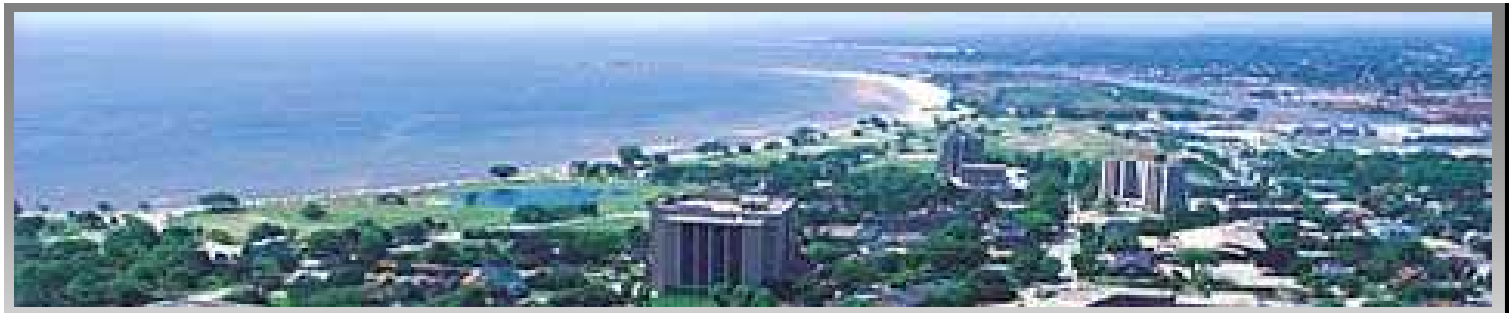
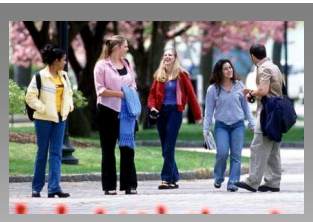
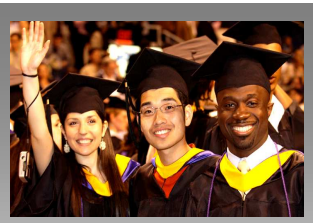


Orthopedic Examination of the Spine, Pelvis, and Extremities, DX 611 Clinical Assessment Protocol

James J. Lehman, DC, MBA, DABCO
University of Bridgeport College of Chiropractic

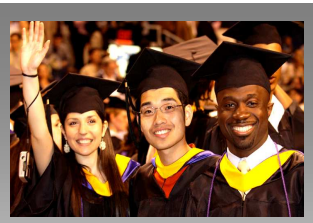


DIAGNOSIS 611

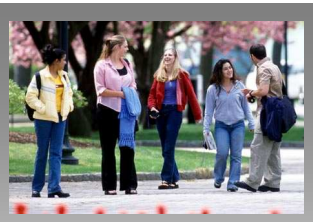
Orthopedics

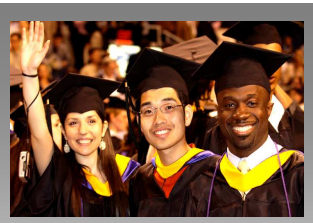
- This lecture and laboratory course introduces students to the procedures necessary to examine the neuromusculoskeletal system. Normal and abnormal findings are presented and discussed. An emphasis is placed on a student's understanding of clinical anatomy and interpretation of positive tests and signs.
  2 lecture hours, 4 laboratory hours, 4 semester hours



Life-Long Learners

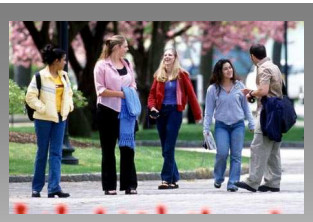



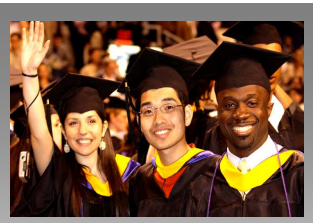


Orthopedics

Clinical assessment protocol

- Patient history
- Inspection and observation
- Palpation
- Range of motion
- Orthopaedic and neurologic testing
- Diagnostic imaging
- Functional testing

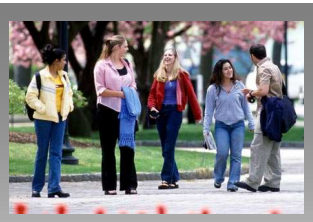



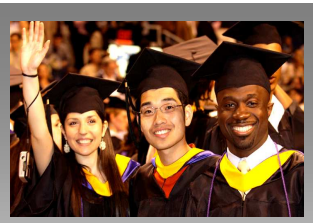


Orthopedics

Clinical assessment protocol

- **S**ubjective — Patient history
- **O**bjective — Objective findings
- **A**ssessment — Diagnoses
- **P**lan — Further testing or treatment



Orthopedics

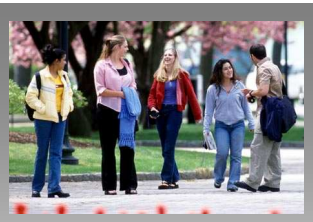
Clinical assessment protocol

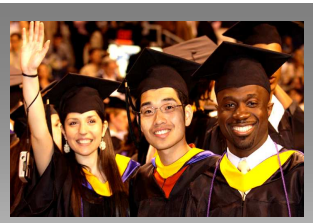
Closed-Ended History

Patient completes an intake form with direct and pointed questions.

Open-Ended History

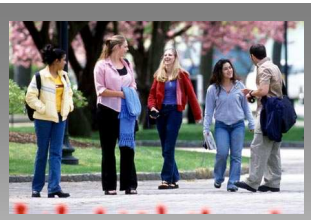
An open dialogue to discuss the patient's condition

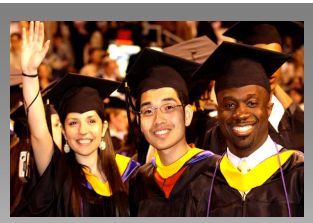





Closed-Ended History

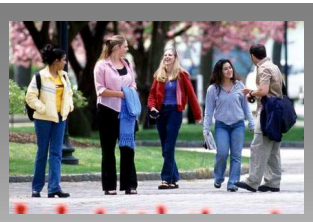
Completion of an intake form by patient

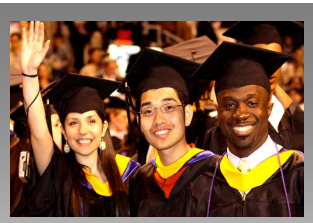





Open-Ended History

Doctor records medical history

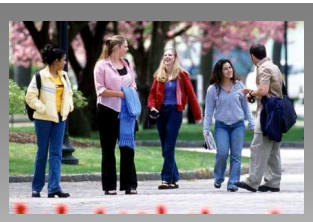



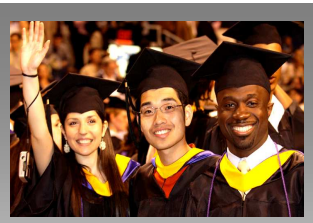


Orthopedics

OPQRST Mnemonic

- **O**nset of complaint
- **P**rovoking or palliative concerns
- **Q**uality of pain
- **R**adiating to a particular area or referred
- **S**ite and severity of complaint
- **T**ime frame of complaint

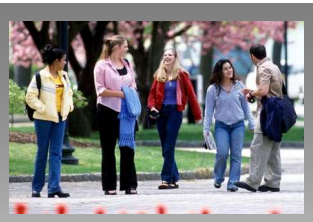



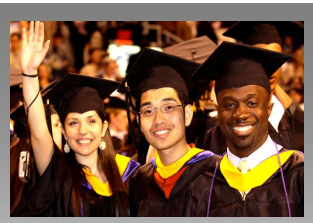


Orthopedics

Observation

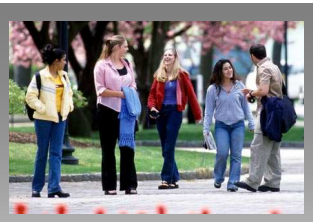
- General appearance
- Functional status
- Body type
- Postural deviations

