I HAVE NO DISCLOSURES

OBJECTIVES

After this presentation I will:

1. Have performed History and Physical and considered conservative treatment, if appropriate, **before** considering imaging.
2. Have considered risks and benefits of imaging.
3. Know how to use the evidence based ACR Appropriateness Criteria (AUC) to determine if imaging beneficial and decide what exam to order.

WHAT TO LOOK FOR:

HISTORY AND PHYSICAL EXAM-

FIRST

- H&P **NECESSARY** TO GUIDE APPROPRIATE IMAGING:

ACR APPROPRIATENESS CRITERIA:

www.acr.org/…/Appropriateness-Criteria

Evidence based guidelines for most appropriate imaging or treatment decision for a specific clinical condition.

ACR Appropriateness Criteria

The ACR Appropriateness Criteria® (AC) are evidence-based guidelines to assist referring physicians and other providers in making the most appropriate imaging or treatment decision for a specific clinical condition. Employing these guidelines helps providers enhance quality of care and contribute to the most efficacious use of radiology. Learn more »

The newest ACR AC are listed below.

See the complete list of ACR AC topics and ratings tables »

Browse Topics

PITFALLS-TRAUMA

H&P:

History- Mechanism of injury, Osteoporosis?, Open growth plates?, Possible stress fracture?, fragile/brittle bone?, infection?, Cancer?, Diabetes?, Steroids?

Signs/symptoms:

INTENSE PAIN, DEFORMITY, BONY TTP (**Palpate the entire bone and joints above and below the fracture site for tenderness**.) STS, BRUISING, NUMBNESS, TINGLING, SEVERE PAIN WITH ROM, INABILITY TO WEIGHT BEAR

PITFALLS-TRAUMA

- NO H&P before considering imaging
- Negative is not negative
- You are not alone – get help

PITFALLS-TRAUMA

- ONE VIEW IS NO VIEW
  - Minimum 2 views at 90°
  - Joint above, Joint below
  - X-ray beam centered

PITFALLS-TRAUMA

- Maximize your diagnostic acumen:
  - Marker on point of maximal tenderness
  - Additional views
  - Comparison views contralateral side
  - Old films your best friends

PITFALLS-TRAUMA

- **Systematically evaluate images**

Patient name, DOB, right versus left side, date

Evaluate: air, fat, soft tissues, bone, metal

If positive finding **look at the rest of the images**,

10% have a second finding as significant as initial

PITFALLS-TRAUMA

- RADIOGRAPHIC DEFINITION OF FRACTURE:

Transcortical lucent line that tapers

(Pitfalls: Nutrient vessels, accessory ossicles, “Stress” fractures,

“bowing/plastic” fractures kids)

Vascular lines example - Femur

- A well-defined lucent line passes lengthways through the bone
- This vascular line passes obliquely through the cortex (lateral image)
- A dense (white) corticated edge is a reassuring sign

Unfused apophysis example - 5th metatarsal

- The normal apophysis runs lengthways along the bone
- The fracture runs across the bone
- Note the corticated and rounded edge of the apophysis compared with the sharp and non-corticated edge of the fracture fragment

Accessory ossicle example - Foot

- This patient has an extra bone adjacent to the navicular
- This bone is normal - note the corticated edge

Bowing Fracture

- Forces on bone stops short of fracture
- Persistent plastic deformity can result
- Little remodeling
- Forearm, fibula common
- Functional and cosmetic deficits
- Requires ortho referral

PD-INEL

Source Undetermined

PD-INEL

Source Undetermined

PITFALLS-TRAUMA

- ALL rings fracture at least **twice** (force in and force out)

  EXAMPLES :

