Musculoskeletal

Assessment & Diagnostic Studies

2025

Assessment- Health History

- **Chief Complaint**
- **History of present illness**
  - Pain
  - Joint Swelling
  - ↓ strength/weakness
  - Change in the size of an extremity or muscle
  - Deformity
  - Spasms
  - Crepitation
  - Change in sensation
  - Stiffness
  - Change in gait
  - Change in functional abilities – ADL's

Health History

- **Past Medical History**
  - Illnesses (Polio, DM, Gout, Arthritis, TB)
  - Immunizations (Tetanus, Polio)
  - Meds & Allergies (OTC, prescription drugs, herbals, steroi
  - Injuries, Hospitalizations, Surgeries
- **Family History/Genetic Risk Alert**
  - Rheumatoid
  - Osteoporosis
  - Muscular dystrophy
  - Degenerative arthritis
  - Gout, OA, Scoliosis

Health History

- **Social History**
  - Occupation
  - Exercise – sedentary vs. heavy lifting/active
  - Diet/Nutrition/Elimination Problems
- **Review of Systems**
  - Describe problems with joint pain, muscle spasms, redness or swelling, ↓ movement, weakness
  - Are ADL's affected?

Physical Assessment

- **Need to always compare <u>bilaterally</u>!**
  - Check the normal before the abnormal
- **Inspection**
  - Symmetry
  - Skin
  - Muscles
  - Deformity
  - Coordination, gait
  - Posture
  - Ability to perform ADL's

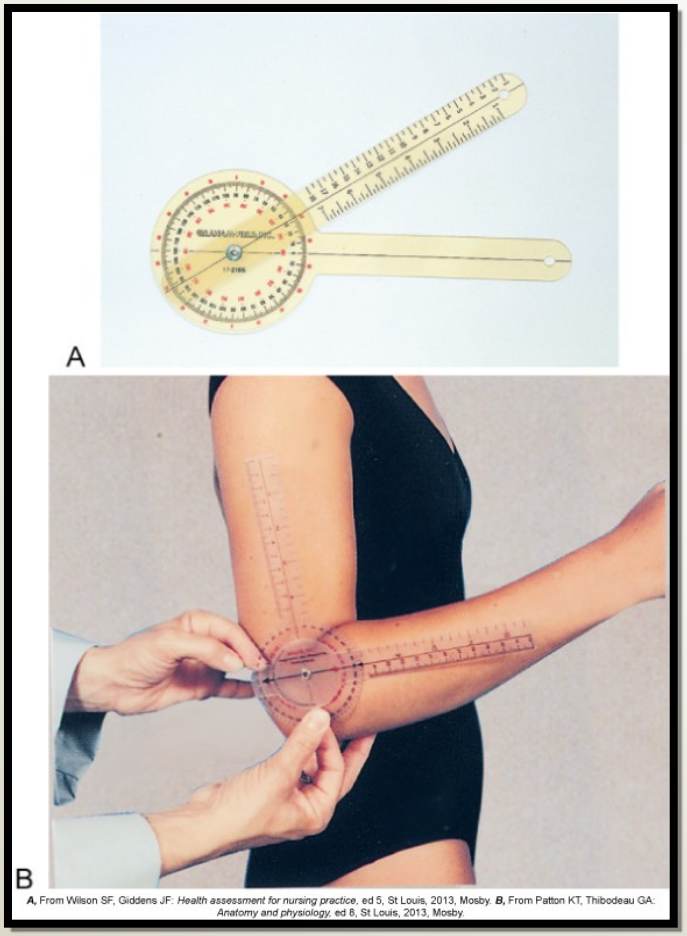
Physical Assessment

- **Palpation**
  - *Gently* palpate muscles, bones, and joints – note swelling, warmth, nodules, spasms, pain, and crepitation
  - Motion-when assessing the pts joint mobility, evaluate active and passive range of motion (ROM)
    - ROM – the full movement potential of a joint
      - Active- the client takes their joints through the movements indep
      - Passive- Joints moved by someone else
    - Perform active before passive ROM
    - If pain or resistance occurs-stop at once
    - Goniometer – used to accurately assess ROM
      - Measures the angle of the joint