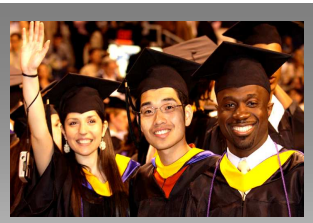





General Appearance

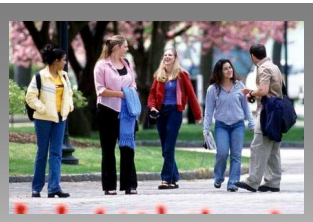
Obese, middle-aged, Caucasian female

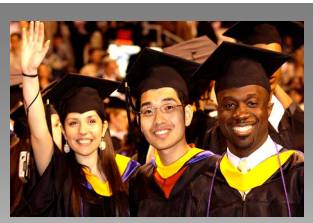





Functional Status

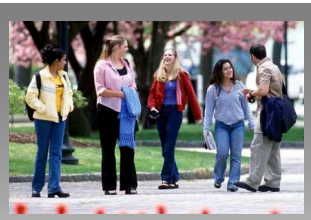
Athletically active adults

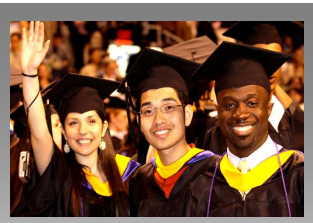





Body Type and General Appearance

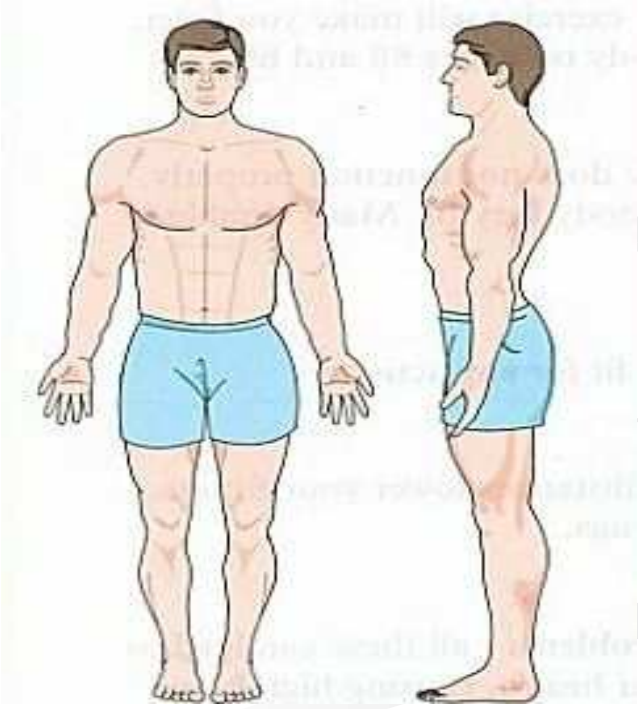
Young, healthy appearing, mesomorphic, male Caucasian

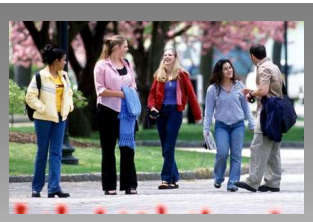



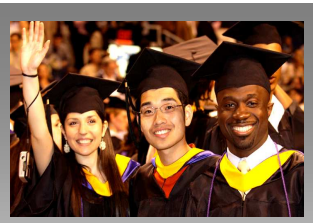


Body Type

Mesomorph

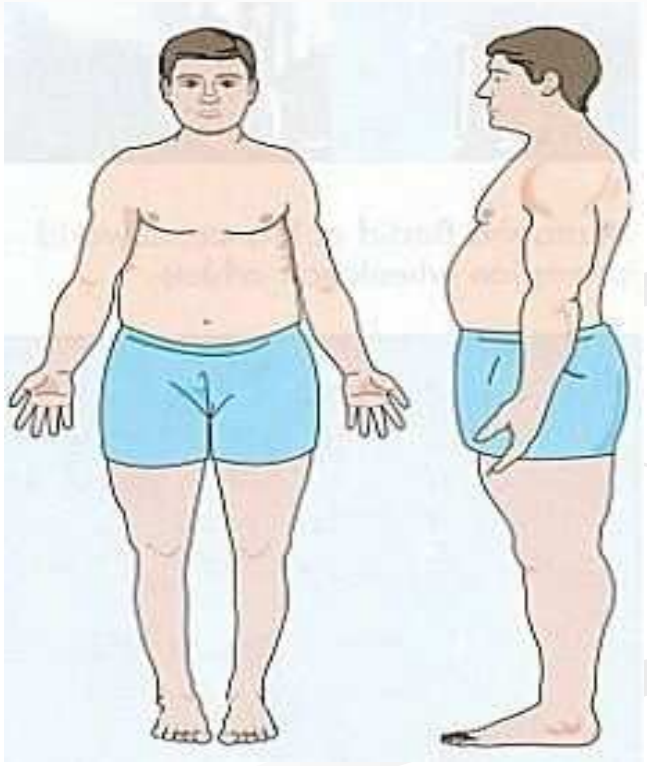


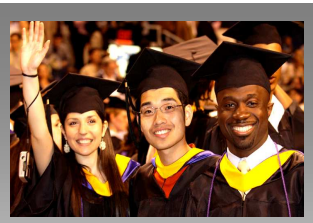


Body Type

Endomorph

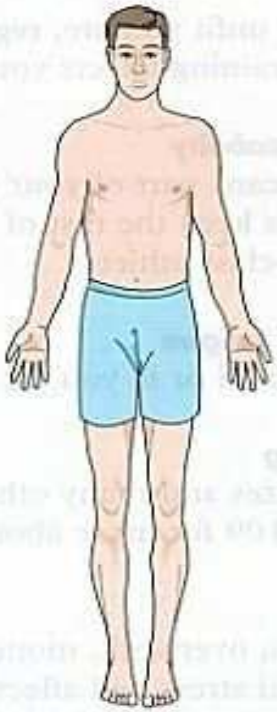


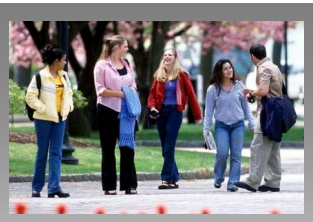


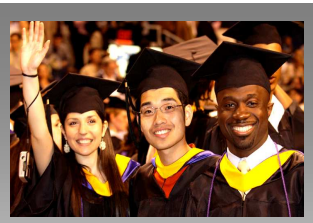



Body Type

Ectomorph

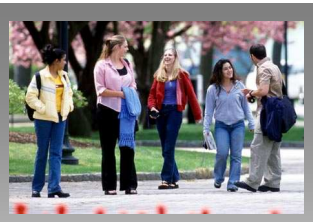


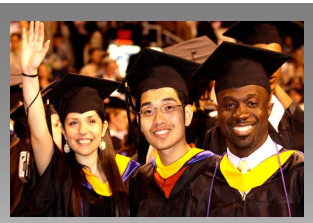





Postural Deviations

Young, healthy appearing, mesomorphic, black female with scoliosis

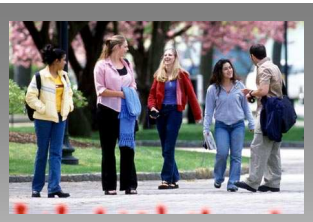



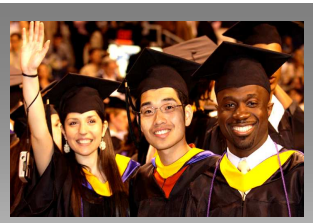


Orthopedics

Observation

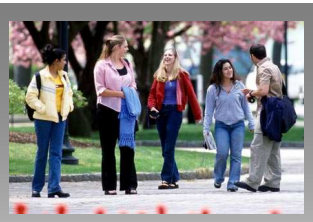
- Postural deviations
  - Gait
  - Muscle guarding
  - Compensatory or substitutive movements
  - Assistive devices for functional status

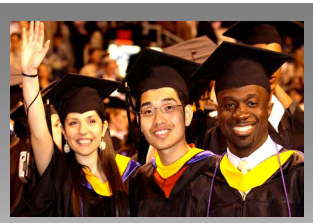





Posture Deviations

Antalgic posture with limping gait

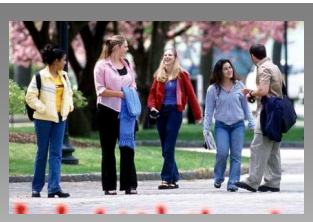



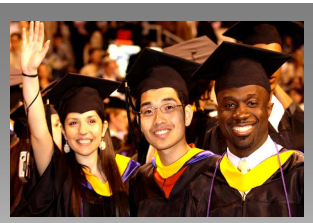


Orthopedics

Inspection

- Skin
- Subcutaneous soft tissue
- Bony structure

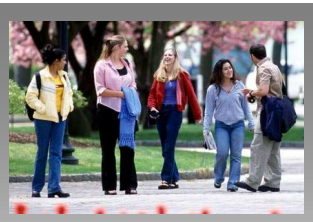



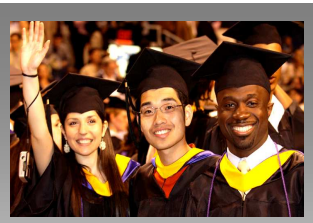


Orthopedics

Skin Inspection

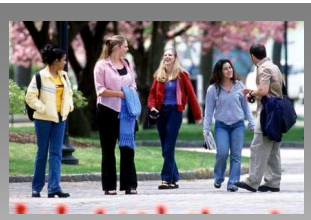
- Contusions or cicitrix formations
- Evidence of trauma or surgical intervention
- Changes in color or texture
- Open wounds

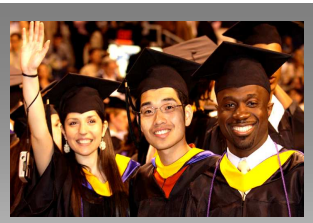





Skin Inspection

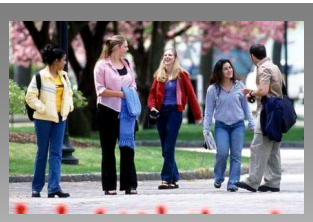
Post-surgical thoracic spine cicitrix formations