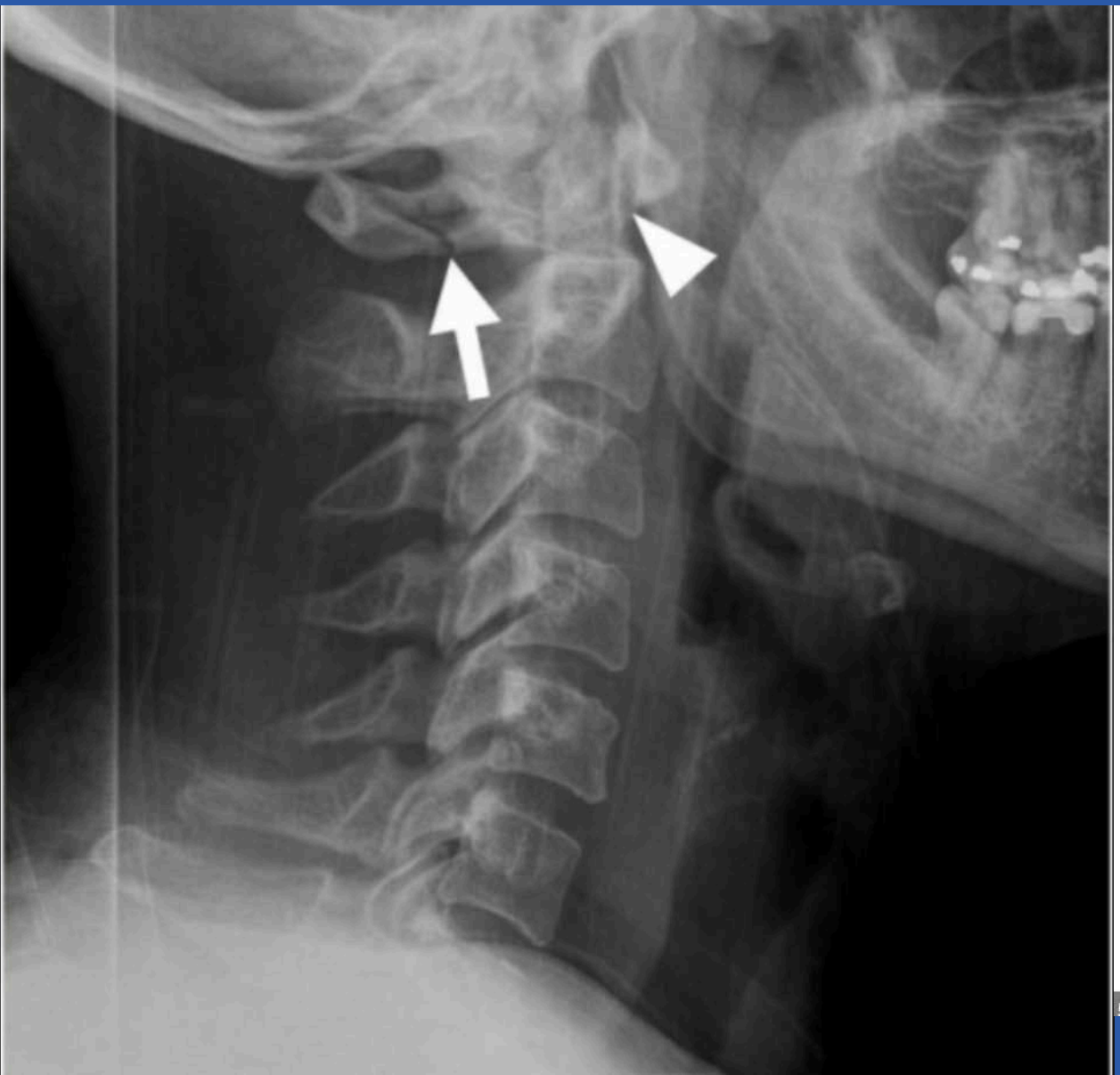
  pelvis

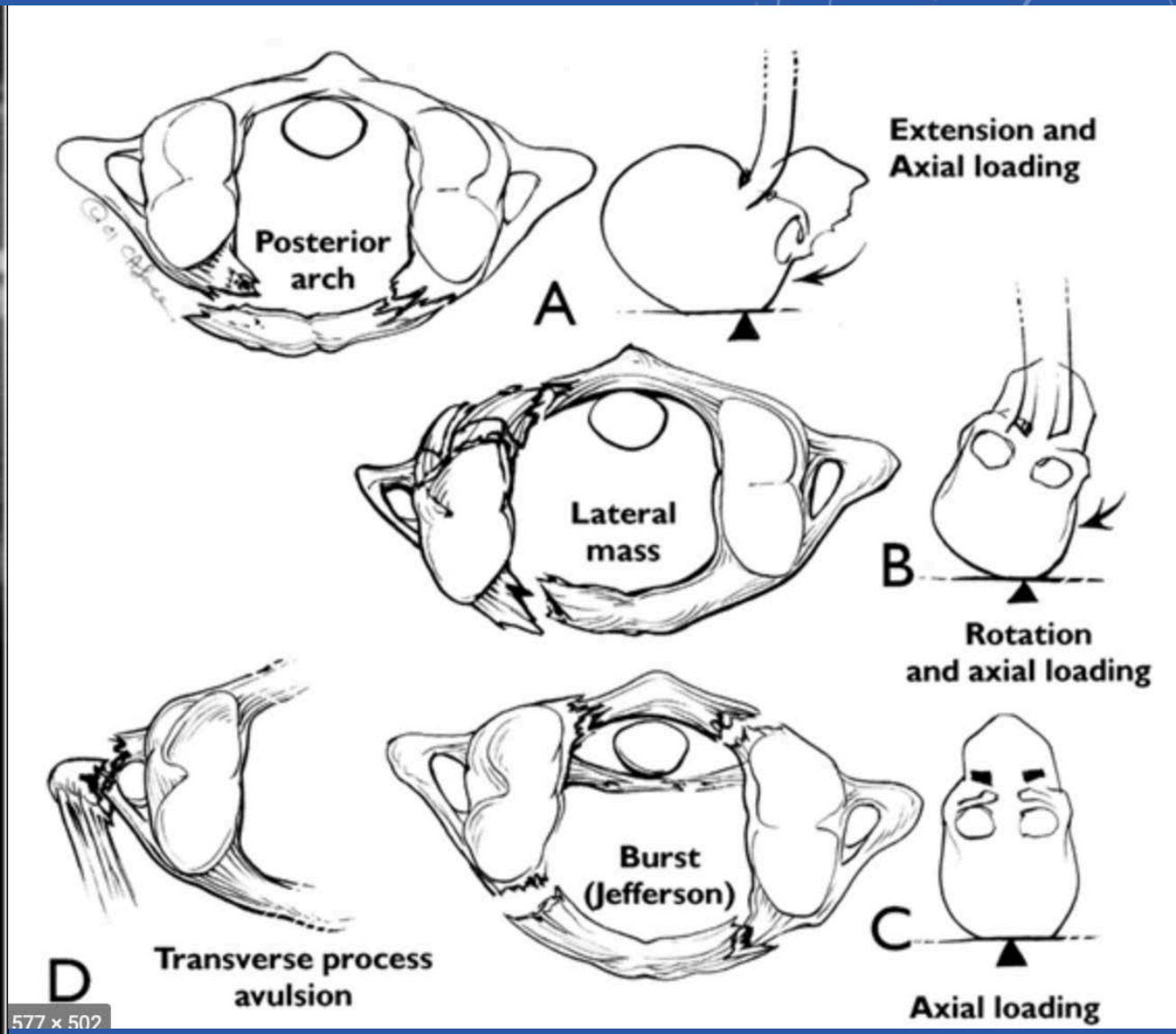
  C-1

Commonly the mandible and acetabulum fracture in more than one location

If management will change do MR/CT to see outlet fracture

C1 RING FRACTURES AND MECHANISMS





PITFALLS-TRAUMA

Plain film limitations:

- 2 D representation of 3-D anatomy
- Summation
- Beam angulation
- Ligaments/tendons/soft tissue not seen
- Fracture/trauma may be present and not seen-
- H&P ***key-if you think there is a fracture- there is***

- ----if management will change go to MR/CT

TABLE 1. MISSED EMERGENCY RADIOLOGY EXTREMITY FRACTURES BY REGION[22]

Location	Percentage Missed (%)	Missed/All Fractures
Foot	7.6	18/238
Knee	6.3	14/224
Elbow	6.0	14/234
Hand	5.4	10/185
Wrist	4.1	25/606
Hip	3.9	20/512
Ankle	2.8	8/282
Shoulder	1.9	5/266
Tibia/Fibula	0.4	1/266
Total	**3.7**	**115/3081**

Wei CJ, Tsai WC, Tiu CM, et al. Systematic analysis of missed extremity fractures in emergency radiology. *Acta Radiol* 2006;47:710-717.

- **Missed fractures** are often subtle, small, and occur in areas where overlapping bones obscure their detection.

- Carefully inspect hand, wrist, and foot images.

- Ask the radiology technician and radiologist (if available) for advice on alternative imaging views to visualize specific areas.

- If initial radiographs are “normal” but continued pain and tenderness suggest occult fracture, consider referral for advanced imaging with computed tomography or magnetic resonance imaging.

- When in doubt, immobilize the injured limb and refer to appropriate specialist.

Wei CJ, Tsai WC, Tiu CM, et al. Systematic analysis of missed extremity fractures in emergency radiology. *Acta Radiol* 2006;47:710-717.

• APPROPRIATE IMAGING

- Unnecessary Imaging Exams

Why Eliminate ?

- Excess cost/radiation
- Waste patients/technologists/physicians time
- False hopes/expectations based on exam results
- Indicates illogical thought pattern in patient’s workup

HEALTH CARE COST USA

- **U.S. health care spending** grew 3.9 percent in 2017, reaching $3.5 trillion or $10,739 per person.

  Health spending accounted for 17.9% GDP (other affluent countries 9.6-12.4%). CMS.gov.

- Defense is 4.2% GDP

- "If the U.S. **did less imaging** and lowered prices and the number of procedures to levels in the Netherlands, it would translate into **a savings of $137 billion**," wrote Ezekiel Emanuel, MD, PhD, of the Perelman School of Medicine at the University of Pennsylvania

Appropriate Use Criteria Program

Background

The Protecting Access to Medicare Act (PAMA) of 2014, Section 218(b), established a new program to increase the rate of appropriate advanced diagnostic imaging services provided to Medicare beneficiaries. Examples of such advanced imaging services include:

- computed tomography (CT)
- positron emission tomography (PET)
- nuclear medicine, and
- magnetic resonance imaging (MRI)

Under this program, at the time a practitioner orders an advanced diagnostic imaging service for a Medicare beneficiary, he/she, or clinical staff acting under his/her direction, will be required to consult a qualified Clinical Decision Support Mechanism (CDSM). CDSMs are electronic portals through which appropriate use criteria (AUC) is accessed. The CDSM provides a determination of whether the order adheres to AUC, or if the AUC consulted was not applicable (e.g., no AUC is available to address the patient's clinical condition). A consultation must take place at the time of the order for imaging services that will be furnished in one of the below settings and paid for under one of the below payment systems. Ultimately, practitioners whose ordering patterns are considered outliers will be subject to prior authorization. Information on outlier methodology and prior authorization is not yet available.

This program impacts all physicians and practitioners (as defined in 1861(r) or described in 1842(b)(18)(C)), that order advanced diagnostic imaging services and physicians, practitioners and facilities that furnish advanced diagnostic imaging services in a physician's office, hospital outpatient department (including the emergency department), an ambulatory surgical center or an independent diagnostic testing facility (IDTF) and whose claims are paid under the physician fee schedule, hospital outpatient prospective payment system or ambulatory surgical center payment system.

Program Timeline

Currently, the program is set to be fully implemented on January 1, 2021 which means AUC consultations with qualified CDSMs are required to occur along with reporting of consultation information on the furnishing professional and furnishing facility claim for the advanced diagnostic imaging service. Claims that fail to append this information will not be paid. Prior to this date the program will operate in an Education and Operations Testing Period starting January 1, 2020 during which claims will not be denied for failing to include proper AUC consultation information. Beginning July 1, 2018 the program is operating under a voluntary participation period during which time consultations with AUC may occur and may be reported on furnishing professional and facility claims using HCPCS modifier QQ.

Rules and Regulations

These policies are codified in our regulations at 42 CFR 414.94.

UNNECESSARY RADIOGRAPHS

- Why?
  - Treatment based on Clinical, Not X-Ray Findings
  - Skull series, Nasal Bone, Rib Series, Coccyx, Ankle Series, Knee Series

UNNECESSARY RADIOGRAPHS

- Why?
  - When auscultation is normal and there are no historical risk factors the probability of abnormal findings is infinitesimally small.
  - Chest Radiograph

UNNECESSARY RADIOGRAPHS

- Why?