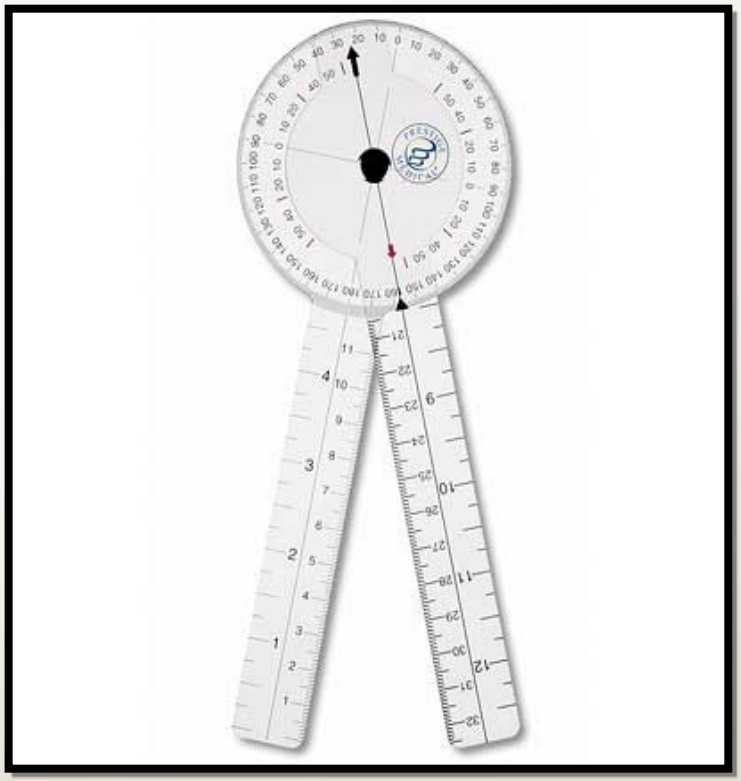
Muscle Strength Testing

- Muscle Strength Testing (p. 1631)
  - Grade it 0-5
    - 0 = no muscular contraction
    - 1=barely detectable flicker/trace of contraction with observable or palpitation
    - 2 active movement of body part with elimination of gravity
    - 3=Active movement against gravity only and not against resistance
    - 4 active movement against gravity and some resistance
    - 5 = active movement against full resistance without fatigue (normal muscle strength)

Goniometers



A, From Wilson SF, Giddens JF: *Health assessment for nursing practice,* ed 5, St Louis, 2013, Mosby. ***B,*** From Patton KT, Thibodeau GA: *Anatomy and physiology,* ed 8, St Louis, 2013, Mosby.



Physical Assessment

- **Normal MS Assessment (pg. 1632)**
  - Full Rom of all joints
  - No joint swelling, deformity, or crepitation
  - Ordinary spinal curvatures
  - No tenderness on palpation of the spine, joints, or muscles
  - No muscle atrophy or asymmetry

Neurovascular (NV) Assessment

- **Nervous and Circulatory systems need to be assessed**
  - Frequency of the assessment depends on the extent of the injury & acuteness
  - Document accurately and completely
  - 6P’s -Pain, Pallor, Pulses, Paraesthesia, Paralysis, and Poikilothermia
  - To prevent complications associated with Orthopedic traumas, fractures, surgeries that can lead to permanent injury and death

Neurovascular (NV) Assessment

- **Circulation:**
  - **Color:** (Pale / Pink / Cyanotic)
    Pink-Normal
    Pale = ↓ arterial blood supply
    Cyanotic = venous stasis
  - **Temperature:** (Warm / Cool / Cold)
    Warm-Normal
    Cool or Cold = ↓ arterial blood supply
  - **Capillary Refill:** (Rapid or sluggish)
    Rapid = < 3 sec (WNL)
    Slow or Sluggish = ↓ arterial blood supply
  - **Edema:** Present? = Poor venous return.
    Is it pitting or non- pitting?
  - **Pulse:** (Absent or Present)
    Note the rate and strength