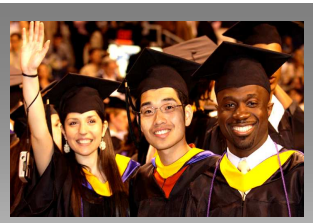





Skin Inspection

Contusions from "Kinetic Impact Munitions"

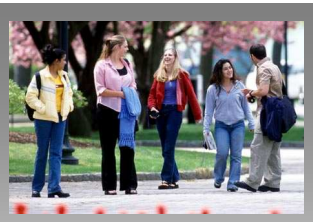



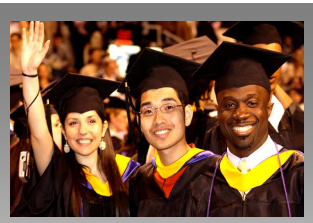


Orthopedics

Subcutaneous Inspection

- Inflammation and swelling or atrophy
  - Compare for bilateral symmetry
  - Circumferential mensuration of extremities

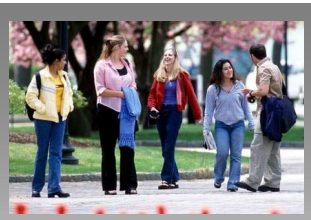



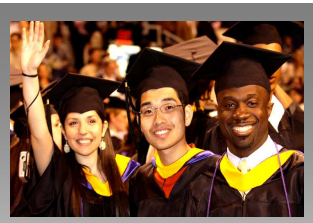


Orthopedics

Subcutaneous Inspection

- Increase in size
  - Edema
  - Articular effusion
  - Muscle hypertrophy or other
  - Note nodules, lymph nodes, or cysts

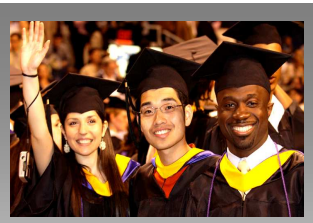





Subcutaneous Inspection

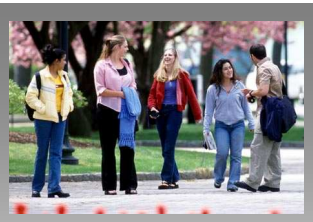
Pitting Edema

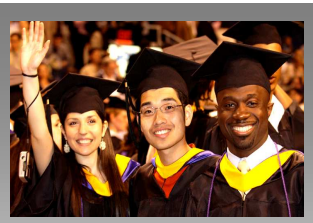


Subcutaneous Inspection

Articular effusion

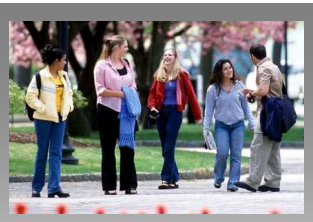


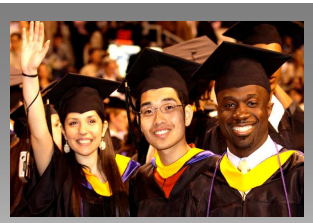
Orthopedics

Bony Structure Inspection

Evaluate

- Functional abnormality
  - Gait deviation
  - Altered range of motion

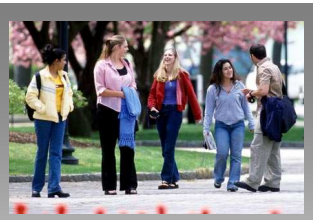


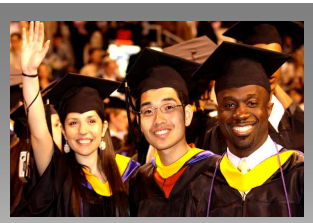
Orthopedics

Bony Structure Inspection

Evaluate

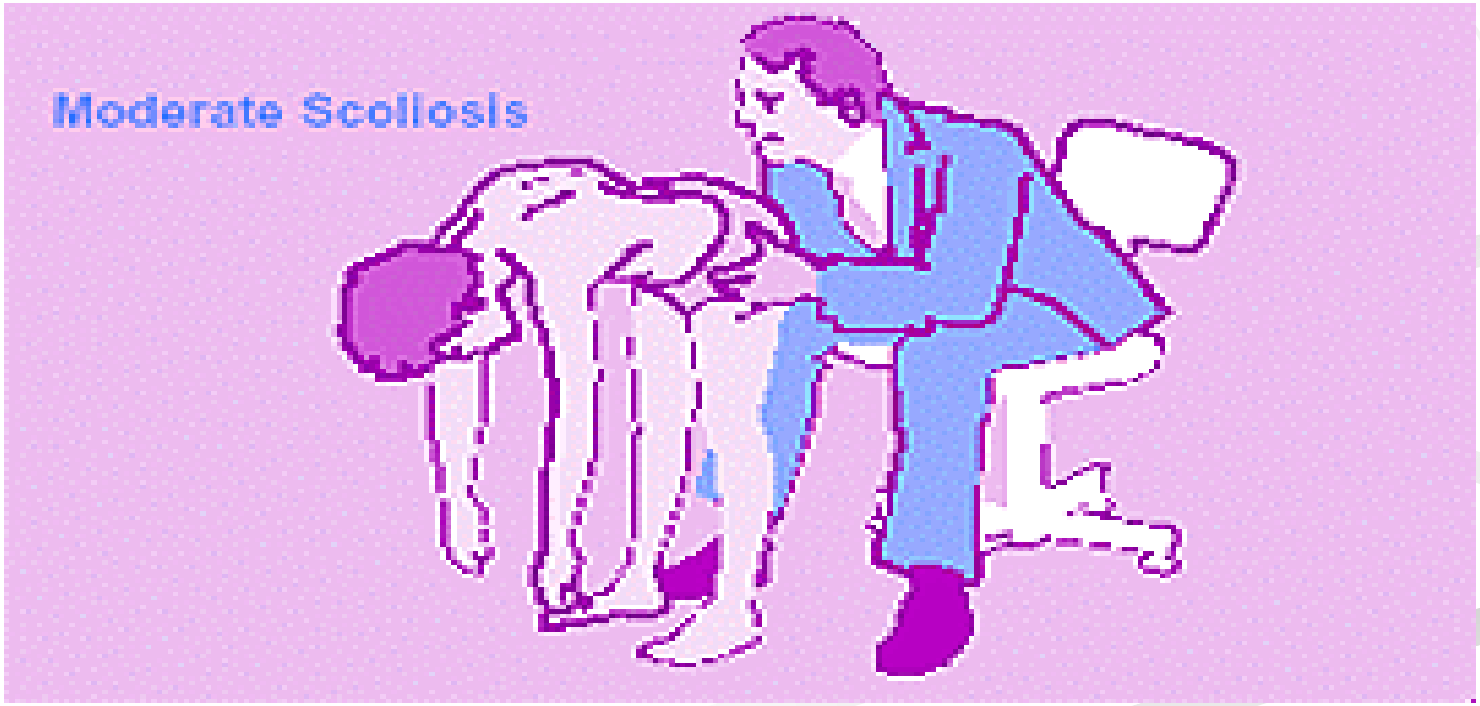
1. Spine
   - Scoliosis
   - Pelvic tilt or obliquity
   - Shoulder height

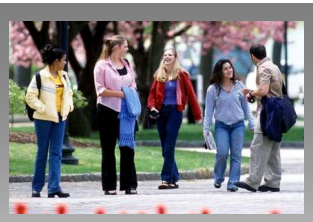



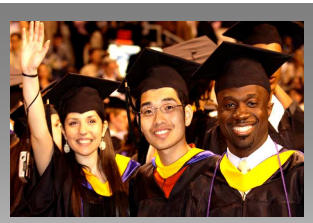


Bony Structure Inspection

Scoliosis examination



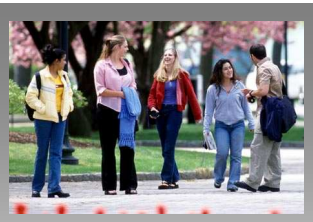



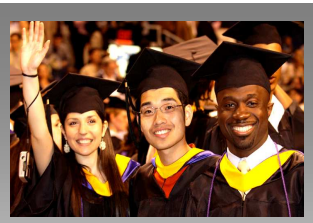


Orthopedics

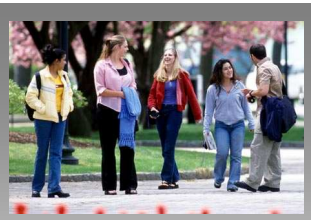
Bony Structure Inspection

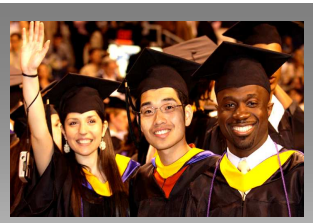
- Note and possibly measure extremity malformations
  - Traumatic
    - Healed Colles' fracture with residual angulation
  - Congenital
    - Genu varus or Genu valgus