  None of the plain film findings can be responsible for the acute problems- other imaging modalities have superseded these exams:

  Lumbar spine (CT/MR)

  Sinus series (CT),

  Metabolic bone surveys(Hand Films), Metastatic Bone survey (NM Bone Scan), Lumbar Myelograms (CT/MR)

THERE IS NO RADIATION WHEN YOU DON'T DO THE EXAM

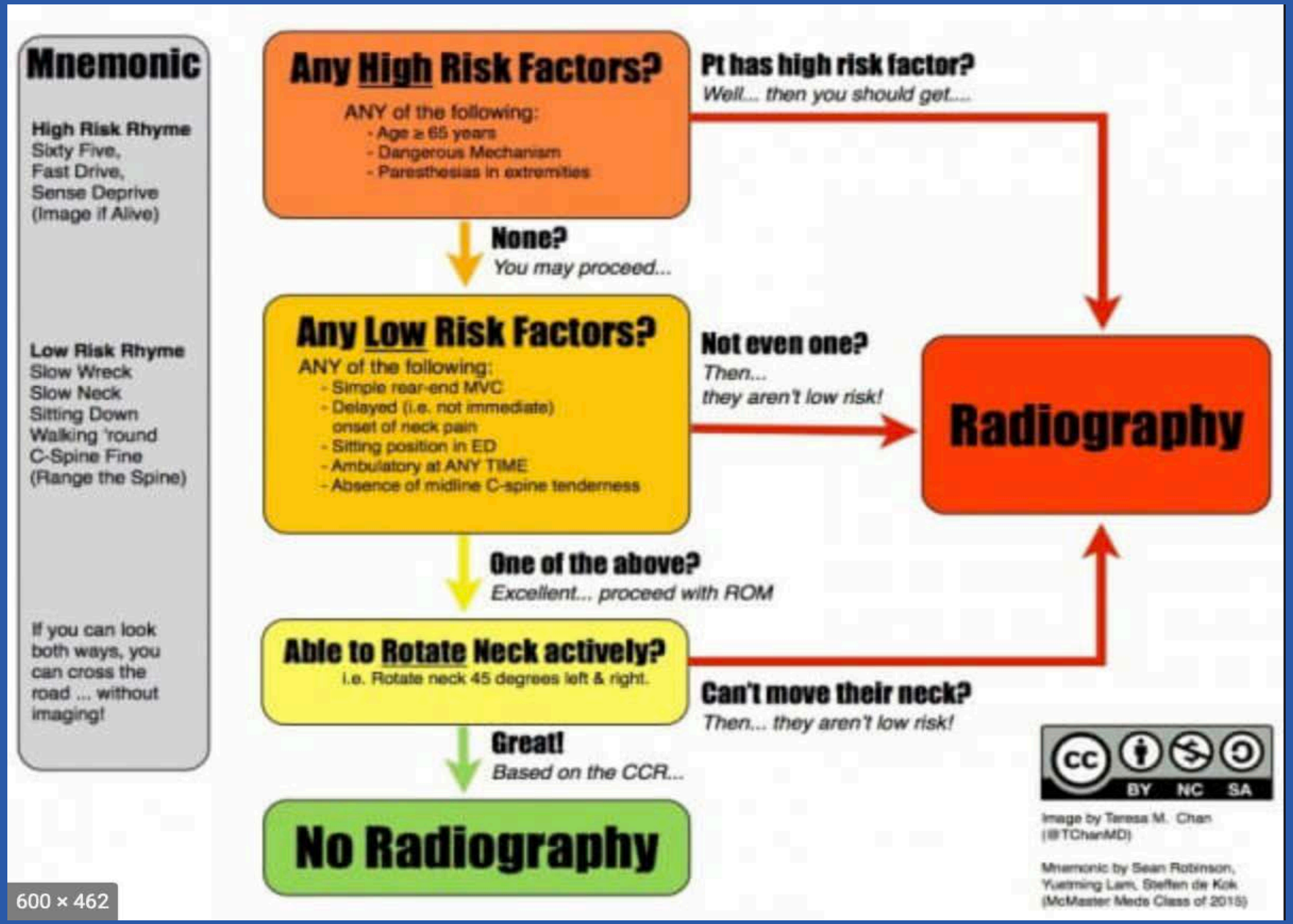
The ALARA* Concept

*As Low As Reasonably Achievable

APPROPRIATE IMAGING
MUSCULOSKETELAL SYSTEM

- ***Only*** after clinical examination (and most often conservative treatment) is imaging indicated.

ACUTE C-SPINE TRAUMA-CANADIAN CS RULE (CCR)



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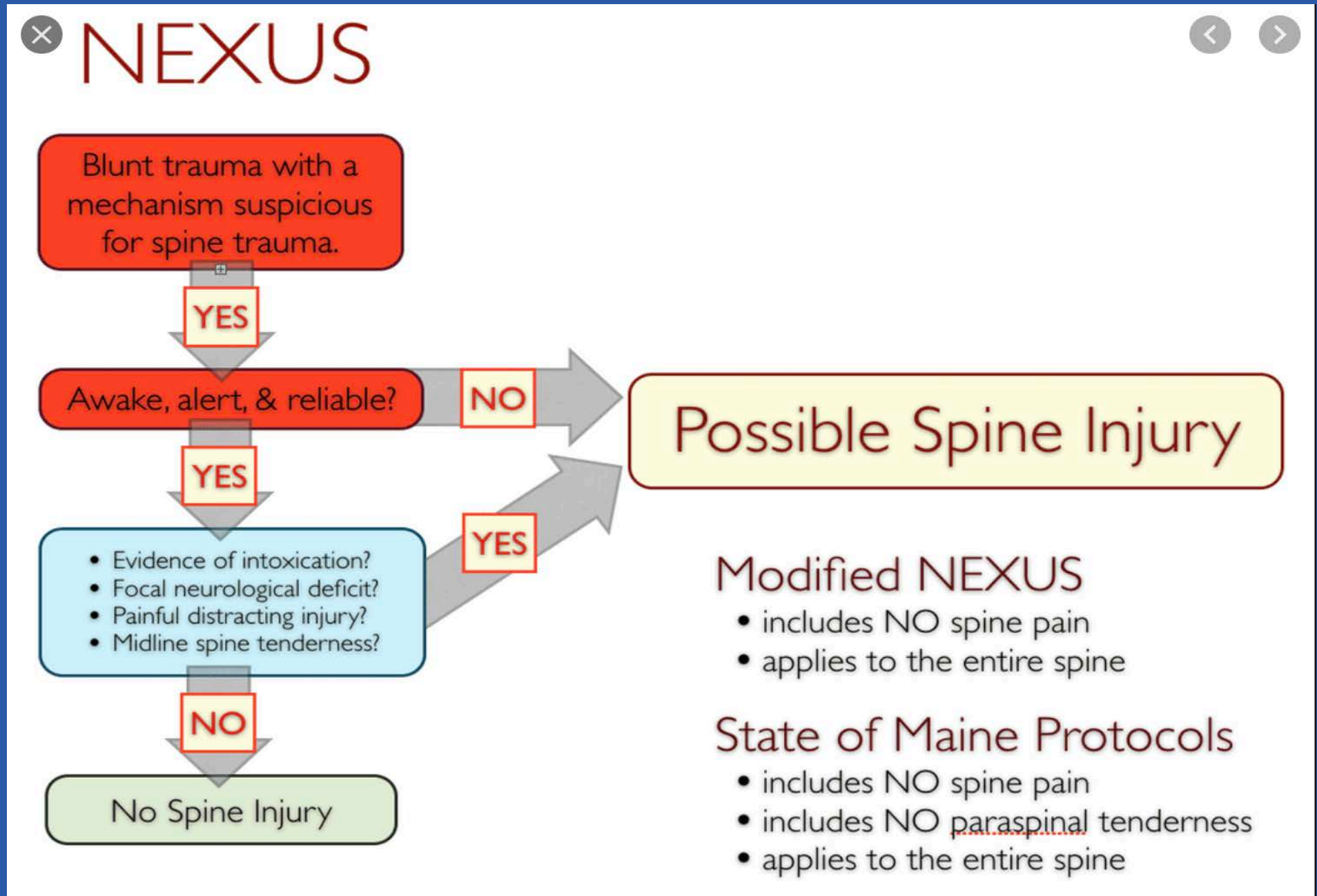
ACUTE C-SPINE TRAUMA