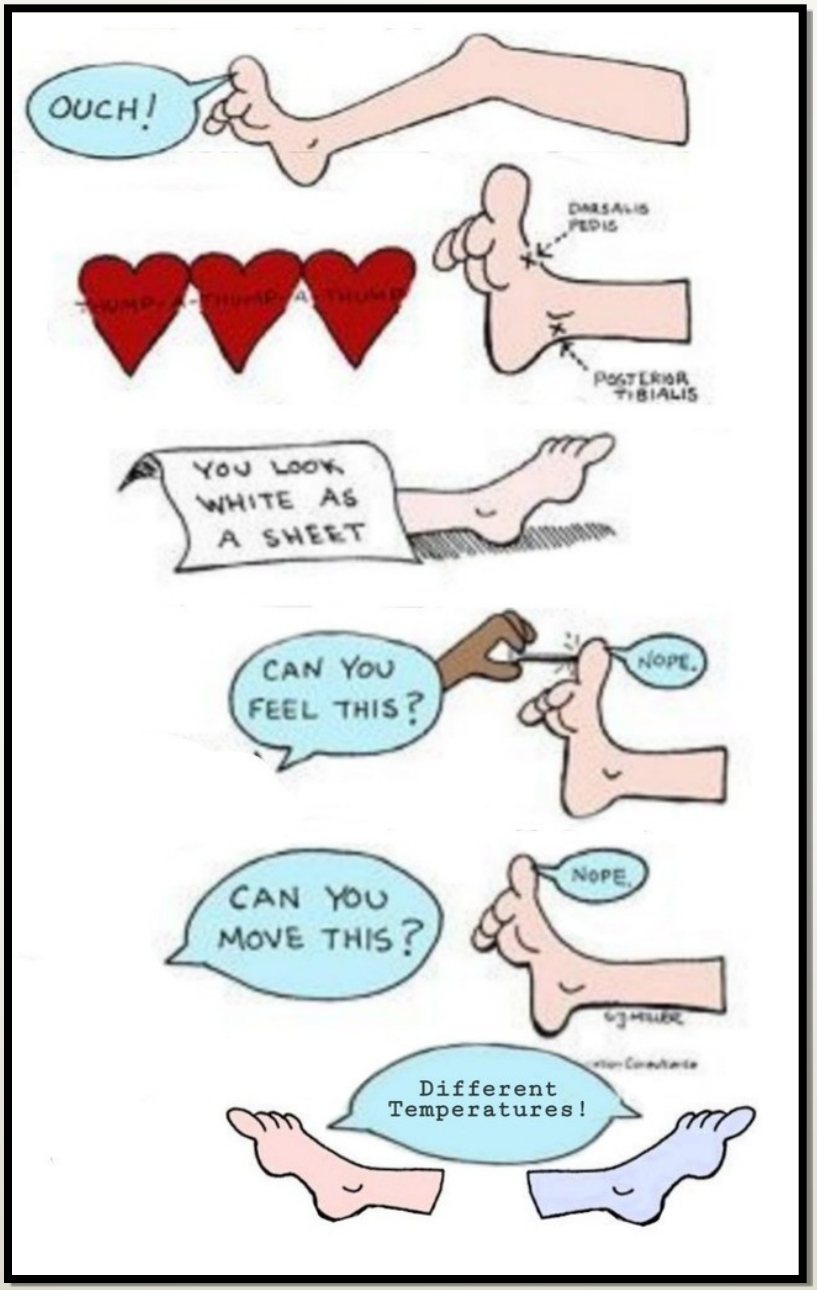
Neurovascular (NV) Assessment

- **<u>Nervous (Sensation & Movement):</u>**

  -Present / decreased / absent

  - Light & deep stimuli
  - How & Where
  - **Numbness & Tingling:** Paraesthesia present?
  - Pressure on nerves innervating parts distal to the injury
  - Motion: Present / Decreased / Absent

Compare with uninvolved limb to determine extent of deviation from normal!


OUCH!
DORSALIS PEDIS
POSTERIOR TIBIALIS
YOU LOOK WHITE AS A SHEET
CAN YOU FEEL THIS?
NOPE.
CAN YOU MOVE THIS?
NOPE.
Different Temperatures!