Colles Fracture

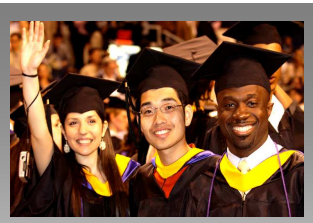





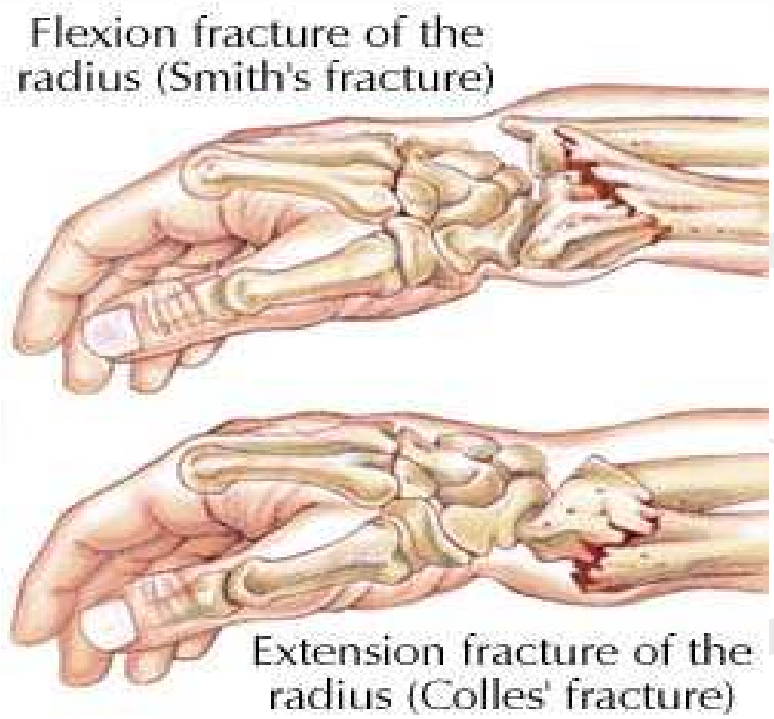
Bony Structure Inspection

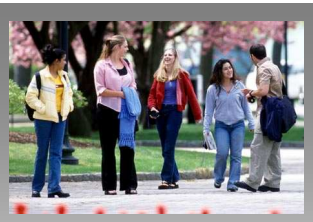
Colles Fracture

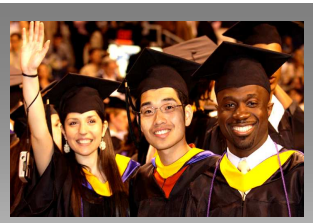


Wrist Fractures



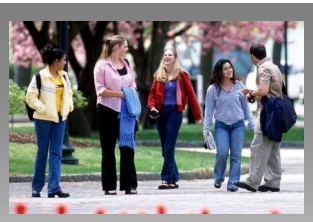



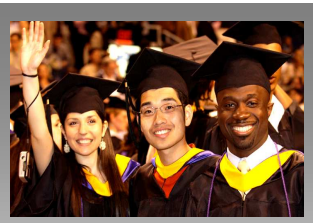


Orthopedics

Bony Structure Inspection

- *All bony structures should be visually assessed for abnormalities and documented*

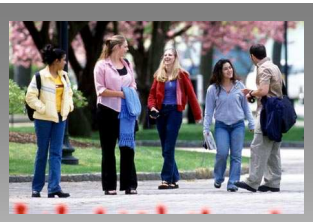


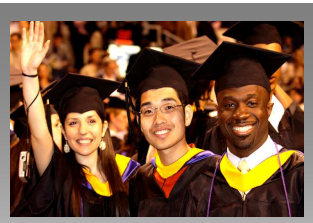
Orthopedics

Skin palpation

Palpation with light touch

1. Temperature
    1. Elevated with inflammation
    2. Lowered with vascular deficiency
2. Mobility
    1. Post-traumatic or post-surgical adhesions

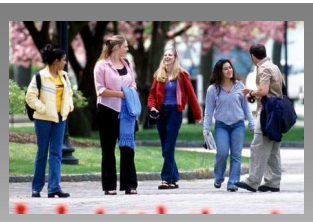


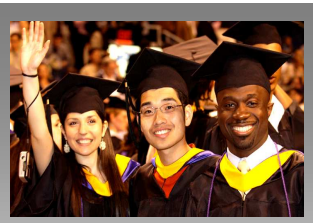
Orthopedics

Subcutaneous soft tissue palpation

Palpation with increased pressure

1. Consists of fat, fascia, tendons, muscles, ligaments, joint capsules, nerves, and blood vessels
2. Note tenderness
3. Determine tenderness and grade it

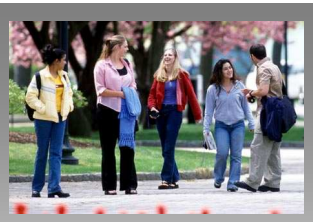


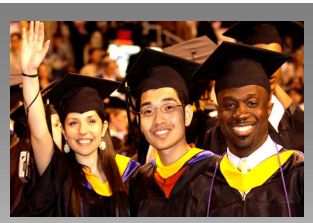
Orthopedics

Tenderness Grading Scale

- Grade I
- Grade II
- Grade III
- Grade IV

- Pain
- Pain and winces
- Winces and withdraws
- Does not allow palpation

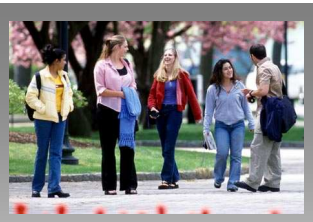


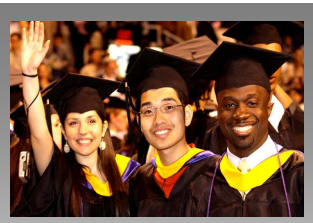
Orthopedics

Differentiate types of edema

1. Blood
2. Synovial fluid

1. Immediate post-traumatic warm and hard
2. 8-24 hours post-traumatic, boggy or spongy

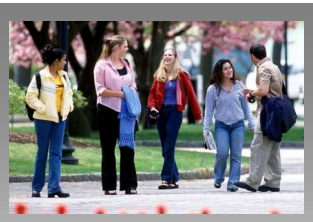


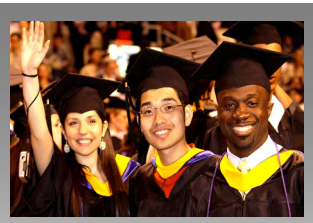
Orthopedics

Differentiate types of edema

3. Callus
4. Chronic swelling
5. Acute
6. Bone
7. Pitting edema

3. Tough and dry swelling
4. Thickened or leathery
5. Soft and fluctuating edema
6. Hard
7. Thick and slow moving edema

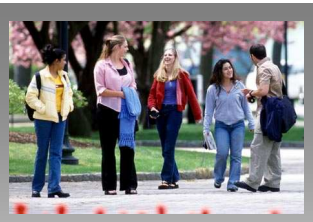



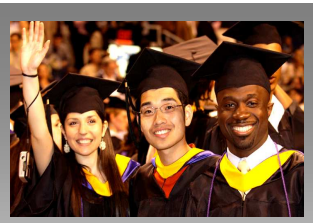


Orthopedics

Pulse palpation

- Thoracic outlet syndrome
- Arterial insufficiency

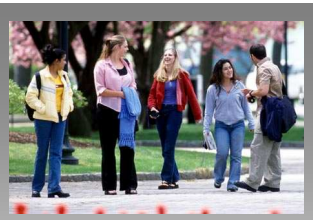



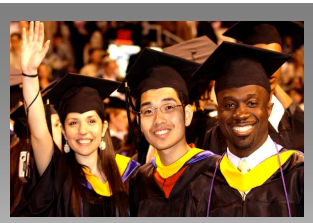


Orthopedics

Palpation of bony structures

- Alignment problems
  - Dislocations
  - Luxations
  - Subluxations
  - Fractures

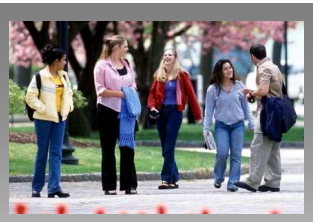



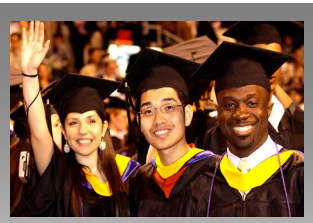


Orthopedics

Palpation of bony structures

- Tenderness is a major finding
  - Identify tendons and ligaments
  - Sprain, strain, or fracture

