATES



## Imaging Ordering Guidelines

## What To Order, When

● August 1, 2016 Edition

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# INTRODUCTION

These guidelines are written in an attempt to help you, the ordering physician, decide which imaging modality is best to evaluate specific clinical questions. They are in no way complete and there may be patients who will represent an exception to these guidelines.

**If you ever have a question about which imaging modality should be ordered, please do not hesitate to call us. We have provided a phone line that will allow providers to talk directly to a Radiologist. Please call CORA @ 541-382-6633 and select option #4 during normal business hours (Monday-Friday, 8 am – 5 pm) or contact us at: [cora.docs@cmillc.org](mailto:cora.docs@cmillc.org)**

## NOTES

# **CAPABILITIES & LIMITATIONS OF SPECIFIC IMAGING MODALITIES**

# **CAPABILITIES & LIMITATIONS OF SPECIFIC IMAGING MODALITIES**

## **Computed Tomography (CT)**

Imaging modality that uses ionizing radiation to give cross-sectional images that can then be reformatted in multiple planes

### Pros/Capabilities

- Is able to image bone, soft tissue and blood vessels all at one time
- Is fast and accurate and readily available; excellent for trauma, infection and tumor imaging
- Is a cost-effective imaging tool for a wide range of clinical problems
- High sensitivity for detecting bowel pathology and complications; hepatic, splenic, renal and pancreatic disease; intracranial hemorrhage; osseous trauma including occult fractures
- Can be used to detect and diagnose vascular diseases(CT angiography), aortic aneurysms
- Imaging of choice for pulmonary embolism; complex or chronic lung disease
- We use reduced dose techniques
- Less sensitive to patient movement than MRI

### Cons/Limitations

- Uses ionizing radiation (3-10 mSV for a CT abdomen and pelvis)
- IV contrast may be contraindicated in some patients
- Contrast resolution and tissue characterization not as sensitive as MRI
- Some patients may not tolerate enteric contrast
- Moderate cost

## **Ultrasound (US)**

Diagnostic sonography is an ultrasound-based diagnostic imaging technique used for visualizing internal organs and subcutaneous body structures including tendons, muscles, joints, and vessels.

### Pros/Capabilities

- Quick, readily available ,frequently initial screening exam for abdomen/pelvic pain
- NO IONIZING RADIATION
- Useful for evaluation of biliary disease; screening liver pathology; ascites; female gynecologic disorders; appendicitis (in thin patients and in pediatric population); small-bowel inflammation in Crohn's disease; hydronephrosis/renal failure; hernias; OB evaluation; vascular interrogation; superficial structures or masses; developmental dysplasia of the hip (in infants  $\leq 6$  months of age); sacral dimple (in infants  $\leq 6$  months of age); large heads or increased FOC (as long as the anterior fontanelle is open and large enough – usually until approx. 6 months of age)
- Less cost than CT or MRI

# **CAPABILITIES & LIMITATIONS OF SPECIFIC IMAGING MODALITIES**

## **Ultrasound (US) – continued**

### Cons/Limitations

- Operator dependent; may be inconclusive
- May be blind to many areas of the abdomen, particularly in the presence of obesity, increased bowel gas or free air

## **Magnetic Resonance Imaging (MRI)**

MRI is a medical imaging technique that uses a magnetic field and pulses of radio wave energy to make multi-planar images of organs and structures inside the body.

### Pros/Capabilities

- NO EXPOSURE TO IONIZING RADIATION
- Excellent detail for showing soft tissue structures, such as muscles, ligaments and cartilage; marrow process; and organs such as the liver, pancreas, kidneys, the neural axis (brain, spine, orbits, nerves) and heart.
- Imaging of choice for liver lesion characterization
- Can evaluate blood flow and CSF flow, MR angiography and cholangiography
- MR enterography is excellent for evaluation of inflammatory bowel disease (More sensitive than CT)

### Cons/Limitations

- Expensive; lack of availability at all locations 24 hours a day
- Contraindicated if patient has cochlear implants, cardiac pacemakers, shrapnel and metallic foreign bodies in the orbits, and some ferromagnetic surgical implants
- Highly sensitive to motion/movement so requires patient cooperation; much longer scan times; very loud
- Claustrophobic patients not able to tolerate or may require sedation
- Pediatric patients (under 6 years of age) will require sedation
- Nephrogenic systemic fibrosis (NSF) has been reported in patients on dialysis and rarely in patients with very limited GFR (less than 30) who have been given gadolinium-based IV contrast agents



## NOTES

**BODY IMAGING GUIDELINES –  
SUMMARY OF WHAT TO ORDER WHEN**

# **BODY IMAGING GUIDELINES – SUMMARY OF WHAT TO ORDER WHEN**

## **US ABDOMEN**

Suspected biliary disease

## **US RENAL**

Hydronephrosis

## **MRI ENTEROGRAPHY (ABDOMEN AND PELVIS WITH AND WITHOUT CONTRAST)**

Inflammatory Bowel Disease – *most sensitive*

## **MRI APPENDIX PROTOCOL WITHOUT CONTRAST**

Pregnant appendicitis

## **MRI APPENDIX PROTOCOL WITHOUT AND WITH CONTRAST**

Non pregnant patient

Appendicitis (pediatrics)

## **MRI ABDOMEN WITHOUT AND WITH CONTRAST**

Liver lesion characterization/detection

Renal lesion characterization

Pancreatic mass (solid/cystic)