Falls

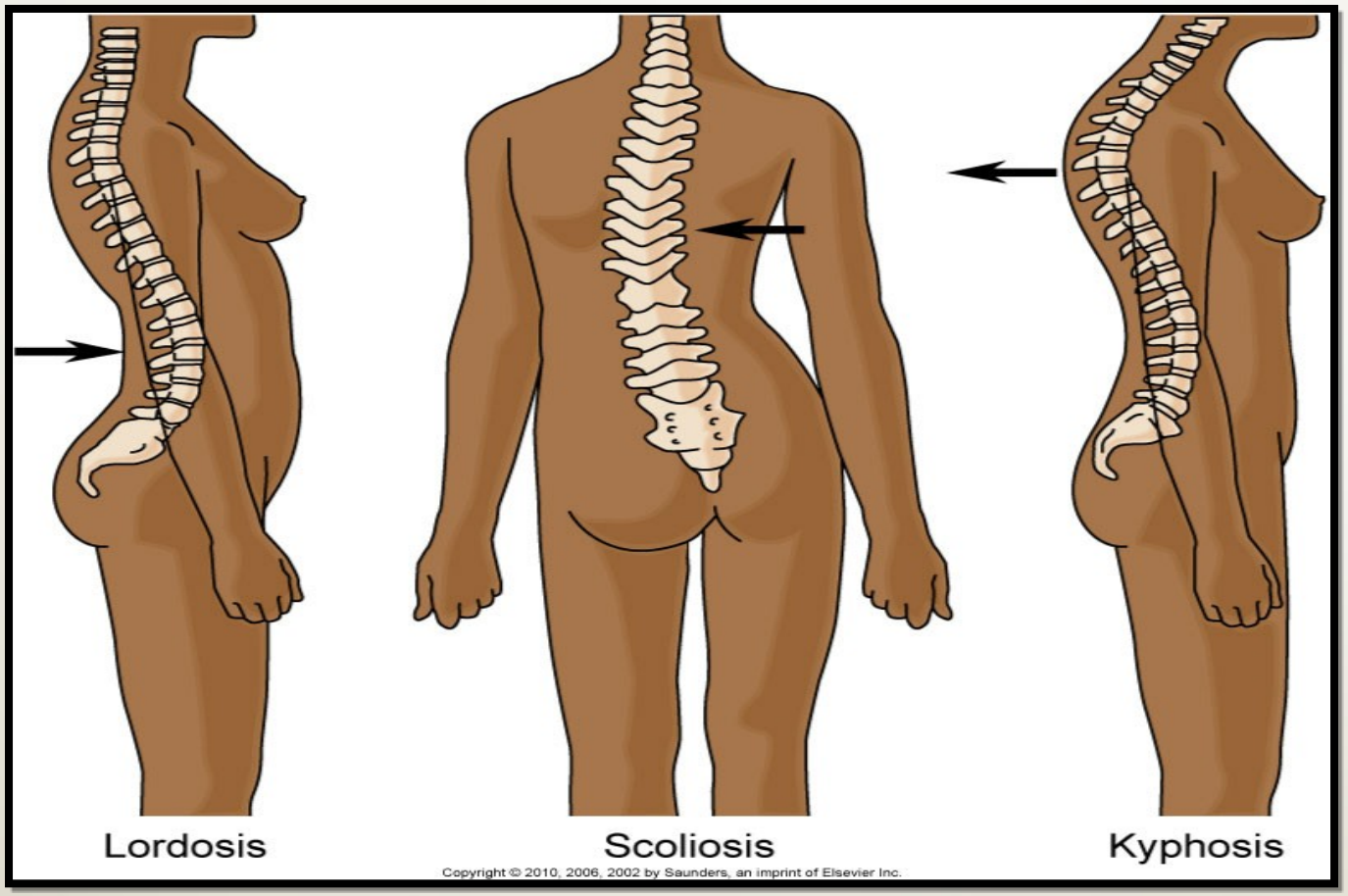
- Cause many musculoskeletal injuries in the home
- Preventive teaching for high-risk persons
  - Those with gait instability, vision impairment
  - Age-appropriate exercise to help maintain muscle strength and balance
  - Adequate calcium and vitamin D for bone health
  - Assess living environment for safety risks