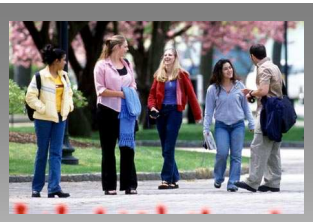



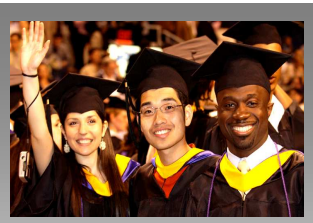


Orthopedics

Palpation of bony structures

- Bony enlargements
  - Healing of fractures
  - Degenerative joint disease

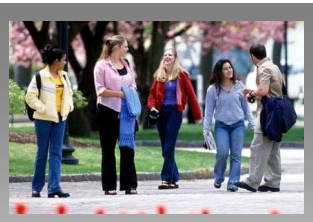



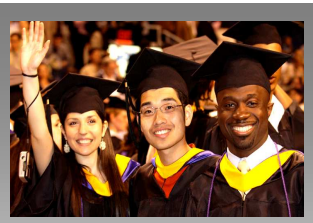


Orthopedics

Range of Motion

1. Passive
2. Active
3. Resisted

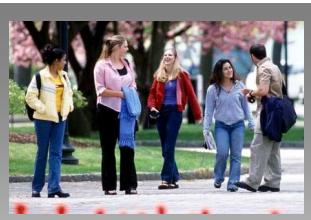


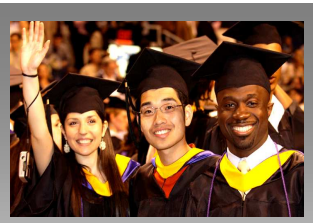
Orthopedics

Passive Range of Motion

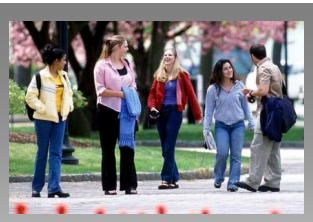
<u>Examiner moves the body part</u>

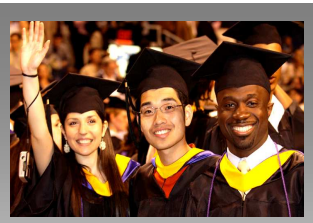
1. Note normal, increased, or decreased ROM and in which planes
2. Note pain
   - Ipsilateral pain = capsular or ligamentous lesion
   - Contralateral pain = Muscular lesion



Passive Range of Motion

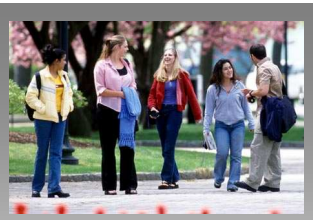


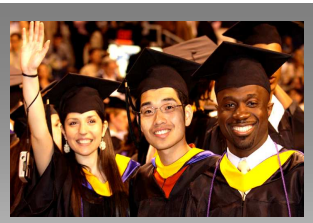
Orthopedics

Active Range of Motion

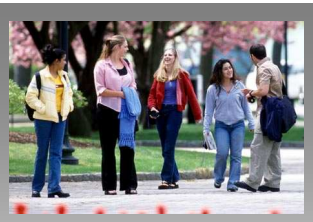
Patient moves body part

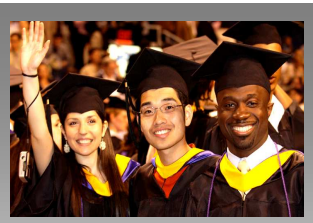
- Tests muscle integrity and nerve supply
- Compare ROM
- Correlate pain with movement
- Note crepitus (crackling)



Active Range of Motion

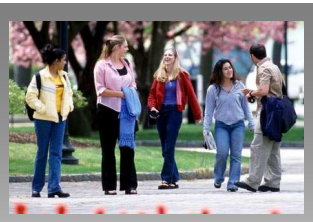



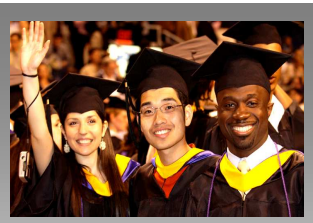


Orthopedics

Active Range of Motion

- Crepitus is crackling sound
- Indicates
  - Roughening of joint
  - Increased friction between tendon and sheath caused by edema or roughening

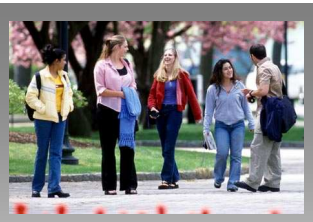



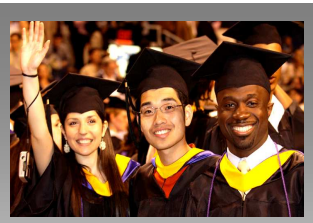


Orthopedics

Active Range of Motion

- You will be required to utilize goniometer but not an inclinometer
- Medical conditions involving impairment ratings or disability determinations require specific mensuration

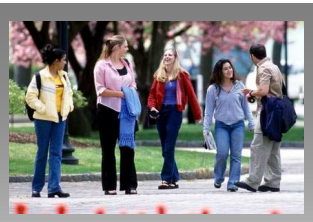



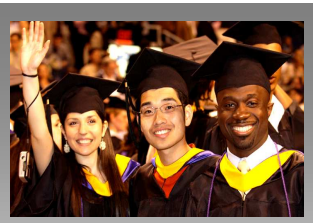


Orthopedics

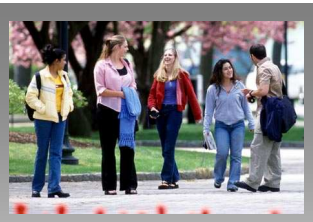
Resisted Range of Motion

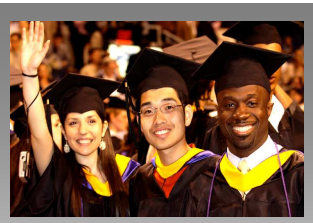
- Examiner resists patient movement
- Assesses musculotendinous and neurologic structures
- Primarily used to test neurologic function



Resisted Range of Motion

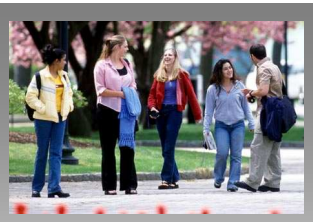



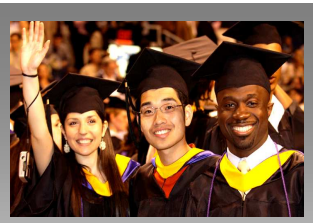


Orthopedics

Resisted Range of Motion

- Musculotendinous injuries are more painful than weak
- Neurologic lesions are more weak than painful

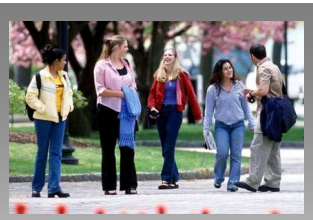



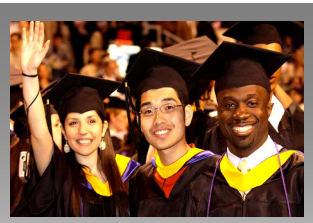


Orthopedics

Six Ranges of Motion and Pain Variations

1. Normal mobility with no pain
2. Normal mobility with pain elicited
3. Hypomobility with no pain
4. Hypomobility with pain elicited
5. Hypermobility with no pain
6. Hypermobility with pain elicited

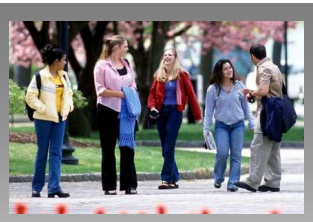


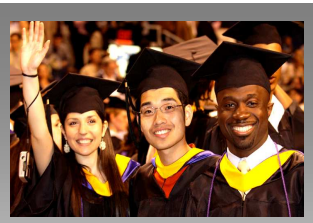
Orthopedics

Hard End Feel Evaluation

Normal Physiological

- Abrupt hard to stop movement when bone contacts bone
- Passive elbow extension
- Olecranon process contracts the olecranon fossa

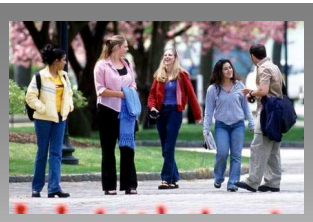


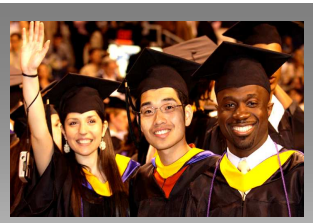
Orthopedics

Hard End Feel Evaluation

Abnormal Pathologic

- Abrupt stopping movement before normal expected passive movements
- Cervical flexion hard end feel due to severe DJD

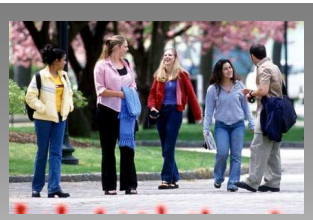


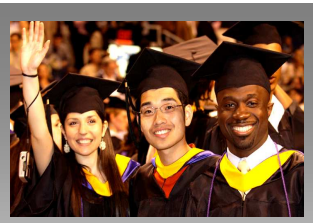
Orthopedics

Soft End Feel Evaluation

Normal

- When 2 body surfaces come together, a soft compression of tissue is felt
- Passive elbow flexion
- Anterior aspect of the forearm approximates the biceps muscle

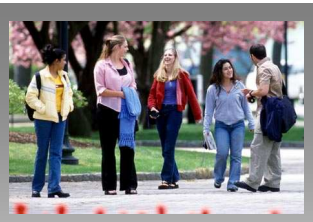


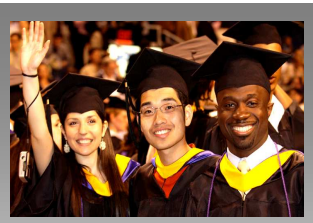
Orthopedics

Soft End Feel Evaluation

Abnormal

- A soft boggy sensation resulting from synovitis or soft tissue edema
- Ligamentous sprain