Biliary obstruction (with MRCP) - suspect tumor

Cholangiocarcinoma

Pancreatitis (with MRCP) - acute, recurrent, chronic

## **MRI ABDOMEN WITHOUT**

Adrenal lesion characterization

Liver/renal/pancreas evaluation – GFR <30

Biliary obstruction (with MRCP) –choledocholithiasis

## **MR UROGRAM (WITHOUT CONTRAST)**

Pregnant patients - hydronephrosis

## **BODY IMAGING GUIDELINES – SUMMARY OF WHAT TO ORDER WHEN**

### **CTPA CHEST**

Pulmonary embolism

### **CT CHEST (HRCT)**

Interstitial Lung Disease, pneumonitis  
Indolent SOB with normal chest X-ray  
Emphysema / bronchiole disease

### **CT CHEST WITHOUT**

Pulmonary nodule follow-up  
Potential nodule on chest x-ray (per Radiologist)

### **CT CHEST WITH**

Medastinum abnormal on chest x-ray  
Oncology  
All other

### **CT ABDOMEN AND PELVIS W/IV AND ORAL CONTRAST**

Bowel Pathology  
Abdominal pain not otherwise specified

### **CT ADRENAL WITHOUT / WITH (radiologist discretion)**

Adrenal mass characterization

### **CT ABDOMEN AND PELVIS (ALLERGY TO IV CONTRAST)**

Premedication should be considered in all patients/refer to radiologist

### **CT ABDOMEN AND PELVIS W/IV CONTRAST ONLY**

Bowel Obstruction

*When oral prep cannot be tolerated*

### **CT ABDOMEN WITH IV CONTRAST (without per radiologist's discretion)**

Pyelonephritis, pancreatitis  
Pancreatic mass (*MRI more sensitive*)

## **BODY IMAGING GUIDELINES – SUMMARY OF WHAT TO ORDER WHEN**

### **CT ABDOMEN AND PELVIS WITHOUT IV CONTRAST**

Stones – renal/ureteral

### **CT UROGRAM**

Hematuria, painless

Urothelial neoplasm

### **CT ENTEROGRAPHY**

Inflammatory Bowel Disease

Intermittent obstruction

### **CTA AORTA (CHEST AND ABDOMEN)**

Aortic dissection/aneurysm

### **CHOLESCINTIGRAPHY**

Gallbladder dysfunction (GBEF)

Acalculous cholecystitis

Chronic cholecystitis

# **BODY IMAGING GUIDELINES**

# **BODY IMAGING GUIDELINES**

## **Patient Presents with Abdominal Pain**

### **1. Patients with Acute, Non-localized Abdominal Pain and Fever:**

#### **A. Non-pregnant adult patient:**

**CT ABDOMEN AND PELVIS WITH CONTRAST (both IV and enteric needed for best results)**

*May be helpful:*

**US ABDOMEN**

*Useful in selected conditions including cholecystitis; cholangitis; liver abscess; appendicitis(in thin patient) and small-bowel inflammation in Crohn's disease; less cost*

**MRI ENTEROGRAPHY**

*Excellent choice if high concern for Inflammatory Bowel Disease*

#### **B. Pregnant Patient:**

**US ABDOMEN**

*May be inconclusive*

**MRI ABDOMEN AND PELVIS WITHOUT CONTRAST**

#### **C. Pediatric Patient:**

**US ABDOMEN**

*If above non-diagnostic:*

**MRI ABDOMEN AND/OR PELVIS WITH CONTRAST (try to localize area of**

**Pain)**

**CT ABDOMEN AND/OR PELVIS WITH BOTH IV AND ENTERIC CONTRAST**

*Can localize appendix when not seen by ultrasound*

# **BODY IMAGING GUIDELINES**

## **Patient Presents with Abdominal Pain**

### **2. Patient with Right Lower Quadrant Pain – Suspected Appendicitis**

#### **A. Adult patients with fever, leukocytosis, and classic clinical presentation**

##### **CT ABDOMEN AND PELVIS WITH IV AND ENTERIC CONTRAST**

*Helps decrease negative appendectomy rate; provides alternative diagnoses may be helpful:*

##### **US ABDOMEN-LIMITED (with graded compression)**

*Appropriate in females with pelvic pain*

#### **B. Adult and adolescent patients have fever, leukocytosis; possible appendicitis, atypical presentation**

##### **CT ABDOMEN AND PELVIS WITH IV AND ENTERIC CONTRAST**

*May be helpful:*

##### **US ABDOMEN**

##### **US PELVIS**

*Appropriate in females with pelvic pain*

##### **MRI APPENDIX PROTOCOL – WITH AND WITHOUT CONTRAST**

#### **C. Pregnant woman with fever, leukocytosis – suspect appendicitis**

##### **US ABDOMEN**

*Is better in the first and early second trimester;*

*If negative or equivocal, then:*

##### **MRI APPENDIX PROTOCOL WITHOUT CONTRAST**

#### **D. Pediatric Patient (younger than age 14) - Fever, leukocytosis, suspect appendicitis or possible appendicitis or atypical presentation**