Prevention of Musculoskeletal Problems in Older Adults

- Wear functional, nonskid, hard-soled shoes
- Remove throw rugs
- Ensure adequate lighting
- Maintain clear path to bathroom for nighttime
- Avoid walking on uneven or wet surfaces

Abnormalities

- **Kyphosis**
  - Round Back, forward bending of the spine
  - Thoracic spinal curvature
  - “Hunchback”
- **Scoliosis**
  - Lateral curvature of the spine
  - “S” shape
- **Lordosis**
  - Exaggerated lumbar curvature
- **Genu Varum (Varus)**
  - Inward turning of the foot
  - Angulation of bone toward the midline
  - Bowlegged

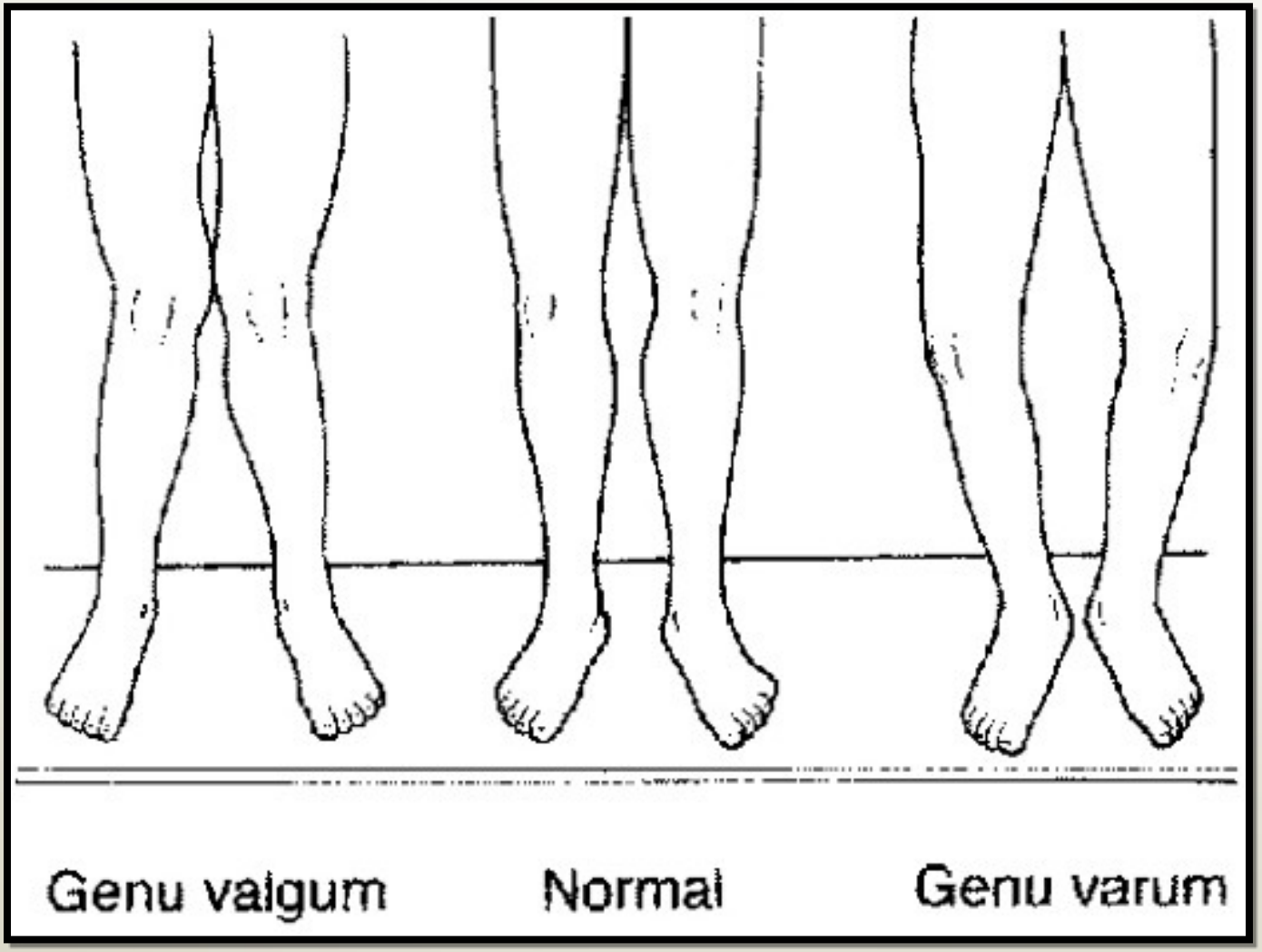


Abnormalities

- **Genu Valgum (Valgus)**
  - Outward turning of the foot
  - Angulation of the bone away from the midline
  - Knock Knee
- **Crepitation**
  - Crackling sound or grading sensation as a result of friction between bones
- **Effusion**
  - Escape of fluid into a body part

  Swelling & pain

Abnormalities



Abnormalities

- **Atrophy**
  - Muscle wasting
  - ↓ in size, flabby, ↓ function & tone
- **Contracture**
  - Resistance to movement of a muscle or joint
  - May be caused by holding a painful limb in a position of comfort
- **Ankylosis**
  - Stiffness and fixation
  - Scarring in a joint

Specific Nerve Assessments

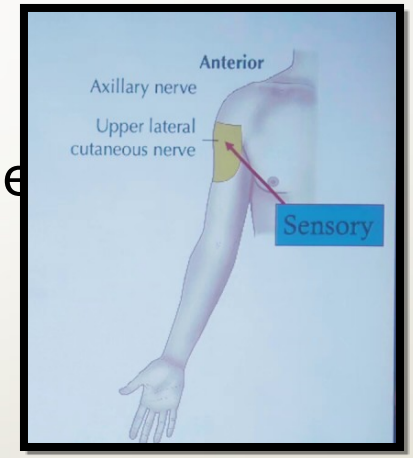
- Median
- Ulnar
- Radial
- Axillary

Specific Nerve Assessments

- Test the most distal points for each nerve's sensory & motor function
- **Upper Extremity:**

How to assess the peripheral nerves of the hand - Median, Ulna and Radial nerve tests - Bing video

  - *Sensory (feeling)*
    - Radial = web space between thumb & index finger