ACUTE C-SPINE TRAUMA

American College of Radiology
ACR Appropriateness Criteria®
Suspected Spine Trauma

Variant 1: **Age greater than or equal to 16 years and less than 65 years. Suspected acute blunt cervical spine trauma; imaging not indicated by NEXUS or CCR clinical criteria. Patient meets low-risk criteria. Initial imaging.**

Procedure	Appropriateness Category	Relative Radiation Level
Arteriography cervicocerebral	Usually Not Appropriate	☢☢☢
CT cervical spine with IV contrast	Usually Not Appropriate	☢☢☢
CT cervical spine without and with IV contrast	Usually Not Appropriate	☢☢☢
CT cervical spine without IV contrast	Usually Not Appropriate	☢☢☢
CT myelography cervical spine	Usually Not Appropriate	☢☢☢☢
CTA head and neck with IV contrast	Usually Not Appropriate	☢☢☢
MRA neck without and with IV contrast	Usually Not Appropriate	O
MRA neck without IV contrast	Usually Not Appropriate	O
MRI cervical spine without and with IV contrast	Usually Not Appropriate	O
MRI cervical spine without IV contrast	Usually Not Appropriate	O
Radiography cervical spine	Usually Not Appropriate	☢☢

Variant 2: **Age greater than or equal to 16 years. Suspected acute cervical spine blunt trauma. Imaging indicated by NEXUS or CCR clinical criteria. Initial imaging.**

Procedure	Appropriateness Category	Relative Radiation Level
CT cervical spine without IV contrast	Usually Appropriate	☢☢☢
Radiography cervical spine	May Be Appropriate	☢☢
Arteriography cervicocerebral	Usually Not Appropriate	☢☢☢
CT cervical spine with IV contrast	Usually Not Appropriate	☢☢☢
CT cervical spine without and with IV contrast	Usually Not Appropriate	☢☢☢
CT myelography cervical spine	Usually Not Appropriate	☢☢☢☢
CTA head and neck with IV contrast	Usually Not Appropriate	☢☢☢
MRA neck without and with IV contrast	Usually Not Appropriate	O
MRA neck without IV contrast	Usually Not Appropriate	O
MRI cervical spine without and with IV contrast	Usually Not Appropriate	O
MRI cervical spine without IV contrast	Usually Not Appropriate	O

THORACIC/LUMBAR SPINE BLUNT TRAUMA

Variant 9: **Age greater than or equal to 16 years. Blunt trauma meeting criteria for thoracic and lumbar imaging. Initial imaging.**

Procedure	Appropriateness Category	Relative Radiation Level
CT thoracic and lumbar spine without IV contrast	Usually Appropriate	☢☢☢
Radiography thoracic and lumbar spine	May Be Appropriate	☢☢☢
CT myelography thoracic and lumbar spine	Usually Not Appropriate	☢☢☢☢
CT thoracic and lumbar spine with IV contrast	Usually Not Appropriate	☢☢☢
CT thoracic and lumbar spine without and with IV contrast	Usually Not Appropriate	☢☢☢☢
MRI thoracic and lumbar spine without and with IV contrast	Usually Not Appropriate	O
MRI thoracic and lumbar spine without IV contrast	Usually Not Appropriate	O

Variant 10: **Age greater than or equal to 16 years. Acute thoracic or lumbar spine injury detected on radiographs or noncontrast CT. Neurologic abnormalities. Next imaging study.**

Procedure	Appropriateness Category	Relative Radiation Level
MRI thoracic and lumbar spine without IV contrast	Usually Appropriate	O
CT myelography thoracic and lumbar spine	May Be Appropriate	☢☢☢☢
CT thoracic and lumbar spine with IV contrast	Usually Not Appropriate	☢☢☢
CT thoracic and lumbar spine without and with IV contrast	Usually Not Appropriate	☢☢☢☢
MRI thoracic and lumbar spine without and with IV contrast	Usually Not Appropriate	O

PITFALLS-

- Low back pain

LOW BACK PAIN

Low back pain is the second most common reason for primary care physician visits in the United States

Approximately one quarter of U.S. adults reported having low back pain lasting at least 1 day in the past 3 months, 2/3 of these that recover will have recurrence within 12 months

Total costs attributable to low back pain in the United States were estimated at $100 billion in 2006, two thirds of which were indirect costs of lost wages and productivity

Warren Bodine, DO, FAOASM

LOW BACK PAIN

Definition of Low Back Pain:

- Pain/muscle tension/stiffness
- +/- sciatica/radicular symptoms
- Between L1-L5
- Acute: present up to 6 weeks, Subacute: 6-12 weeks
- Chronic: present for > 3 months; significant enough to impact function/quality of life
- Non-specific Low Back pain: pain not attributable to a recognizable pathology

Warren Bodine, DO, FAOASM

RED FLAGS----LOW BACK PAIN

- Age<20 or>50
- Severe or progressive neurologic deficit
- Bladder/bowel dysfunction
- History of cancer
- Fever or unexplained weight loss
- Disturbed gait and saddle anesthesia
- Patients with back pain in the primary care setting (80 percent) tend to have one or more red flags, but rarely have a serious condition.

Warren Bodine, DO, FAOASM

LOW BACK PAIN- NO RED FLAGS

American College of Radiology
ACR Appropriateness Criteria®

Clinical Condition: **Low Back Pain**

Variant 1: **Acute, subacute, or chronic uncomplicated low back pain or radiculopathy. No red flags. No prior management.**

Radiologic Procedure	Rating	Comments	RRL*
MRI lumbar spine without IV contrast	2		O
X-ray lumbar spine	2		☢☢☢
CT myelography lumbar spine	2		☢☢☢☢
Tc-99m bone scan with SPECT spine	2	If there is concern for spondylolysis in a young patient, SPECT/CT remains the gold standard.	☢☢☢
CT lumbar spine without IV contrast	2		☢☢☢
CT lumbar spine with IV contrast	2		☢☢☢
MRI lumbar spine without and with IV contrast	2		O
CT lumbar spine without and with IV contrast	1		☢☢☢☢

Rating Scale: **1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate** ***Relative Radiation Level**

Clinical Condition: Low Back Pain

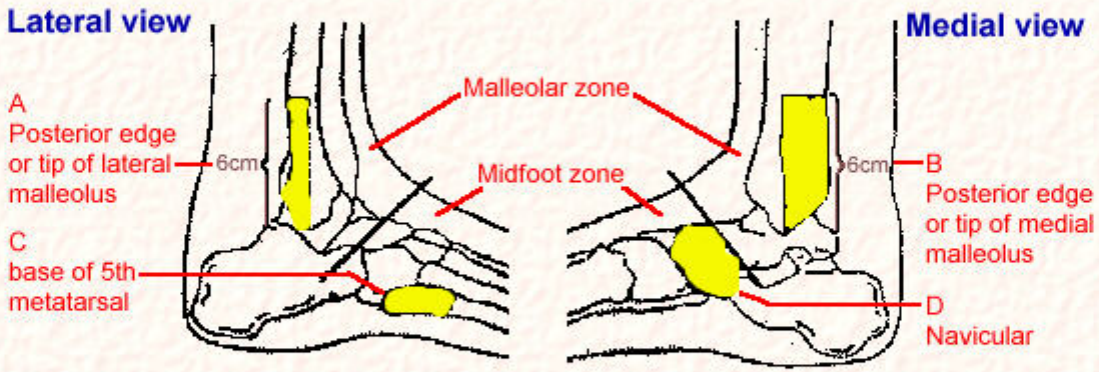
Variant 4: Acute, subacute, or chronic low back pain or radiculopathy. Surgery or intervention candidate with persistent or progressive symptoms during or following 6 weeks of conservative management.