##### **US ABDOMEN**

*If equivocal or negative, then:*

##### **CT ABDOMEN AND PELVIS WITH IV AND ENTERIC CONTRAST**

**OR, if available and patient cooperative**

##### **MRI APPENDIX PROTOCOL WITHOUT AND WITH CONTRAST**



# **BODY IMAGING GUIDELINES**

## **Patient Presents with Abdominal Pain**

### **3. Patient with Right Upper Quadrant Pain – suspect gallbladder disease**

#### **A. Fever, elevated white blood cell count, positive Murphy sign**

##### **US ABDOMEN**

*May be useful if US non-diagnostic:*

##### **MRI ABDOMEN WITHOUT AND WITH CONTRAST**

*Helpful in a patient who is difficult to examine by US*

##### **CT ABDOMEN WITH IV AND ENTERIC CONTRAST**

#### **B. Suspect acalculous cholecystitis**

##### **US ABDOMEN**

*If equivocal US, then:*

##### **CHOLESCINTIGRAPHY**

*Gallbladder EF will give information on gallbladder function*

#### **C. No fever, normal WBC**

##### **US ABDOMEN**

*If negative:*

##### **CHOLESCINTIGRAPHY**

#### **D. Pregnant patient, RUQ pain, fever, leukocytosis**

##### **US ABDOMEN**

*If negative or equivocal:*

##### **MRI ABDOMEN WITHOUT CONTRAST**

### **4. Patient presents with Left Lower Quadrant Pain – Suspected Diverticulitis**

#### **A. Typical clinical presentation for diverticulitis or suspected complications or atypical presentations**

##### **CT ABDOMEN AND PELVIS WITH IV AND ENTERIC CONTRAST**

*May be helpful*

##### **MRI ENTEROGRAPHY**

*If strongly considering or known Crohn's/IBD disease*

#### **5. Patient presents with Left Lower Quadrant pain – suspect ureteral calculus versus diverticulitis**

##### **CT ABDOMEN WITHOUT AND WITH IV CONTRAST AND PELVIS WITH IV CONTRAST**

*(abdomen/pelvis are obtained before excretory phase)*

## **BODY IMAGING GUIDELINES**

### **Patient Presents with Abdominal Pain Cont.**

6. Patient presents with acute abdominal pain, no fever, vomiting – Suspect small-bowel obstruction

#### **CT ABDOMEN AND PELVIS WITH IV CONTRAST**

*Can identify the cause of obstruction; can differentiate from adynamic small-bowel ileus*

7. Patient Presents with Acute Onset Flank Pain, possible hematuria – suspect stone disease  
Initial Presentation:

**Adult, non pregnant patient:**

#### **CT ABDOMEN AND PELVIS WITHOUT CONTRAST**

*If positive for ureteral calculus, recommend a follow-up KUB  
If following distal ureteral stone by CT, consider CT pelvis  
without contrast only (rather than CT abdomen and pelvis  
without contrast)*

**Pregnant Patient:**

#### **US KIDNEY AND BLADDER WITH DOPPLER**

**Pediatric Patient:**

#### **US KIDNEY AND BLADDER**

**Recurrent symptoms of stone disease**

**Adult, non-pregnant patient:**

#### **CT ABDOMEN AND PELVIS WITHOUT CONTRAST**

**Pregnant Patient :**

#### **US KIDNEY AND BLADDER WITH DOPPLER AND KUB**

*May be useful:*

#### **X-RAY ABDOMEN AND PELVIS (KUB)**

*Good for baseline, post-treatment follow-up, follow-up ureteral calculus*

8. Patient Presents with Hematuria, no Flank Pain, Negative C+S

**Adult Patient without glomerular disease**

#### **CT UROGRAM (CT abdomen and pelvis without and with contrast)**

*Minimal usefulness:*

*IVP – CT urography has supplanted its use*

**Adult patient, glomerular disease**

*(if any imaging is needed)*

#### **US KIDNEYS AND BLADDER**

**Young females with hemorrhagic cystitis**

*No imaging is needed if hematuria completely and permanently resolves*

# **BODY IMAGING GUIDELINES**

## **Patient Presents with Acute Chest Pain**

### **1. Patient presents with Acute Chest Pain- Suspected Pulmonary Embolism**

#### **A. Adult, non-pregnant patient:**

##### **X-RAY CHEST (PA AND LATERAL):**

*Will exclude other causes of acute chest pain; is complimentary to other exams*

*If negative:*

##### **CT PULMONARY ARTERIES (CHEST WITH CONTRAST)**

*Current standard of care for detecting PE; highly accurate*

#### **B. Pregnant patient:**

##### **X-RAY CHEST (PA AND LATERAL):**

*Will exclude other causes of acute chest pain*

*If negative:*

##### **US LOWER EXTREMITY WITH DOPPLER**

*If negative:*

##### **CTA CHEST WITH CONTRAST (with appropriate shielding)**

### **2. Patient Presents with Acute Chest Pain -Suspect Aortic Dissection:**

**X-RAY CHEST**– *may exclude other causes of chest pain; obtain ONLY if readily available and does not cause delay in obtaining a CT or MRI*

##### **CTA AORTA: CHEST WITHOUT AND WITH AND ABDOMEN WITH CONTRAST**

##### **MRA CHEST AND ABDOMEN WITHOUT AND WITH CONTRAST**

*Alternative to CTA if contraindication to CT (iodinated contrast), or previous multiple prior chest CTA for similar symptoms, and in patients showing no sign of hemodynamic instability*

