What Radiology Test Should I Order?

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Disclosure

Consultant to CMEinfo/Ebix

What to Order?

“I got this!”
Q1: For which condition is a radiograph likely “enough” without needing a Chest CT?
A. Nodule follow up
B. Recurrent hemoptysis
C. Blunt chest trauma
D. Chest pain, concern for dissection
E. Acute coronary syndrome

Q2: What is different about a high-resolution chest CT (HRCT) compared to a conventional Chest CT?
A. Thinner slices
B. Higher resolution per slice
C. More radiation
D. Reconstruction algorithm

Q3: Low Dose Chest CTs administer how much less radiation than conventional chest CT?
A. 20%
B. 50%
C. 80%

Q4: The radiation dose from a low dose chest CT equals what duration of background radiation??
A. 2 days
B. 6 months
C. 2 years
Q5: Which test is best to order for acute onset flank pain with suspicion for stone disease?
A. Radiograph (KUB)
B. Ultrasound
C. CT without contrast
D. CT with contrast
E. MR urography

Q6: Which test is best for a 1st time presentation of acute pancreatitis (typical pain, + amylase/lipase)?
A. Radiograph (KUB)
B. Ultrasound
C. CT without contrast
D. CT with contrast
E. MR with MRCP

Topics
When is CXR enough?
Types of chest CTs and indications
Radiation
When is contrast needed?
Nodules, nodules, and more nodules
Types of abdomen CTs and indications

Message
Becoming an “Appropriateness Criteria” expert will help you use better (and less) imaging.
When do I get one?

- Daily ICU films on unchanged patients?
  - No!
- Pre op CXR?
  - Symptomatic or diagnosed heart/lung disease
  - >70 and no CXR in last 6 mo
  - Surgery on heart/lungs

ACR Appropriateness Criteria: Intensive care unit patients, variant 1: Choosing wisely: chest X-rays before surgery

When do I get one?
When is CXR enough?
For which condition is a radiograph likely “enough” without needing a Chest CT?

A. Nodule follow up  
B. Recurrent hemoptysis  
C. Blunt chest trauma  
D. Chest pain, concern for dissection  
E. Acute coronary syndrome

ACR Appropriateness Criteria

- Evidence-based guidelines  
- Multi-specialty  
- 235 topics with over 900 “variants”  
  - “Radiographically Detected Solitary Pulmonary Nodule”  
  - “Solid nodule < 1 cm, low clinical suspicion for cancer”
<table>
<thead>
<tr>
<th>Radiologic Procedure</th>
<th>Rating</th>
<th>Comments</th>
<th>Relative Radiation Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Watchful waiting with CT follow up</td>
<td>8</td>
<td></td>
<td>Varies</td>
</tr>
<tr>
<td>CT Chest without IV Contrast</td>
<td>7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Usually Appropriate
May be appropriate
Usually not appropriate

ACR’s a qPLE for PAMA!

Qualifies for Upcoming Medicare Rules
Protecting Access to Medicare Act (PAMA)...
...requires consultation with appropriateness criteria (AC)...
...when ordering advanced imaging (CT, MRI, PET/CT, NM)...
...created by qualified provider-led entities (qPLE)...
...such as the American College of Radiology (ACR).

Free web version and integrated paid version.
When is CXR enough?

**Check the AC’s!**

- Milder, less dangerous respiratory complaints
- When you find the answer enough to treat.
- Rib fractures
- Possible TB
- Lines and Tubes
After Treatment (No Change)

When is a CXR not enough?

- Dangerous: immunocompromise, traumatic injury, Acute Ao injury
- Cancer: hemoptysis, staging, (met surveillance?)
- Chronic unexplained symptoms: dyspnea
- Occupational Lung Disease
- Some “concerning” radiographic findings

For which condition is a radiograph likely “enough” without needing a Chest CT?

A. Nodule follow up
B. Recurrent hemoptysis
C. Blunt chest trauma
D. Chest pain, concern for dissection
E. Acute coronary syndrome
Acute Coronary Syndrome

Myocardial Perfusion Imaging
Coronary Arteriography (Cath)

CXR = 5 ("May be appropriate")
Comment: "survey for noncardiac etiologies"

What is different about a high-resolution chest CT (HRCT?)

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A Long Sordid Tale....
A Long Sordid Tale….