Radiologic Procedure	Rating	Comments	RRL*
MRI lumbar spine without IV contrast	8		O
CT lumbar spine with IV contrast	5	MRI is preferred. CT is useful if MRI is contraindicated or unavailable and/or for problem solving.	☢☢☢
CT lumbar spine without IV contrast	5	MRI is preferred. CT is useful if MRI is contraindicated or unavailable and/or for problem solving.	☢☢☢
MRI lumbar spine without and with IV contrast	5	This procedure is indicated if noncontrast MRI is nondiagnostic or indeterminate. Contrast is indicated if patient has history of prior lumbar surgery. See variant 5.	O
CT myelography lumbar spine	5	MRI is preferred. This procedure can be indicated if MRI is contraindicated or nondiagnostic.	☢☢☢☢
X-ray lumbar spine	4	This procedure is usually not sufficient for decision making without MR and/or CT imaging but can be helpful in surgical planning.	☢☢☢
Tc-99m bone scan with SPECT spine	4	This procedure can be particularly useful for facet arthropathy or stress fracture. SPECT/CT can be useful for anatomic localization and problem solving.	☢☢☢
Discography and post-discography CT lumbar spine	3	Although controversial, this can be useful in patients with >3 months of LBP (chronic LBP patients).	☢☢☢
CT lumbar spine without and with IV contrast	3		☢☢☢☢
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

LOWER EXTREMITY

- KNEE
- ANKLE
- HIP

Ottawa ankle and foot rules



An ankle x-ray is required only if there is any pain in malleolar zone and any of these findings:

- bone tenderness at A
- bone tenderness at B
- inability to weight bear both immediately and in the casualty department.

A foot x-ray is required if there is any pain in the midfoot zone and any of these findings:

- bone tenderness at C
- bone tenderness at D
- inability to weight bear both immediately and in the casualty department.

Ottawa knee rules

A knee x-ray is only required for knee injury patients with any of these findings:

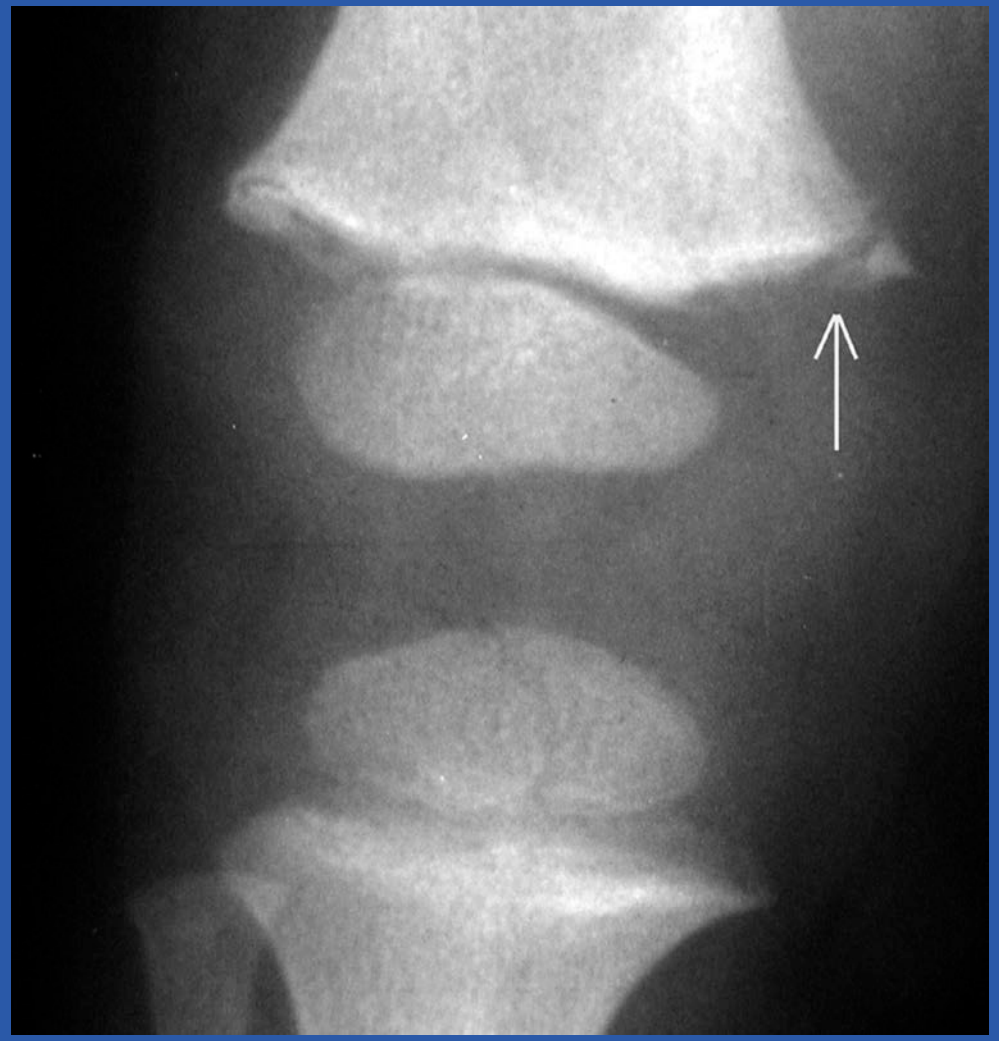
- age 55 or over
- isolated tenderness of the patella (no bone tenderness of the knee other than the patella)
- tenderness at the head of the fibula
- inability to flex to 90 degrees
- inability to weight bear both immediately and in the casualty department (4 steps - unable to transfer weight twice onto each lower limb regardless of limping).

KNEE: TRAUMA CLINICAL SCENARIO

1 Adult or child >1 year old. Fall or twisting injury, no focal tenderness, no effusion; able to walk. First study. 10

Name	Category	Adult RRL	Peds RRL
MRI knee without IV contrast	Usually not appropriate	O 0 mSv	O 0 mSv [ped]
X-ray knee	Usually not appropriate	☢ <0.1 mSv	☢ <0.03 mSv [ped]
CT knee with IV contrast	Usually not appropriate	☢ <0.1 mSv	☢☢ 0.03-0.3 mSv [ped]
CT knee without and with IV contrast	Usually not appropriate	☢ <0.1 mSv	☢☢ 0.03-0.3 mSv [ped]
CT knee without IV contrast	Usually not appropriate	☢ <0.1 mSv	☢☢ 0.03-0.3 mSv [ped]
MRA knee without and with IV contrast	Usually not appropriate	O 0 mSv	O 0 mSv [ped]
MRA knee without IV contrast	Usually not appropriate	O 0 mSv	O 0 mSv [ped]
MRI knee without and with IV contrast	Usually not appropriate	O 0 mSv	O 0 mSv [ped]
Tc-99m bone scan with SPECT lower extremity	Usually not appropriate	☢☢☢ 1-10 mSv	
US knee	Usually not appropriate	O 0 mSv	O 0 mSv [ped]

Figure 5a. Bucket-handle fracture



Lee, P. et al. Radiographics 2004;24:1009-1027

RadioGraphics

3 **Adult or child >1 year old. Fall or twisting injury with either no fracture or a Segond fracture seen on a radiograph, suspect internal derangement. Next study.** **9**

Name	Category	Adult RRL	Peds RRL
MRI knee without IV contrast	Usually appropriate	O 0 mSv	O 0 mSv [ped]
CT knee without IV contrast	May be appropriate	☢ <0.1 mSv	☢☢ 0.03-0.3 mSv [ped]
CT knee with IV contrast	Usually not appropriate	☢ <0.1 mSv	☢☢ 0.03-0.3 mSv [ped]
CT knee without and with IV contrast	Usually not appropriate	☢ <0.1 mSv	☢☢ 0.03-0.3 mSv [ped]
MRA knee without and with IV contrast	Usually not appropriate	O 0 mSv	O 0 mSv [ped]
MRA knee without IV contrast	Usually not appropriate	O 0 mSv	O 0 mSv [ped]
MRI knee without and with IV contrast	Usually not appropriate	O 0 mSv	O 0 mSv [ped]
Tc-99m bone scan with SPECT lower extremity	Usually not appropriate	☢☢☢ 1-10 mSv	
US knee	Usually not appropriate	O 0 mSv	O 0 mSv [ped]

3 **Adult or child >1 year old. Fall or twisting injury with either no fracture or a Segond fracture seen on a radiograph, suspect internal derangement. Next study.** **9**

Name	Category	Adult RRL	Peds RRL
MRI knee without IV contrast	Usually appropriate	O 0 mSv	O 0 mSv [ped]
CT knee without IV contrast	May be appropriate	☢ <0.1 mSv	☢☢ 0.03-0.3 mSv [ped]
CT knee with IV contrast	Usually not appropriate	☢ <0.1 mSv	☢☢ 0.03-0.3 mSv [ped]
CT knee without and with IV contrast	Usually not appropriate	☢ <0.1 mSv	☢☢ 0.03-0.3 mSv [ped]
MRA knee without and with IV contrast	Usually not appropriate	O 0 mSv	O 0 mSv [ped]
MRA knee without IV contrast	Usually not appropriate	O 0 mSv	O 0 mSv [ped]
MRI knee without and with IV contrast	Usually not appropriate	O 0 mSv	O 0 mSv [ped]
Tc-99m bone scan with SPECT lower extremity	Usually not appropriate	☢☢☢ 1-10 mSv	
US knee	Usually not appropriate	O 0 mSv	O 0 mSv [ped]

HIP INJURY

History- Mechanism of injury, Osteoporosis?, Open growth plates?, Fragile/Brittle bone?, Infection?, Cancer?, Diabetes?, Steroids?