# **NEURO IMAGING GUIDELINES**

# **NEURO IMAGING GUIDELINES**

## **Patient with Low Back Pain**

- A. Uncomplicated acute low back pain and/or radiculopathy  
NO IMAGING INDICATED**
- B. In patient**
  - a. following low-velocity trauma**
  - b. with osteoporosis**
  - c. age > 70 years**  
**X-RAY LUMBAR SPINE**
- C. In patient**
  - a. with focal and/or progressive deficit**
  - b. prolonged symptom duration (>6 weeks)**  
**MRI LUMBAR SPINE WITHOUT CONTRAST**
- D. In patient with**
  - a. suspicion of cancer**
  - b. infection**
  - c. immunosuppression**  
**MRI LUMBAR SPINE WITHOUT AND WITH CONTRAST**
- E. Prior lumbar surgery**  
**MRI LUMBAR SPINE WITHOUT AND WITH CONTRAST**
- F. Cauda equine syndrome, multifocal deficits or progressive deficit**  
**MRI LUMBAR SPINE WITHOUT CONTRAST**

# **NEURO IMAGING GUIDELINES**

## **Patient with Headache**

In general, need to further characterize headache to determine best imaging approach

- A. Chronic, no new features. Normal neurologic examination  
NO IMAGING INDICATED
- B. Chronic with new feature or neurologic deficit  
MRI HEAD WITHOUT AND WITH CONTRAST
- C. Sudden onset severe headache (“worst headache of my life”)  
CT HEAD WITHOUT CONTRAST
- D. Sudden onset unilateral headache or suspected carotid or vertebral dissection or ipsilateral Horner syndrome  
CTA HEAD AND NECK WITH CONTRAST  
OR  
MRA AND MRI HEAD AND NECK WITHOUT AND WITH CONTRAST
- E. Suspected intracranial complication of sinusitis and/or mastoiditis  
CT WITH CONTRAST
- F. Oromaxillofacial origin  
CT WITH CONTRAST
- G. New headache
  - a. Cancer patient or immunocompromised individual
  - b. Suspected meningitis/encephalitis  
MRI HEAD WITHOUT AND WITH CONTRAST
  - c. Elderly patient, sed rate >55, temporal tenderness
  - d. Focal neurologic deficit or papilledema  
MRI/MRA WITH CONTRAST
  - e. Pregnant woman  
MRI HEAD WITHOUT CONTRAST
- H. Post-traumatic headache  
CT HEAD WITHOUT CONTRAST

# **NEURO IMAGING GUIDELINES**

## **Patient with Head Trauma**

**CAREFUL HISTORY AND DETAILED NEUROLOGICAL EXAM WILL HELP TO TAILOR IMAGING**

- A. Minor or mild acute closed head injury (GCS $\geq$ 13), without risk factors or neurologic deficit  
IF ANY IMAGING, DO CT HEAD WITHOUT CONTRAST (known to have low yield)**
- B. Minor or mild acute closed head injury, focal neurologic deficit, and/or risk factors  
CT HEAD WITHOUT CONTRAST**
- C. Moderate or severe acute closed head injury  
CT HEAD WITHOUT CONTRAST**
- D. Mild or moderate acute closed head injury, child < 2 years of age  
CT HEAD WITHOUT CONTRAST**
- E. Subacute or chronic closed head injury with cognitive and/or neurologic deficit(s)  
MRI HEAD WITHOUT CONTRAST**
- F. Closed head injury; rule out carotid or vertebral artery dissection  
CTA HEAD AND NECK WITH CONTRAST  
OR  
MRA HEAD AND NECK WITHOUT AND WITH CONTRAST**
- G. Penetrating injury, stable, neurologically intact  
CT HEAD WITHOUT CONTRAST**
- H. Skull Fracture  
CT HEAD WITHOUT CONTRAST**

# **NEURO IMAGING GUIDELINES**

## **Patient with Sinonasal Disease**

### **1. Adult Patient**

- a. **Acute (<4 weeks) or subacute (4-12 weeks) uncomplicated rhinosinusitis**  
*Most episodes are managed without imaging, as this is primarily a clinical diagnosis*
- b. **Acute or subacute rhinosinusitis in immunodeficient patient**  
**CT PARANASAL SINUSES WITHOUT CONTRAST**
- c. **Acute or subacute rhinosinusitis with associated orbital and/or intracranial complications with ocular and/or neurologic deficit**  
**CT PARANASAL SINUSES AND ORBITS WITHOUT CONTRAST**  
**MRI HEAD AND PARANASAL SINUSES WITHOUT AND WITH CONTRAST**  
*(NOTE: depending on the patient, these both may be indicated and useful – consult the radiologist)*
- d. **Recurrent acute or chronic rhinosinusitis -- REFER to ENT - if probable surgical candidate, then:**  
**CT PARANASAL SINUSES WITHOUT CONTRAST**
- e. **Sinonasal polyposis**  
**CT PARANASAL SINUSES WITHOUT AND WITH CONTRAST**
- f. **Sinonasal obstruction, unilateral, suspected mass lesion**  
**MRI HEAD AND PARANASAL SINUSES WITHOUT AND WITH CONTRAST**

### **2. Pediatric Patient**

- a. **Acute (<4 weeks) uncomplicated rhinosinusitis**  
*Most episodes are managed without imaging, as this is primarily a clinical diagnosis*
- b. **Subacute (persistent), recurrent, or chronic sinusitis**  
**Consider referring to ENT prior to any additional imaging studies**  
*( if imaging indicated, can tailor imaging to keep radiation exposure to a minimum )*
- c. **Clinical sinusitis with orbital or intracranial complication**  
**CT PARANASAL SINUSES/HEAD WITH CONTRAST**  
**MRI PARANASAL SINUSES (may be an option in patients over 5 years)**