    - Median = distal surface of index finge
    - Ulnar = pad of little finger
    - Axillary = military patch (arm pit)



  - *Motor (Movement)*
    - Radial = dorsiflex the wrist & hyperextend the thumb
    - Median = thumb opposition with base of little finger
    - Ulnar = spread fingers apart (Abduction)
    - Axillary = abduct arm at the shoulder

Specific Nerve Assessments

- **Lower Extremity**:
  - **Sensory**
    - Femoral = anterior thigh
    - Peroneal
      - Top of foot between great toe & 2nd toes
      - Lateral aspect of top of foot
    - Tibial = sole of foot
  - **Motor**
    - Femoral = straight leg raise
    - Peroneal
      - Dorsiflex the foot (ankle) & toes
      - Laterally evert the foot
    - Tibial = plantar flex foot & toes (curl downward)

Geriatric Differences in Assessment

- **Ligaments & Cartilage**
  - Less elastic
- **Muscle**
  - Less number & diameter of muscle cells
- **Joints**
  - Erosion of articular cartilage
  - Osteophytes
- **Bone**
  - Decrease in bone mass

Diagnostic Studies

Radiography

- **Standard X-Ray**
  - Most common dx test to assess MS system
  - Purpose = diagnosis of fractures, assess disease progression, evaluate effectiveness of treatment

Radiography

- **CT Scan (computerized axial tomography)**
  - Computerized picture of tissue being studied
  - 3 dimensional
  - Safer, more accurate, ↑ radiation exposure, painless
  - IV Dye - Check allergies to iodine & seafood
  - Sign consent form for contrast dye
  - Patient teaching – calm their fears, encourage fluids post
  - Purpose = ID soft tissue abnormalities, bony abnormalities, & MS trauma