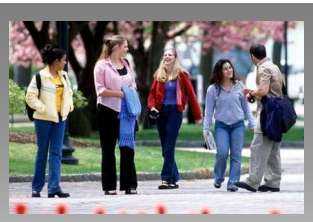


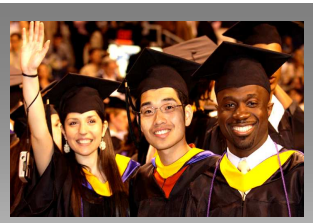
Orthopedics

Firm End Feel Evaluation

Normal

- A firm or spongy sensation that has some give when a muscle, ligament, or tendon is stretched
- Passive wrist flexion, passive external shoulder rotation

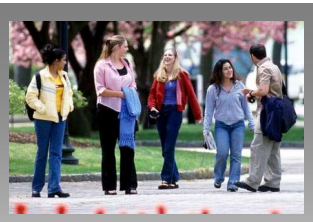


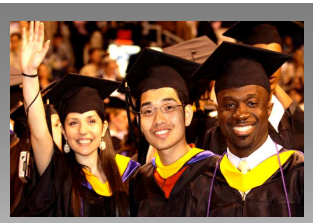
Orthopedics

Firm End Feel Evaluation

Abnormal

- A firm springy sensation to movement with a slight amount of give in capsular joints
- Frozen shoulder or adhesive capsulitis

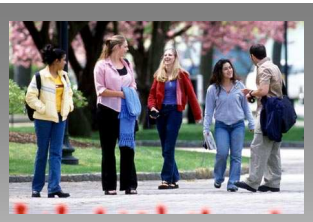


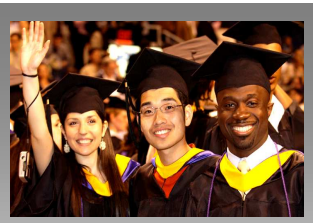
Orthopedics

Springy, Block End Feel Evaluation

Abnormal Pathologic End Feels

- Rebound effect with limited motion; usually in joints with a meniscus.
- Torn meniscus

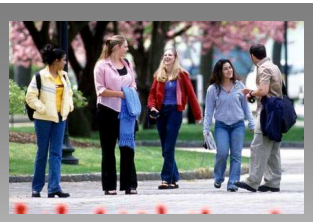


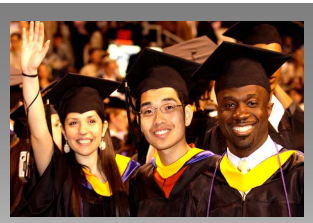
Orthopedics

Empty End Feel Evaluation

Abnormal Pathologic End Feel

- An empty feel in a joint with severe pain when passively moved. The movement cannot be performed because of the pain.
- Fracture, subacromial bursitis, neoplasm, joint inflammation.

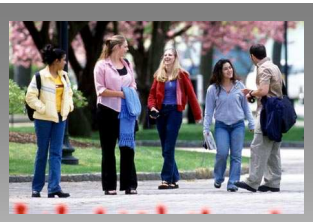



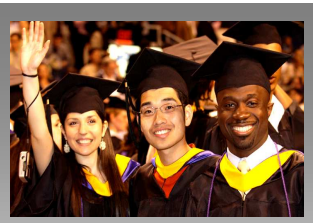


Orthopedics

Special physical, orthopaedic, and neurologic testing

- Provocative maneuvers
- Place functional stress on isolated tissue structures
- Reveal pathologies and biomechanical lesions
- Multiple tests are necessary to confirm a diagnosis

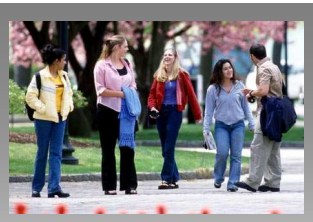



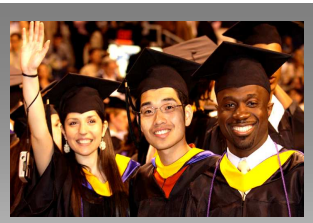


Orthopedics

Special physical, orthopaedic, and neurologic testing

- *"Primum non nocere"*
- *First do no harm*
- Prior to performing provocative maneuvers it is essential that you rule out contraindications to such procedures.

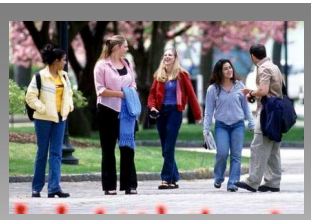



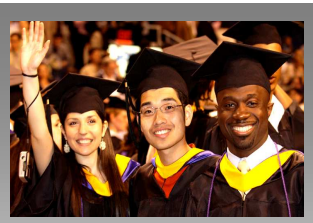


Hippocrates

Epidemics, Book 1, Section XI

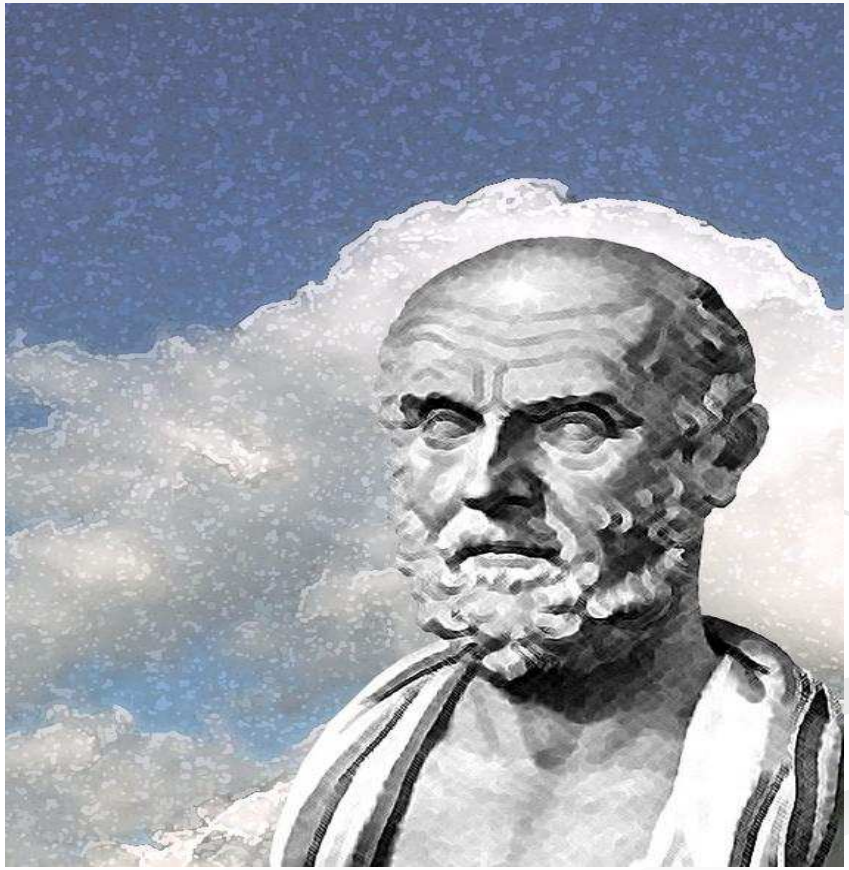
- *"Declare the past, diagnose the present, foretell the future; practice these acts. As to diseases, make a habit of two things — to help, or at least to do no harm."*

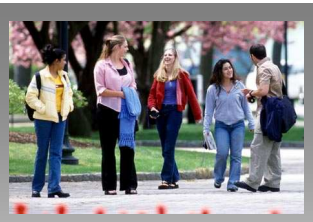



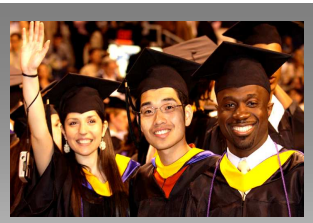


Hippocrates

Father of Chiropractic Medicine



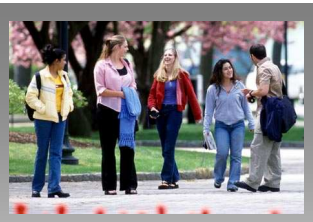



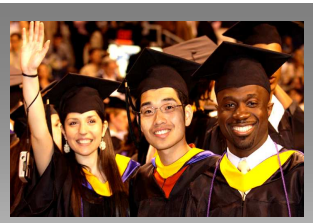


Orthopedics

Special physical, orthopaedic, and neurologic testing

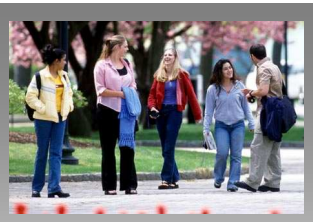
- Rust's sign
- Post-traumatic holding of head with both hands in order to support the weight of the head on the cervical spine.
- Supine patient will grasp back of head while attempting to rise into a seated position

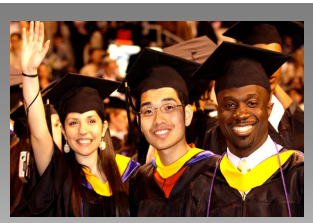





Rust's Sign

Do not perform orthopedic tests or spinal manipulation

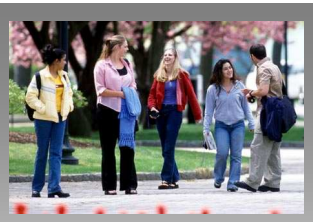



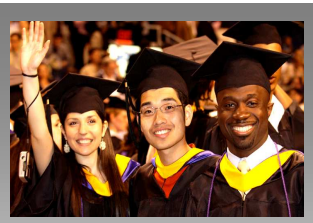


Orthopedics

Special physical, orthopaedic, and neurologic testing

- Rust's sign indicates a probable upper cervical spine instability
- Severe upper cervical spine injury to muscle, ligament, disc, and osseous structures
- Rule out fracture, dislocation, severe strain or sprain