## **NEURO IMAGING GUIDELINES**

*In summary, most cases of uncomplicated acute and subacute rhinosinusitis are diagnosed clinically and should not require any imaging procedure.*

*CT of the sinuses without contrast is the imaging method of choice in adult patients with re-current acute sinusitis or chronic sinusitis, or to define sinus anatomy prior to surgery*

# MUSCULOSKELETAL IMAGING GUIDELINES

# **MUSCULOSKELETAL IMAGING GUIDELINES**

1. Patient presents with joint or bone pain, no history of trauma

**X-RAY AP AND LATERAL VIEW OF AREA OF PAIN**

*If positive for osteoarthritis and patient is a candidate for joint replacement:*

**Orthopedics referral**

*If negative and internal derangement suspected:*

**MRI WITHOUT CONTRAST**

2. Patient presents with acute trauma:

**X-RAY OF AFFECTED AREA (THREE VIEWS)**

*If negative and suspicion remains high for fracture (assuming change in tx)*

**CT (usually) or MRI (especially in elderly or children)**

3. Patient presents with lump or bump:

**X-RAY AP AND LATERAL VIEW OF AREA**

*If negative:*

**US OF AREA**

*Good for determining if cystic versus solid*

*Good for superficial and suspected benign entities such as ganglion cysts*

*NOT specific in many cases- MRI may be needed*

*If positive on U/S or suspect malignancy:*

**MRI OF AREA WITH AND WITHOUT CONTRAST**

*If bone tumor is responsible for bump:*

**Nonaggressive appearance on X-ray:**

**STOP**

**Indeterminate or aggressive on X-ray:**

**CT/MRI/BONE SCAN PER RADIOLOGIST RECOMMENDATION AND REFERRAL**

## **MUSCULOSKELETAL IMAGING GUIDELINES cont.**

### **4. Patient presents with cellulitis and osteomyelitis or septic arthritis is**

**Suspected:**

#### **TWO VIEW X-RAY**

*If negative and a septic joint effusion is suspected in a child:*

**ULTRASOUND can be useful in children and to guide aspiration**

*If negative (usually):*

#### **MRI WITH AND WITHOUT CONTRAST**

*Try to include only region of highest suspicion for osteo and if positive, aspiration or biopsy (fluoro or CT guided if needed)*

**NOTE: MRI is very sensitive but can be nonspecific**

*May need:*

**Bone SCAN or tagged WBC STUDY**

**In general, always order a 2 view X-ray before ordering an MRI**

**Three views in trauma!**

## NOTES

# BREAST IMAGING

# **BREAST IMAGING**

## **SCREENING MAMMOGRAPHY:**

Much controversy about when to start and how frequently to order screening mammograms. For average risk women, the USPSTF (U.S. Preventative Services Task Force) 2009 recommended biennial screening from 50-74 y.o. with case by case screening <50 y.o. Currently the American Cancer Society (ACS) and American College of Radiology (ACR) still recommend mammograms annually starting at the age of 40 until the patient is no longer fit to undergo treatment of breast cancer. A patient can self refer for an annual mammogram, if she chooses.

*--patients must be asymptomatic: no pain, no new lump, no discharge, no concerns, for this to be a screening exam.*

## **DIAGNOSTIC MAMMOGRAPHY:**

Two situations for which a diagnostic work-up should be ordered. A mammogram and ultrasound should be ordered up front so that one or both modalities can be used to help address the problem.

1. A symptom or concerning sign: lump, pain, discharge, skin changes, etc.

*--please include the o'clock position or breast quadrant, approximate size of the abnormality, and distance from the nipple when this applies. For example: "Palpable mass, approximately 1 cm in size, 3 o'clock position, 8 cm from the nipple."*

2. A callback: screening mammogram shows a possible abnormality for which additional mammographic views and or ultrasound is recommended to further evaluate.

## **WHOLE BREAST SCREENING ULTRASOUND:**

Ultrasound screening should be considered as an adjunct to mammography in some cases. Society of Breast Imaging (SBI) and ACR recommendation:

1. Can be considered in high-risk women for whom magnetic resonance imaging (MRI) screening may be appropriate but who cannot have MRI for any reason

2. Can be considered in women with dense breast tissue as an adjunct to mammography

## **BREAST IMAGING**

### **BREAST MRI:**

#### **SCREENING MRI:**

For women with increased risk. A patient's lifetime risk can be calculated using the Gail Model or other genetic model. Consider referring a patient who may be high risk to a genetic counselor.

Per the SBI and ACR (2010) (Journal of the American College of Radiology)

[Volume 7, Issue 1](#) , (Pages 18-27, January 2010) these patients include:

- proven carriers of a deleterious *BRCA* mutation = annually starting by age 30
- untested first-degree relatives of proven *BRCA* mutation carriers = annually starting by age 30
- women with >20% lifetime risk for breast cancer on the basis of family history = annually starting by age 30
- women with histories of chest irradiation (usually as treatment for Hodgkin's disease) = annually starting 8 years after the radiation therapy
- women with newly diagnosed breast cancer and normal contralateral breast by conventional imaging and physical examination = single screening MRI of the contralateral breast at the time of diagnosis

#### **DIAGNOSTIC MRI:**

--This is occasionally recommended, usually by the radiologist in conjunction with the referring doctor, to help further evaluate a breast symptom or sign that is not confidently characterized on mammogram and or ultrasound, or clinical exam.

--Short-interval follow-up diagnostic MRI may also be recommended in the case of a Probably Benign, BIRADS 3, finding on screening or diagnostic MRI.