Signs/symptoms: INTENSE PAIN, DEFORMITY, BONY TTP, STS, BRUISING, NUMBNESS, TINGLING, SEVERE PAIN WITH ROM, INABILITY TO WEIGHT BEAR

American College of Radiology
ACR Appropriateness Criteria®
Acute Hip Pain-Suspected Fracture

Variant 1: **Acute hip pain. Fall or minor trauma. Suspect fracture. Initial imaging.**

Procedure	Appropriateness Category	Relative Radiation Level
Radiography hip	Usually Appropriate	☢☢☢
Radiography pelvis	Usually Appropriate	☢☢
Radiography pelvis and hips	Usually Appropriate	☢☢☢
CT pelvis and hips with IV contrast	Usually Not Appropriate	☢☢☢
CT pelvis and hips without and with IV contrast	Usually Not Appropriate	☢☢☢☢
CT pelvis and hips without IV contrast	Usually Not Appropriate	☢☢☢
MRI pelvis and affected hip without and with IV contrast	Usually Not Appropriate	O
MRI pelvis and affected hip without IV contrast	Usually Not Appropriate	O
Bone scan hips	Usually Not Appropriate	☢☢☢
US hip	Usually Not Appropriate	O

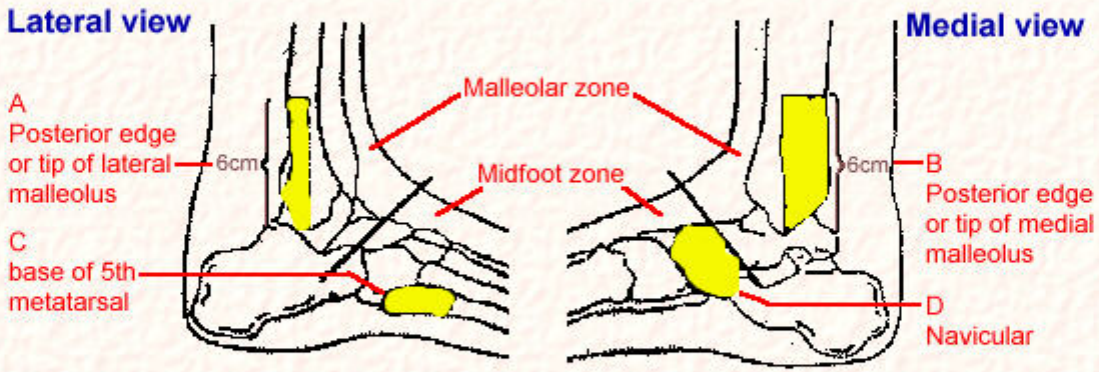
Variant 2: **Acute hip pain. Fall or minor trauma. Negative radiographs. Suspect fracture. Next imaging study.**

Procedure	Appropriateness Category	Relative Radiation Level
MRI pelvis and affected hip without IV contrast	Usually Appropriate	O
CT pelvis and hips without IV contrast	Usually Appropriate	☢☢☢
CT pelvis and hips with IV contrast	Usually Not Appropriate	☢☢☢
CT pelvis and hips without and with IV contrast	Usually Not Appropriate	☢☢☢☢
MRI pelvis and affected hip without and with IV contrast	Usually Not Appropriate	O
Bone scan hips	Usually Not Appropriate	☢☢☢
US hip	Usually Not Appropriate	O

ANKLE

- Trauma: PF and conventional evaluation still best for acute skeletal injury.

Ottawa ankle and foot rules



An ankle x-ray is required only if there is any pain in malleolar zone and any of these findings:

- bone tenderness at A
- bone tenderness at B
- inability to weight bear both immediately and in the casualty department.

A foot x-ray is required if there is any pain in the midfoot zone and any of these findings:

- bone tenderness at C
- bone tenderness at D
- inability to weight bear both immediately and in the casualty department.

Ottawa knee rules

A knee x-ray is only required for knee injury patients with any of these findings:

- age 55 or over
- isolated tenderness of the patella (no bone tenderness of the knee other than the patella)
- tenderness at the head of the fibula
- inability to flex to 90 degrees
- inability to weight bear both immediately and in the casualty department (4 steps - unable to transfer weight twice onto each lower limb regardless of limping).

Variant 2: **Adult or child >5 years old. Acute injury to the ankle; does not meet the Ottawa Ankle Rules. No point tenderness over the malleoli, talus, or calcaneus on physical examination. Able to walk. Neurologically intact (including no peripheral neuropathy). First study.**

Radiologic Procedure	Rating	Comments	RRL*
X-ray ankle	1	Obtain AP, lateral, and mortise views.	☢
CT ankle without IV contrast	1		☢
CT ankle with IV contrast	1		☢
CT ankle without and with IV contrast	1		☢
MRI ankle without IV contrast	1		O
MRI ankle without and with IV contrast	1		O
US ankle	1		O
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Variant 5: **Adult or child >5 years old. Acute injury to the ankle with >1 week persistent pain. Initial radiographs negative.**

Radiologic Procedure	Rating	Comments	RRL*
MRI ankle without IV contrast	6		O
X-ray ankle	5	Obtain AP, lateral, and mortise views.	☢
CT ankle without IV contrast	5		☢
US ankle	5		O
CT ankle with IV contrast	1		☢
CT ankle without and with IV contrast	1		☢
MRI ankle without and with IV contrast	1		O

Rating Scale: **1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate**

***Relative Radiation Level**

UPPER EXTREMITY

- WRIST
- ELBOW
- SHOULDER

WRIST-HAND

- Trauma: osseous – PF

American College of Radiology
ACR Appropriateness Criteria®
Acute Hand and Wrist Trauma

Variant 1: **Acute blunt or penetrating trauma to the hand or wrist. Initial imaging.**

Procedure	Appropriateness Category	Relative Radiation Level
Radiography area of interest	Usually Appropriate	Varies
CT area of interest with IV contrast	Usually Not Appropriate	Varies
CT area of interest without and with IV contrast	Usually Not Appropriate	Varies
CT area of interest without IV contrast	Usually Not Appropriate	Varies
MRI area of interest without and with IV contrast	Usually Not Appropriate	O
MRI area of interest without IV contrast	Usually Not Appropriate	O
Tc-99m bone scan area of interest	Usually Not Appropriate	☢☢☢
US area of interest	Usually Not Appropriate	O

Variant 2: **Suspect acute hand or wrist trauma. Initial radiographs negative or equivocal. Next imaging study.**