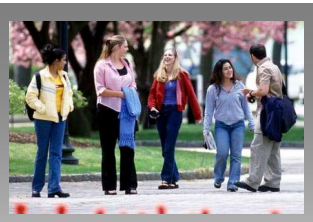



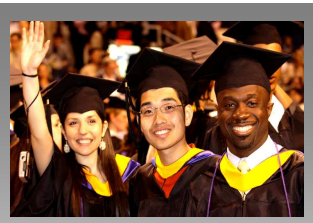


Orthopedics

Special physical, orthopaedic, and neurologic testing

- Rust's sign
- Patient is attempting to stabilize the head with slight traction and reduce pain
- Patient presents guarded movements
- Imaging studies must proceed any provocative testing

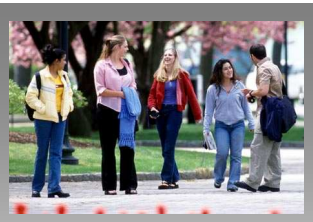



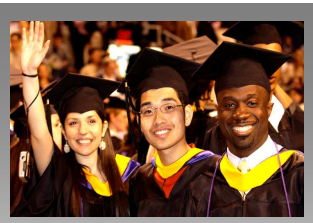


Orthopedics

Special physical, orthopaedic, and neurologic testing

- Sensitivity/Reliability Scale
- Based upon the biomechanics of the movement to isolate the affected structures

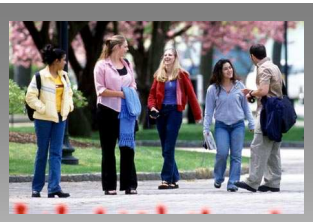



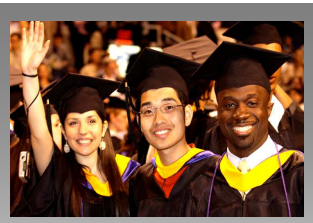


Orthopedics

Special physical, orthopaedic, and neurologic testing

- Sensitivity is the proportion of true positives that are correctly identified by the test.
- Specificity is the proportion of true negatives that are correctly identified by the test.

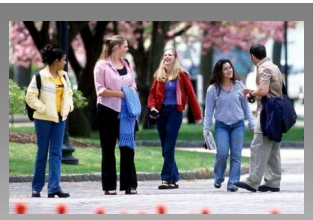



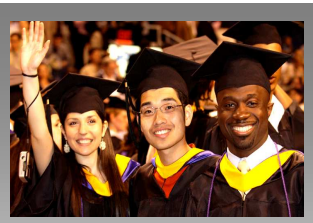


Sensitivity and Specificity

Instability (Rust's sign)

	Abnormal	Normal	Total
VFS	(+)	(-)	
Abnormal(+)	90	10	100
Normal(-)	20	80	100
Total	110	90	200

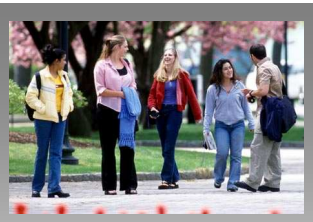


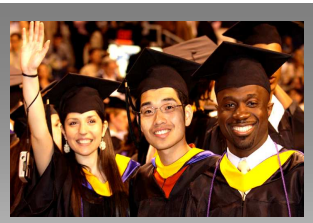
Sensitivity and Specificity

- The proportions of these two groups that were correctly diagnosed by the sign were

  90/110=0.82 (sensitivity) and

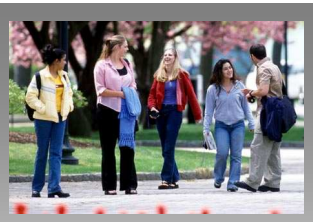
  80/90=0.89 (specificity)

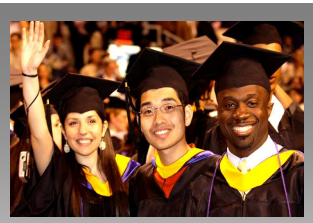





Predictive Values

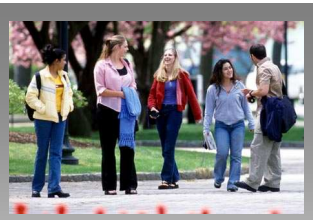
"Given a positive (or negative) test result, what is the new probability of instability?"

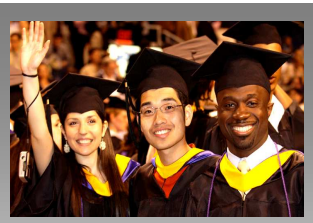





Predictive Values

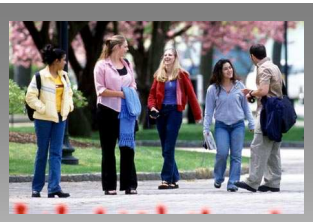
Positive predictive value = probability of instability among patients with a positive test

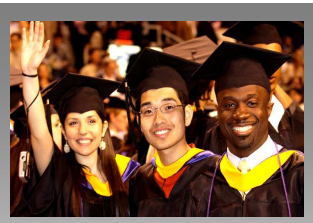





Predictive Values

Negative predictive value = probability of no instability among patients with a negative test

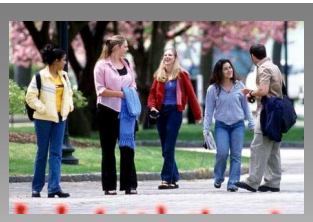



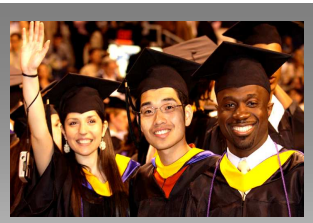


Predictive Values

http://www.poems.msu.edu/EBM/Diagnosis/PredictiveValues.htm

	With instability	Without stability
Test is Positive	a(90)	b(10)
Test is Negative	c(20)	d(90)

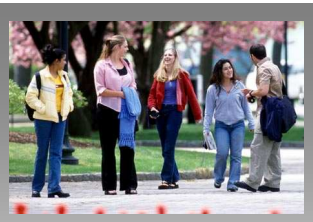



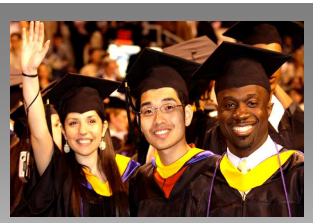


Predictive Values

We can now define positive and negative predictive value

- Positive predictive value = a / (a+b)
- Negative predictive value = d / (c+d)
- Post-test probability of instability given a positive test = a / (a+b)
- Post-test probability of instability given a negative test = c / (c+d)

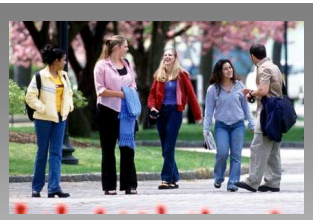



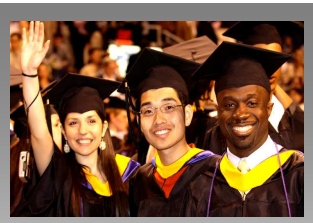


Predictive Values

We can now define positive and negative predictive value

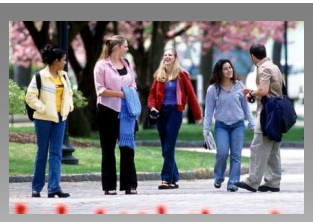
- Positive predictive value = 90 / (90+10) = 90%
- Negative predictive value = 90 / (20+90) = 82%
- Post-test probability of instability given a positive test = 90/ (90+10) = 90%
- Post-test probability of instability given a negative test = 20 / (20+90) = 18%

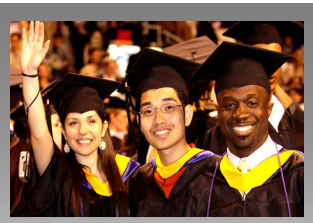





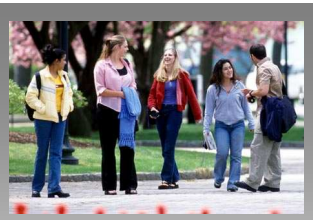
Diagnostic Imaging
Radiographic Examination

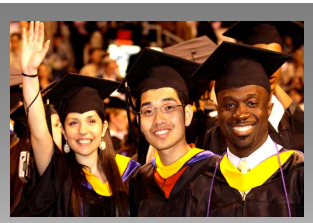
- *Bone is best-seen tissue on plain film radiography*