## **BREAST IMAGING**

### **Breast Density:**

Current legislation (Senate Bill 420) requires mammography providers to notify women with dense breast tissue with the following similar paragraph within the patient letter:

*“The mammogram shows that your breast tissue is dense. Dense breast tissue is very common and is not abnormal. But dense breast tissue can make it harder to find cancer on a mammogram. Also, dense breast tissue may increase your breast cancer risk. This information about the result of your mammogram report is given to you to raise your awareness. Use this report when you talk to your doctor about your own risks for breast cancer, which includes your family history. At that time, ask your doctor if more screening tests, such as MRI, Ultrasound, etc. might be useful, based on your risk.”*

Approximately 50% of women undergoing screening mammography are classified as having either "heterogeneously dense" or "extremely dense" breasts.

Only 10% of all women have "extremely dense" breast tissue, which is associated with a relative risk of breast cancer of approximately 2 compared with average breast density. For example, if a patient's background risk is 1/100, then it would increase to 1/50.

The sensitivity of mammography is reduced by approximately 10% to 20% as background breast tissue density increases.

No change in mammography recommendations. All women, regardless of breast density, should consider screening mammography. Ultrasound and/or MRI might be used in addition to mammograms, but are not meant to replace mammograms.

For patients who are interested in additional screening options, a breast cancer risk assessment may be appropriate.

# **PEDIATRIC IMAGING GUIDELINES**

# **PEDIATRIC IMAGING GUIDELINES**

( because children are not “just small adults”)

## **General Considerations:**

1. **Radiation Safety:** The pediatric patient is more sensitive to radiation exposure than adults. Radiation exposure is cumulative. Benefit of diagnostic imaging using ionizing radiation must always be weighed against risk of exposure. Whenever possible, use imaging modalities from which there is no ionizing radiation exposure— Ultrasound and MR.
2. **Sedation:** For some diagnostic studies, the patient must be able to cooperate and hold still for a period of time. Due to their age, a pediatric patient may not be able to fully cooperate, and sedation may be required.

All radiology examinations requiring sedation are being scheduled with an anesthesiologist managing all sedations.

Examinations requiring sedation:

- a. All MRI's in patients less than 6 years of age
- b. A very small number of CT exams (i.e. temporal bones to evaluate for hearing loss)
- c. Possibly a nuclear medicine bone scan or renal scan
- d. If you have a patient who is over 6 years of age but who will probably need sedation, please order it as a “sedated” examination.
- e. If you have a patient that is younger than 6 years of age, but who most likely will be able to complete the study without sedation, please indicate as such on your order. The parents must be informed that if we are unsuccessful without sedation, their child will have to be rescheduled at a time when the anesthesiologist is available.

***FOR ANY STUDY THAT WILL NEED TO BE DONE WITH SEDATION, YOU WILL NEED TO SEND A H&P THAT HAS BEEN PERFORMED WITHIN 30 DAYS OF THE SCHEDULED APPOINTMENT DATE WITH YOUR ORDER.***

# PEDIATRIC IMAGING GUIDELINES

## SPECIFIC CONDITIONS:

### 1. Infant (up to 3 months of age) with vomiting

*If bilious and less than 1 week of age:*

**X-RAY ABDOMEN** (*will help determine further work-up strategy- consult the radiologist*)

Followed by

**X-RAY UPPER GI** (*to exclude malrotation with volvulus*)

*Versus*

**X-RAY CONTRAST ENEMA** (*for causes of distal bowel obstruction*)

*If bilious and patient 1 week – 3 months of age:*

**X-RAY UPPER GI**

*If new onset projectile and nonbilious:*

**US ABDOMEN (upper GI tract)**

### 2. Patient with febrile UTI

A. 1<sup>st</sup> time boys pre-pubescent girls:

**US KIDNEYS AND BLADDER AND RNC** (*radionuclide cystogram*)

*- If normal get follow-up Renal US in 6 months (in patients 2 years or younger) or 12 months (in patients over 2 years of age) to document appropriate interval growth*

### 3. Patient with sacral dimple

*If  $\leq$  6 months*

**US OF THE LUMBOSACRAL SPINE**

*If  $>$  6 months*

**MRI LUMBAR SPINE WITHOUT CONTRAST**

### 4. Patient with abdominal pain and/or bloody stools (suspect intussusception)

**US OF THE ABDOMEN**

## NOTES

# **RADIATION SAFETY CONSIDERATIONS**

## RADIATION SAFETY CONSIDERATIONS

The information gained from diagnostic imaging is immense and has enabled marked improvement in diagnosis and treatment of patients.

Radiation exposure to a human comes from 2 main sources – natural background radiation and man-made sources such as that from diagnostic imaging. Everyone is exposed to ionizing radiation on a daily basis from natural sources. The amount of background radiation exposure is approximately 3 mSv per year. Medical imaging has greatly increased over the last 2 decades and now accounts for almost 50% of a person’s annual exposure. Exposure is cumulative over a lifetime and certain tissues/organs (gonads, thyroids, eyes, breasts) are more sensitive.

Likewise, the pediatric population is more sensitive, in general, and they have a longer lifetime to accumulate exposure.

Most researchers now agree that there is no truly safe amount of exposure to ionizing radiation. Several reports state that a person’s increased risk of developing a cancer later in life is seen following a dose equivalent of 10 mSv.

Below are listed some typical radiation doses.