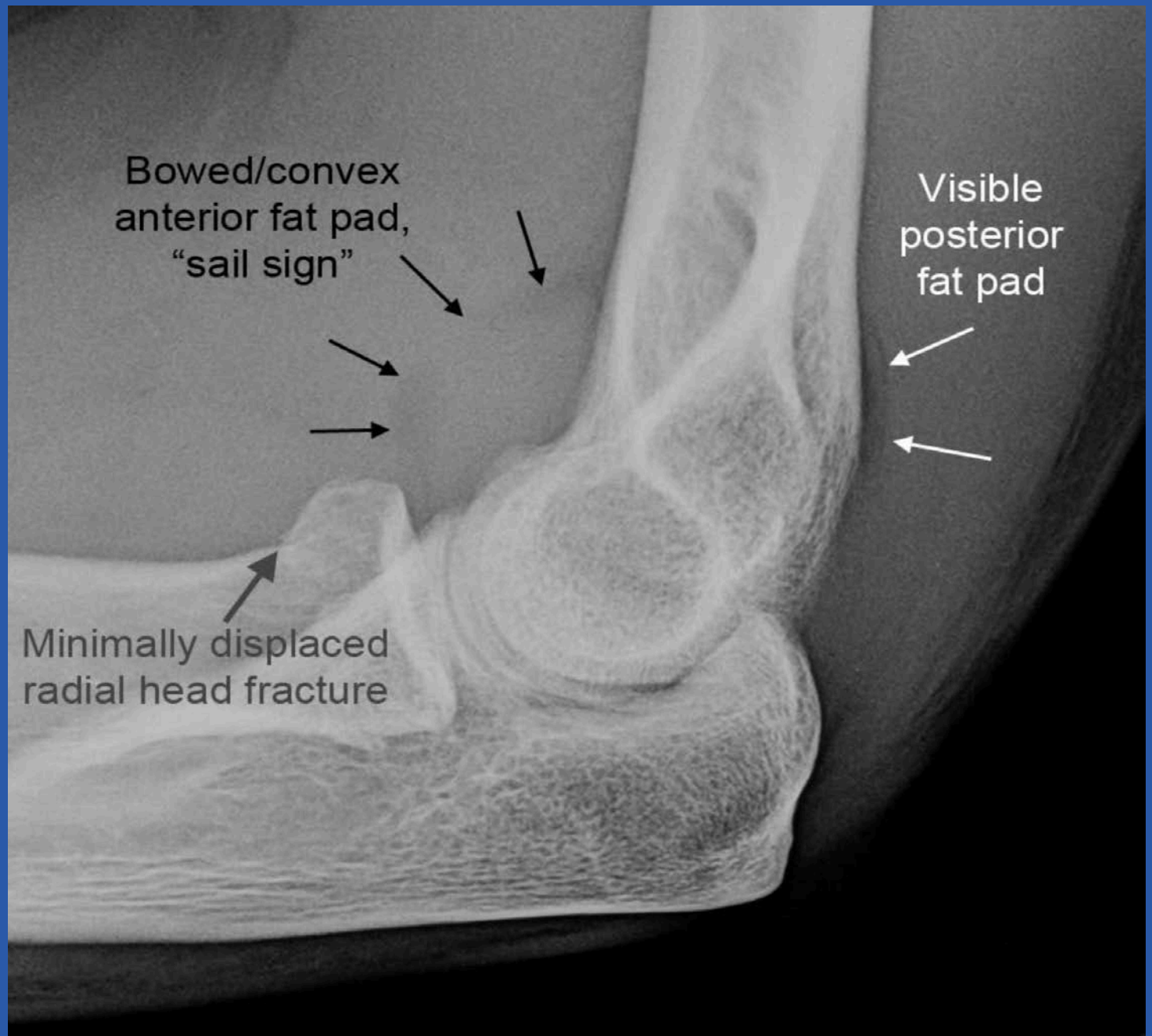
Procedure	Appropriateness Category	Relative Radiation Level
MRI area of interest without IV contrast	Usually Appropriate	O
Radiography area of interest repeat in 10-14 days	Usually Appropriate	Varies
CT area of interest without IV contrast	Usually Appropriate	Varies
CT area of interest with IV contrast	Usually Not Appropriate	Varies
CT area of interest without and with IV contrast	Usually Not Appropriate	Varies
MRI area of interest without and with IV contrast	Usually Not Appropriate	O
Tc-99m bone scan area of interest	Usually Not Appropriate	☢☢☢
US area of interest	Usually Not Appropriate	O

ELBOW

In the adult elbow, fracture is **excluded** and imaging is therefore **unnecessary** if the patient has:

- **normal full elbow extension**
- **absence of bruising** and **lack of tenderness over the radial head, olecranon, and medial epicondyle.**

ELBOW FAT PADS=FRACTURE



SHOULDER

TRAUMA

Variant 1: **Traumatic shoulder pain. Any etiology. Initial imaging.**

Procedure	Appropriateness Category	Relative Radiation Level
Radiography shoulder	Usually Appropriate	☢
CT arthrography shoulder	Usually Not Appropriate	☢☢☢☢
CT shoulder with IV contrast	Usually Not Appropriate	☢☢☢
CT shoulder without and with IV contrast	Usually Not Appropriate	☢☢☢
CT shoulder without IV contrast	Usually Not Appropriate	☢☢☢
FDG-PET/CT skull base to mid-thigh	Usually Not Appropriate	☢☢☢☢
MR arthrography shoulder	Usually Not Appropriate	O
MRI shoulder without and with IV contrast	Usually Not Appropriate	O
MRI shoulder without IV contrast	Usually Not Appropriate	O
Bone scan shoulder	Usually Not Appropriate	☢☢☢
US shoulder	Usually Not Appropriate	O

THORAX

- "**Lung cancer kills** more people each year than breast, colon and prostate cancers combined with a 5-year survival rate of only 19.9%
- **Lung cancer incidence and mortality rates are higher in rural areas** [4, 5].
- **Rural areas also have higher rates of late-stage lung cancer compared with urban areas. Smoking rates are consistently higher in rural areas** than their urban counterparts [7]. Smoking-attributable lung cancer accounts for 80% to 90% of all cases of lung cancer. Compared with urban areas, **rural areas also tend to have higher poverty, more uninsured residents, lower incomes, lower educational attainment, and a higher proportion of older adults, characteristics that make these areas more vulnerable to high smoking rates and high rates of lung cancer**. These disparities are most pronounced in the South, where lung cancer rates, smoking rates, and poverty are the highest in the nation [8, 9].
- To improve lung cancer survival rates, **early detection is imperative** [2, 10]. **Lung cancers diagnosed at a localized stage have a 56.3% 5-year relative survival rate compared with 29.7% and 4.7% 5-year relative survival rates for lung cancer diagnosed at regional and distant stages, respectively**

JACR Challenges and Opportunities for Lung Cancer Screening in Rural America

Cassie L. Odahowski, MPH Whitney E. Zahnd, PhD Jan M. Eberth, PhD

DOI:https://doi.org/10.1016/j.jacr.2019.01.001

Lung Cancer Screening Guidelines and Recommendations

Organization	Groups eligible for screening	Year
American Academy of Family Practice[1]	Evidence is insufficient to recommend for or against screening.	2013
American Association for Thoracic Surgery[2]	1. Age 55 to 79 years with ≥ 30 pack-year smoking history. 2. Long-term lung cancer survivors who have completed 4 years of surveillance without recurrence, and who can tolerate lung cancer treatment in order to detect second primary lung cancer until the age of 79. 3. Age 50 to 79 years with a 20 pack-year smoking history and additional comorbidity that produces a cumulative risk of developing lung cancer ≥ 5% in 5 years.	2012
American Cancer Society[3]	Age 55 to 74 years with ≥ 30 pack-year smoking history, either currently smoking or have quit within the past 15 years, and who are in relatively good health.	2013
American College of Chest Physicians[4]	Age 55 to 74 years with ≥ 30 pack-year smoking history and either continue to smoke or have quit within the past 15 years.	2013
American College of Chest Physicians and American Society of Clinical Oncology[5]	Age 55 to 74 years with ≥ 30 pack-year smoking history and either continue to smoke or have quit within the past 15 years.	2012
American Lung Association[6]	Age 55 to 74 years with ≥ 30 pack-year smoking history and no history of lung cancer.	2012
National Comprehensive Cancer Network[7]	1. Age 55 to74 years with ≥ 30 pack-year smoking history and smoking cessation < 15 years. 2. Age ≥ 50 years and ≥ 20 pack-year smoking history and 1 additional risk factor (other than secondhand smoke).[a]	2012
U.S. Preventive Services Task Force[8]	Age 55 to 80 years with ≥ 30 pack-year smoking history and smoking cessation < 15 years.	2013

[a]Additional risk factors include cancer history, lung disease history, family history of lung cancer, radon exposure, occupational exposure, and history of chronic obstructive pulmonary disease or pulmonary fibrosis. Cancers with increased risk of developing new primary lung cancer include survivors of lung cancer, lymphomas, cancer of the head and neck, and smoking-related cancers. Occupational exposures identified as carcinogens targeting the lungs include silica, cadmium, asbestos, arsenic, beryllium, chromium (VI), diesel fumes, and nickel.