- Same thickness
- Same in-plane resolution
- Similar radiation

Reconstruction Kernel / Filter / Algorithm

Expiratory Views: “Air Trapping”
High-Resolution Chest CT (HRCT)

Interstitial lung disease
Air Trapping (BO, post lung transplant)

Non-contrast Chest CT

- Lung nodules
- Pneumonias
- Airways
- Bones
- (Ao Size, or changes)

Contrast Enhanced Chest CT
Contrast Enhanced Chest CT

- Mediastinum
- Lymph Nodes
- Pluera
- Chest wall
- Trauma
- Cancer

CT Angiogram

- Pulmonary Emboli
- Aorta
- Great Arteries

CT Angiogram

Dual Energy CT

40 keV
Iodine Map
Special CT “Angiograms”
- Delayed
  - Vascular extravasation
  - Endoleaks
  - Left Atrial Appendage
  - Venograms

Low Dose (Non-Con)

Low Dose (Non-Con)
- Lung CA Screening
- Nodule Follow Up
- Radiation Sensitive

How much less radiation?
A. 20%
B. 50%
C. 80%

Equals how much background radiation?
A. 2 days
B. 6 months
C. 2 years
**How much less radiation?**

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**Radiation**

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Equivalent Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dental x-ray</td>
<td>14 hrs</td>
</tr>
<tr>
<td>Flight</td>
<td>4 days</td>
</tr>
<tr>
<td>CXR</td>
<td>12 days</td>
</tr>
<tr>
<td>Low Dose Chest CT</td>
<td>6 months</td>
</tr>
<tr>
<td>Head CT</td>
<td>8 months</td>
</tr>
<tr>
<td>Living on Earth</td>
<td>1 year</td>
</tr>
<tr>
<td>Chest CT</td>
<td>2 years</td>
</tr>
<tr>
<td>Abd CT</td>
<td>3 years</td>
</tr>
<tr>
<td>PET/CT</td>
<td>8 years</td>
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**Low Dose (Non-Con)**

80% fewer photons

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**Low Dose Chest CTs....**

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Lung Cancer Screening

High risk:
- > 30 pack years
- Current smoker, quit <15 Years
- >55 years old

Sufficient Benefit:
- <77-80 years old (USPSTF, CMS)
- Good life expectancy
- Willingness to undergo treatment

Crazy Facts
- Must be asymptomatic
- Must have documented clinical visit, shared decision making with an aid, smoking cessation counseling
- Data uploaded to a registry, including outcomes.

Nodules, Nodules, and More Nodules!
Fleischner, Lung-RADS, Gestalt, Oh my!

- Flieschner: Incidental
- Lung-RADS: Screening
- Oncology Patients: Depends
- Young Patients: Depends

When a Nodule is Seen

1. We look for definitively benign features.
   Not definitely benign?
2. If small (<8 mm), we recommend follow up.
   Not small?
3. We help assess risk of malignancy
   Help guide management.

Definitely Benign Features

- "Long Term" Stability
- Classic Perifissural nodules

Small Nodules

Fleischer Society Guidelines of 2017
- Multiplicity, density, risk factors
- Some "optional"
- Up to 5 years
5 Years!? 8 Yrs

Large Nodules
Short interval CT
PET/CT
Biopsy
(Treat)

When is an Abdominal X-Ray Enough?
Bowel Gas Abnormalities

Which test is best to order for acute onset flank pain with suspicion for stone disease?

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Abdominal CT protocols

- Multiphase Liver
- Adrenal
- CTA
- Venogram
- Pancreatic

Contrast, Timing, Radiation Dose
Less about processing

Non-Contrast Abd CT

The ACR Appropriateness Criteria

Non-Con CT = 8
Con and Non-con CT = 6
US = 6
X-ray = 4
MR Urography = 4
Which test is best for a 1st time presentation of acute pancreatitis (typical pain, + amylase/lipase)?

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The ACR Appropriateness Criteria

Gastrointestinal and Urologic Sections
40 topics and many variants!

The ACR Appropriateness Criteria

Variant 1
First time presentation, typical abdominal pain, and increased amylase and lipase with high clinical certainty of diagnosis; <48–72 hours after onset of symptoms; clinical score irrelevant; unknown cause.

Appropriate Tests
US Abdomen = 9 (assess for gallstones)
Con CT, MRI = 4
The ACR Appropriateness Criteria

- Non-localized Abd pain: CT with con
- Palpable Abd mass: CT with con (or MR)
- R/o Appendicitis: CT with con
- R/o Diverticulitis: CT with con
- R/o BPH: None (US= 6 "may be" appropriate)

Use of the ACR AC leads to...

- More Imaging
- Better Imaging
- Less Imaging

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Topics

- When is CXR enough?
- Types of Chest CTs and Indications
- Radiation
- When is Contrast needed?
- Nodules, Nodules, and More Nodules
- Types of Abdomen CTs and Indications
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