### Typical radiation doses

<u>Source</u>	<u>Est. dose (mSv)</u>
Natural background	2.4- 3.0 mSv/yr
Airport security x-ray scanner	0.0001 mSv
7 hour airplane flight	0.03 mSv
Smoke ½ pack of cigarettes/d	0.18 mSv/yr
Single view CXR	0.01 mSv
Head CT	up to 2 mSv
Abd/pelvis CT	2-10 mSv
CT pulmonary angiogram	6-14 mSv
PET CT(scan + RP)	8-15 mSv

As you can see, some of the CT studies reach or exceed the level of exposure after which there is a possible increase for the risk of developing a cancer later in life. Therefore, it is imperative that whenever ordering an imaging study which involves ionizing radiation (basically ALL imaging studies except for MRI and ultrasound) the potential benefits outweigh the risks. Try to avoid ordering repeat studies in a patient in whom symptoms have not changed.

Finally, whenever you have a question on the best way to image a patient with a specific clinical presentation or about the appropriateness of a specific imaging study, do not hesitate to contact a radiologist. (541-382-6633 option #4 during regular business hours, or have him/her paged through the St. Charles Hospital operator after hours)

# CPT CODES

**Please note: All CPT codes are subject to change**



# CPT CODES

## CT

### CPT CODE(S)

### EXAM

<u>74150</u>	<u>ABDOMEN (without IV contrast)</u>
<u>74160</u>	<u>ABDOMEN (with IV contrast)</u>
<u>74170</u>	<u>ABDOMEN (with and without IV contrast)</u>
<u>74176</u>	<u>ABDOMEN AND PELVIS (allergy to IV contrast)</u>
<u>74177</u>	<u>ABDOMEN AND PELVIS (with IV and oral contrast)</u>
<u>74177</u>	<u>ABDOMEN AND PELVIS (with IV contrast only)</u>
<u>74176</u>	<u>ABDOMEN AND PELVIS (without IV contrast)</u>
<u>74150</u>	<u>ADRENAL (without contrast)</u>
<u>74160</u>	<u>ADRENAL (with contrast)</u>
<u>74170</u>	<u>ADRENAL (with and without contrast)</u>
<u>71275 &amp; 74175</u>	<u>AORTA CHEST AND ABDOMEN</u>
<u>74174</u>	<u>AORTA ABDOMEN AND PELVIS</u>
<u>71250</u>	<u>CHEST (HRCT)</u>
<u>71250</u>	<u>CHEST (without contrast)</u>
<u>71260</u>	<u>CHEST (with contrast)</u>
<u>71275 &amp; 74174</u>	<u>CTA AORTA (aorta without and with and abdomen and pelvis with)</u>
<u>70496 &amp; 70498</u>	<u>CTA HEAD AND NECK (with contrast)</u>
<u>71275</u>	<u>CTPA CHEST</u>
<u>74177</u>	<u>ENTEROGRAPHY</u>
<u>70450</u>	<u>HEAD (without contrast)</u>
<u>70460</u>	<u>HEAD (with contrast)</u>
<u>70487</u>	<u>MAXILLOFACIAL (with contrast)</u>
<u>70487 &amp; 70460</u>	<u>PARANASAL SINUSES AND HEAD (with contrast)</u>
<u>70488</u>	<u>PARANASAL SINUSES (with and without contrast)</u>
<u>70486</u>	<u>PARANASAL SINUSES (without contrast)</u>
<u>74177</u>	<u>UROGRAM (with contrast)</u>
<u>74178</u>	<u>UROGRAM (with and without contrast)</u>

## MRA

<u>71555 &amp; 74185</u>	<u>MRA CHEST AND ABDOMEN (without and with contrast)</u>
<u>70553 &amp; 70546 &amp; 70549</u>	<u>MRA AND MRI HEAD AND NECK (without and with contrast)</u>
<u>70546 &amp; 70549</u>	<u>MRA HEAD AND NECK (without and with contrast)</u>
<u>70552 &amp; 70545</u>	<u>MRA/MRI HEAD (with contrast)</u>

## MRI

### CPT CODE(S)

### EXAM

<u>74183</u>	<u>ABDOMEN (without and with contrast)</u>
<u>74182</u>	<u>ABDOMEN (with contrast)</u>
<u>74181</u>	<u>ABDOMEN (without contrast)</u>
<u>74182 &amp; 72196</u>	<u>ABDOMEN AND PELVIS (with both IV and enteric contrast)</u>
<u>74182 &amp; 72196</u>	<u>ABDOMEN AND PELVIS (with contrast)</u>
<u>74181 &amp; 72195</u>	<u>ABDOMEN AND PELVIS (without contrast)</u>
<u>74182</u>	<u>ABDOMEN ONLY (with both IV and enteric contrast)</u>
<u>72197</u>	<u>APPENDIX PROTOCOL (without and with contrast)</u>
<u>72195</u>	<u>APPENDIX PROTOCOL (without contrast)</u>
<u>77058</u>	<u>BREAST SCREENING or DIAGNOSTIC (unilateral)</u>
<u>77059</u>	<u>BREAST SCREENING or DIAGNOSTIC (bilateral)</u>
<u>74183 &amp; 72197</u>	<u>ENTEROGRAPHY (abdomen and pelvis with and without contrast)</u>
<u>70553</u>	<u>HEAD (without and with contrast)</u>
<u>70551</u>	<u>HEAD (without contrast)</u>
<u>70553 &amp; 70543</u>	<u>HEAD AND PARANASAL SINUSES (without and with contrast)</u>
<u>72158</u>	<u>LUMBAR SPINE (without and with contrast)</u>
<u>72148</u>	<u>LUMBAR SPINE (without contrast)</u>
<u>70552 &amp; 70545</u>	<u>MRI/MRA HEAD (with contrast)</u>
<u>70543</u>	<u>PARANASAL SINUSES (with and without contrast)</u>
<u>70542</u>	<u>PARANASAL SINUSES (with contrast)</u>
<u>70540</u>	<u>PARANASAL SINUSES (without contrast)</u>
<u>72195</u>	<u>PELVIS (without contrast)</u>
<u>72196</u>	<u>PELVIS (with contrast)</u>
<u>72197</u>	<u>PELVIS (with and without contrast)</u>
<u>74181 &amp; 72195</u>	<u>UROGRAM (without contrast)</u>