Standard Plain Film Radiograph

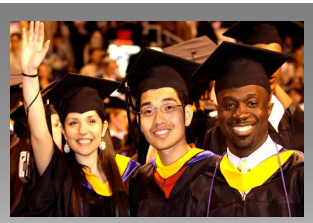





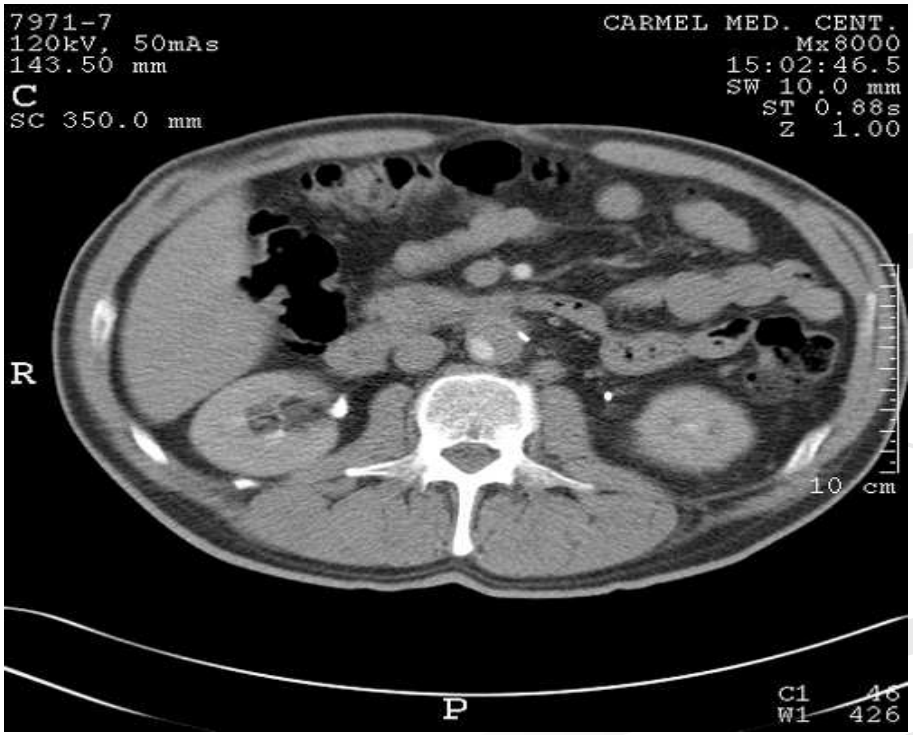
Computed Tomography

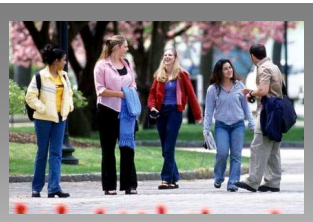
- *CT is best used for bone detail and demonstration of calcifications.*
- *Intervertebral disc defects may also be visualized on CT, but not as well as MRI*

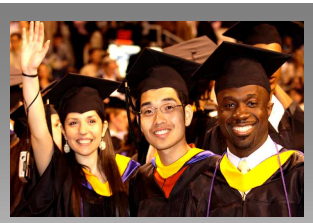


CT Scan

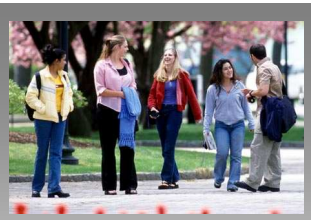

7971-7
120kV, 50mAs
143.50 mm
C
SC 350.0 mm
CARMEL MED. CENT.
Mx8000
15:02:46.5
SW 10.0 mm
ST 0.88s
Z 1.00
R
10 cm
P
C1 46
W1 426

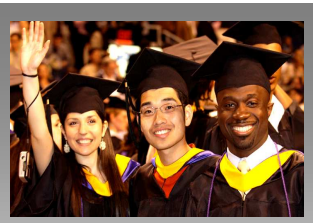





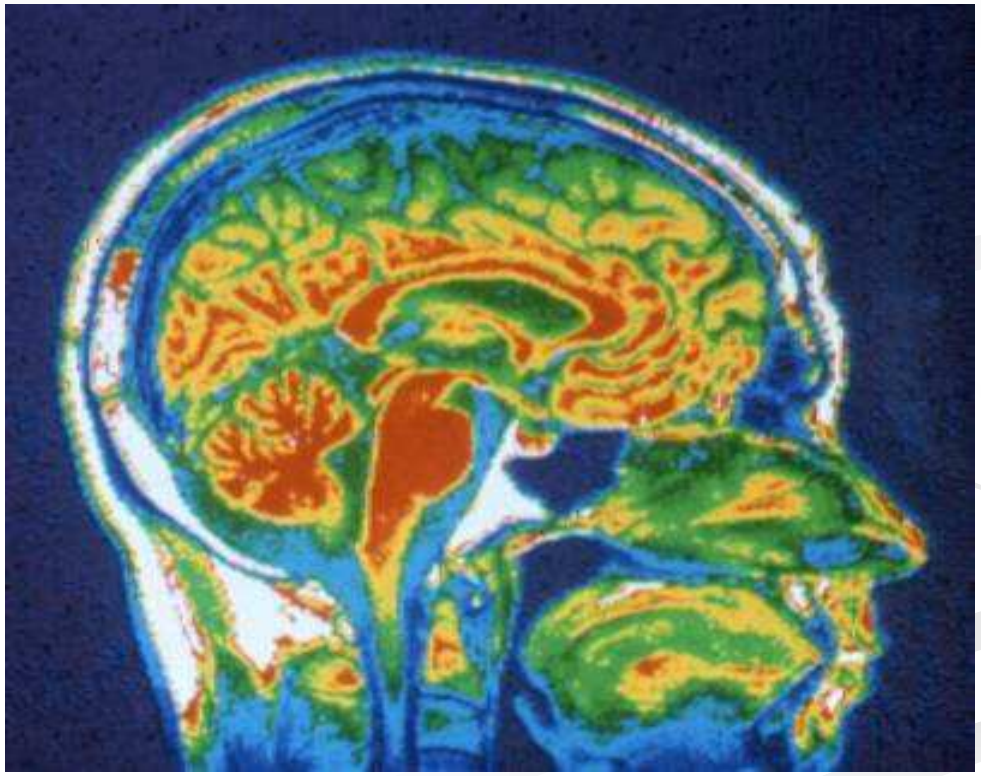
Magnetic Resonance Imaging

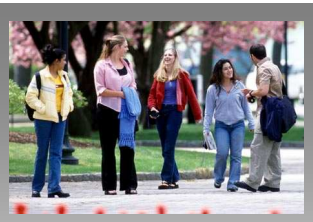
- *MRI is invaluable in contrasting soft tissue structures in many planes without the use of ionizing radiation*
- *It poorly demonstrates bone density detail or calcifications; this is the advantage of CT.*

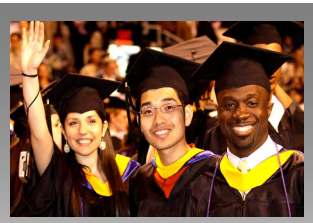





MRI

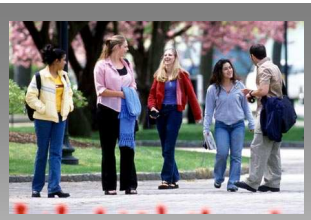


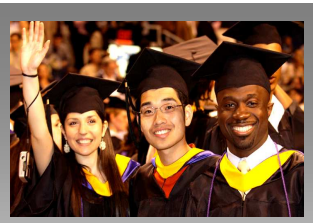





Myelography

- Water-soluble contrast medium is injected into the subarachnoid space
- Standard radiographic exposure is used to evaluate any defects of the spinal canal
- Spinal stenosis, spinal cord lesions, and dural tears



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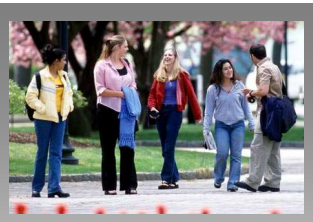
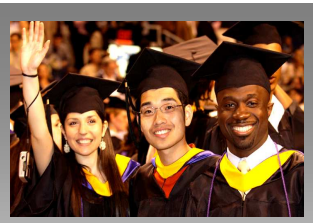
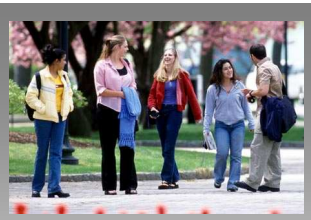
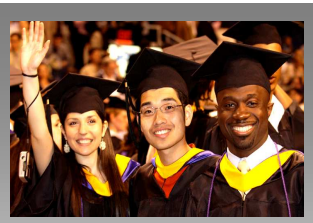


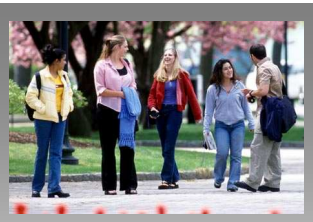


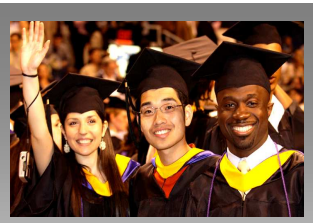
Skeletal Scintigraphy or Bone Scans

- Intravenous radiopharmaceutical, technetium-99m
- Attracts osteoblastic activity, such as healing fractures
- Best suited for undetectable fractures and arthropathies (DJD, osteomyelitis, bony dysplasias, primary bone tumors, and METS)





Clinical Assessment Protocol Final Slide