2020 PROPOSED USPSTF LOW DOSE SCREENING CT FOR LUNG CANCER GUIDELINES

- When final, this recommendation will replace the 2014 USPSTF recommendation on screening for lung cancer. **In 2014,** the USPSTF recommended annual screening for lung cancer with LDCT in adults **ages 55 to 80 years** who have a **30 pack-year** smoking history and currently smoke or have quit within the past 15 years (abbreviated as A-55-80-30-15).[17]
- For the current draft recommendation, the USPSTF has changed the age range and pack-year eligibility criteria, and recommends annual screening for lung cancer with LDCT in adults **ages 50 to 80 years** who have a **20 pack-year** smoking history and currently smoke or have quit within the past 15 years (A-50-80-20-15).
- As in the 2014 recommendation, the USPSTF recommends that **screening should be discontinued once a person has not smoked for 15 years or develops a health problem that substantially limits life expectancy or the ability or willingness to have curative lung surgery.**

New 2018

American College of Radiology
ACR Appropriateness Criteria®
Lung Cancer Screening

Variant 1: **Lung cancer screening. Patient 55 to 80 years of age and 30 or more packs per year smoking history and currently smoke or have quit within the past 15 years.**

Procedure	Appropriateness Category	Relative Radiation Level
CT chest without IV contrast screening	Usually Appropriate	☢☢☢
CT chest with IV contrast	Usually Not Appropriate	☢☢☢
CT chest without and with IV contrast	Usually Not Appropriate	☢☢☢
FDG-PET/CT skull base to mid-thigh	Usually Not Appropriate	☢☢☢☢
MRI chest without and with IV contrast	Usually Not Appropriate	O
MRI chest without IV contrast	Usually Not Appropriate	O
Radiography chest	Usually Not Appropriate	☢

WHAT TO LOOK FOR AND HOW BEST TO FIND IT:

WWW.ACR.ORG/.../APPROPRIATENESS-CRITERIA

NOT SURE? CALL YOUR RADIOLOGIST/ORTHOPEDIC SURGEON-GIVE THEM THE PERTININENT H&P FINDINGS

THANK YOU!

REFERRAL DECISIONS

Urgent referral – immediate

- Significant soft tissue injury
- Life threatening injuries – hemorrhage, fat or pulmonary embolism, gas gangrene, tetanus.
- Arterial or Nerve injury
- Open fractures

REFERRAL DECISIONS

Urgent Referrals–Ambulance to ER

Compartment Syndrome – elevated pressures in rigid fascial muscle compartments.

5 Ps – pain, pallor, paresthesia, paralysis, pulseless – Late sign

Tenting of skin - concern for open fracture

REFERRAL DECISIONS

Urgent Referral Ambulance to ER?

Complicated Fractures to refer

- Fractures needing to reduce
- Multiple Fractures
- Intra articular fractures
- Fracture Dislocations
- Epiphyseal plate fractures
- Fractures with tendon injuries

George Gabel PA-C Orthopedics Department Houston VAMC

Variant 1: **Atraumatic shoulder pain. Initial imaging.**

Procedure	Appropriateness Category	Relative Radiation Level
Radiography shoulder	Usually Appropriate	☢
CT arthrography shoulder	Usually Not Appropriate	☢☢☢☢
CT shoulder with IV contrast	Usually Not Appropriate	☢☢☢
CT shoulder without and with IV contrast	Usually Not Appropriate	☢☢☢
CT shoulder without IV contrast	Usually Not Appropriate	☢☢☢
MR arthrography shoulder	Usually Not Appropriate	O
MRI shoulder without and with IV contrast	Usually Not Appropriate	O
MRI shoulder without IV contrast	Usually Not Appropriate	O
US shoulder	Usually Not Appropriate	O
X-ray arthrography shoulder	Usually Not Appropriate	☢

Subacromial decompression surgery for adults with shoulder pain: a clinical practice guideline

BMJ 2019 ; 364 doi: https://doi.org/10.1136/bmj.l294 (Published 06 February 2019)
Cite this as: *BMJ* 2019;364:l294

Linked Editorial
Subacromial decompression surgery for shoulder pain

Visual summary of recommendation

Population

Including:
- Subacromial pain syndrome (SAPS)
- Rotator cuff disease (RCD)

Does not apply to patients with:
- Traumatic shoulder pain
- Other differential diagnoses

Interventions compared

Subacromial decompression surgery
Arthroscopic subacromial decompression plus nonoperative management

or

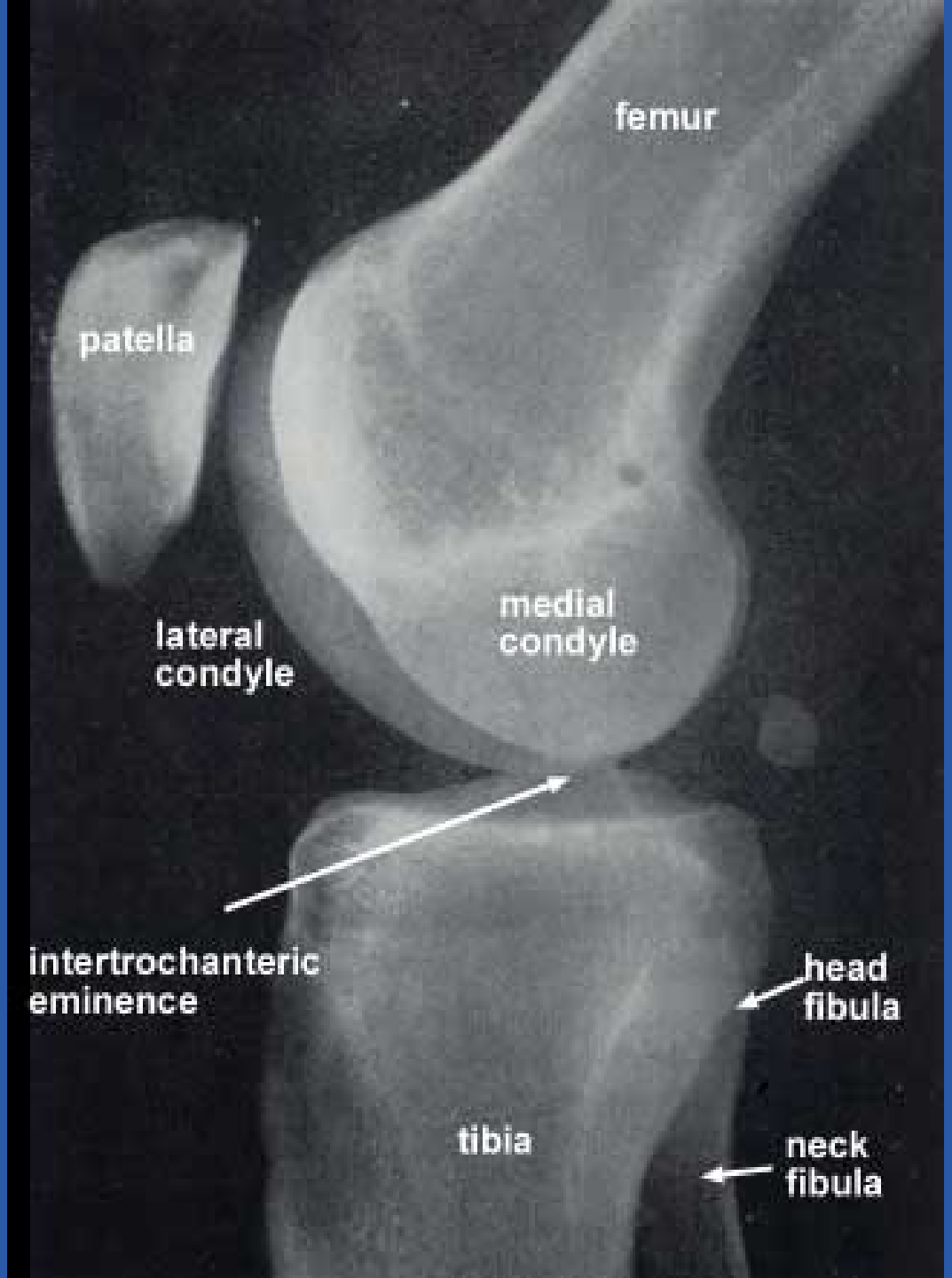
Nonoperative management only
Including guided physical therapy, exercise programmes, NSAIDs, and steroid injections

Recommendation

Strong | Weak | Weak | Strong

We recommend against subacromial decompression surgery

More details


femur
patella
lateral condyle
medial condyle
intertrochanteric eminence
head fibula
tibia
neck fibula