## ULTRASOUND

<u>76700</u>	<u>ABDOMEN</u>
<u>76705</u>	<u>ABDOMEN-LIMITED (with graded compression)</u>
<u>76641 X 2</u>	<u>BREAST (whole breast screening)</u>
<u>76770</u>	<u>KIDNEYS AND BLADDER</u>
<u>93971</u>	<u>LOWER EXTREMITY WITH DOPPLER – VENOUS (unilateral)</u>
<u>93970</u>	<u>LOWER EXTREMITY WITH DOPPLER – VENOUS (bilateral)</u>
<u>76800</u>	<u>LUMBOSACRAL SPINE</u>
<u>76856</u>	<u>PELVIS - TRANSABDOMINAL</u>
<u>76770</u>	<u>RENAL</u>

## X-RAY

### CPT CODE(S)

### EXAM

<u>74000</u>	<u>ABDOMEN</u>
<u>71010</u>	<u>CHEST</u>
<u>71020</u>	<u>CHEST (PA and lateral)</u>
<u>74270</u>	<u>ENEMA (with contrast)</u>
<u>72100</u>	<u>LUMBAR SPINE (2/3 views)</u>
<u>72110</u>	<u>LUMBAR SPINE (4 views)</u>
<u>72114</u>	<u>LUMBAR SPINE (complete with bending)</u>
<u>74241</u>	<u>UPPER GI</u>
<u>51600 &amp; 74455</u>	<u>X-RAY VCUG</u>

## MAMMOGRAPHY

<u>G0206</u>	<u>DIAGNOSTIC (unilateral)</u>
<u>G0206 &amp; 77051 &amp; G0279</u>	<u>DIAGNOSTIC (unilateral with CAD &amp; 3D)</u>
<u>G0204</u>	<u>DIAGNOSTIC (bilateral)</u>
<u>G0204 &amp; 77051 &amp; G0279</u>	<u>DIAGNOSTIC (bilateral with CAD &amp; 3D)</u>
<u>G0202</u>	<u>SCREENING</u>
<u>G0202 &amp; 77052 &amp; 77063</u>	<u>SCREENING (with CAD-routine)</u>
<u>G0279</u>	<u>3D DIAGNOSTIC</u>
<u>77063</u>	<u>3D SCREENING</u>
<u>77051</u>	<u>DIAGNOSTIC CAD</u>

## NUCLEAR MEDICINE

<u>78227</u>	<u>CHOLESCINTIGRAPHY (with ejection fraction)</u>
<u>78740</u>	<u>RNC (radionuclide cystogram)</u>

# **RADIOLOGIST'S SPECIALTIES**

## **RADIOLOGIST'S SPECIALTIES**

<b>Steven Michel, MD</b>	<b>Abdominal Imaging</b>
<b>Traci Clautice-Engle, MD</b>	<b>Body Imaging</b>
<b>Robert Hogan, MD</b>	<b>Body Imaging</b>
<b>Patrick Brown, MD</b>	<b>Interventional Radiology</b>
<b>Jeffrey Drutman, MD</b>	<b>Interventional Radiology</b>
<b>Steven Kjobech, MD</b>	<b>Interventional Radiology</b>
<b>David Zulauf, MD</b>	<b>Interventional Radiology</b>
<b>Garrett Schroeder, MD</b>	<b>Interventional Radiology</b>
<b>Thomas Koehler, MD</b>	<b>Musculoskeletal</b>
<b>John Stassen, MD</b>	<b>Musculoskeletal</b>
<b>Nicholas Branting, MD</b>	<b>Musculoskeletal</b>
<b>Brant Wommack, MD</b>	<b>Musculoskeletal</b>
<b>Travis Abele, MD</b>	<b>Neuroradiology</b>
<b>James Johnson, MD</b>	<b>Neuroradiology</b>
<b>William Wheir III, MD</b>	<b>Neuroradiology</b>
<b>Laurie Martin, MD</b>	<b>Nuclear Medicine, Women's Imaging</b>
<b>Stephen Shultz, MD</b>	<b>Women's Imaging</b>
<b>Cloe Shelton, MD</b>	<b>Women's Imaging</b>
<b>Karen Lynn, MD</b>	<b>Women's Imaging</b>
<b>Paula Shultz, MD</b>	<b>Pediatric Radiology</b>

## NOTES

# **FOR PROVIDER CONTACT TO A RADIOLOGIST**

**Call 541-382-6633 and select option #4 during normal business hours  
(Monday-Friday, 8 am – 5 pm) or contact us at: [cora.docs@cmillc.org](mailto:cora.docs@cmillc.org)**