Radiography

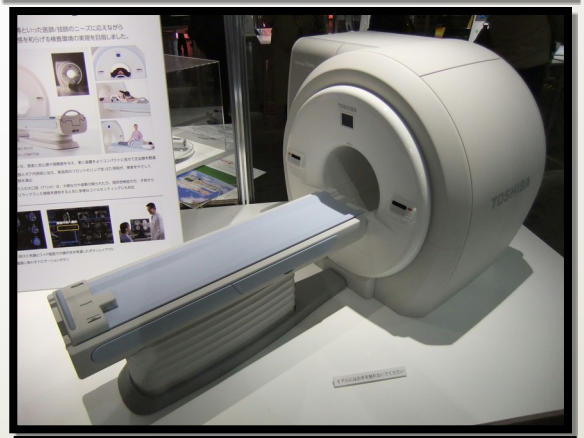
Computerized Axial Tomography
(CT Scan)

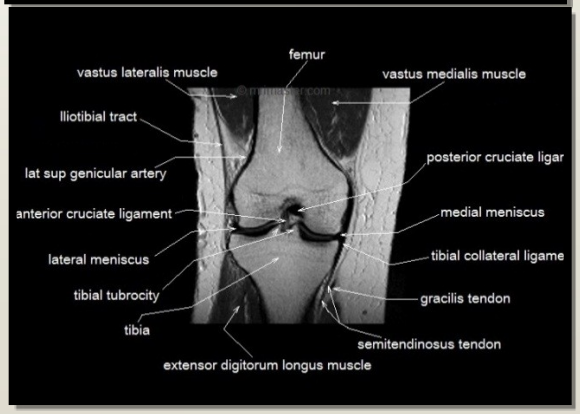
Radiography

- **Arthrogram**
  - Injection of a contrast media and/or air into a joint cavity for visualization of joint structures
  - ROM while a series of x-rays are taken
  - Question allergies to dye
  - Purpose = dx meniscus tears, joint abnormalities, & synovial problems

MRI
Magnetic Resonance Imaging

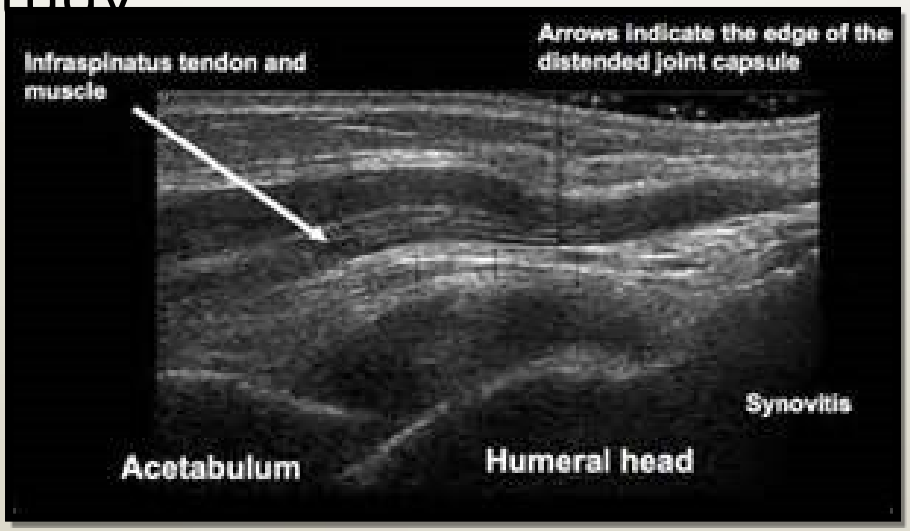
- Magnetic forces & radio waves used to view soft tissues
  - Greater contrast in images of soft tissue structures than a CT scan
  - No metal allowed
  - Painless, safe, non-invasive, no radiation
  - Must lay still – may need anti-anxiety med
    - (claustrophobia)
    - Purpose = dx avascular necrosis, disc disease, tumors, osteomyelitis, ligament tears
    - *Good test to look at: muscle, tendons & ligaments*.





Musculoskeletal Ultrasound

- Visualization of muscles, tendons, ligaments, joints (effusions, synovitis) and adjacent soft tissues
- Shoulder, knee, biceps brachii, Achilles tendon
- Tears, fluid collection, swelling, nerve entrapment, tumors/cysts, foreign bodies, RA
- Pt’s who cannot tolerate MRI or just need a targeted study



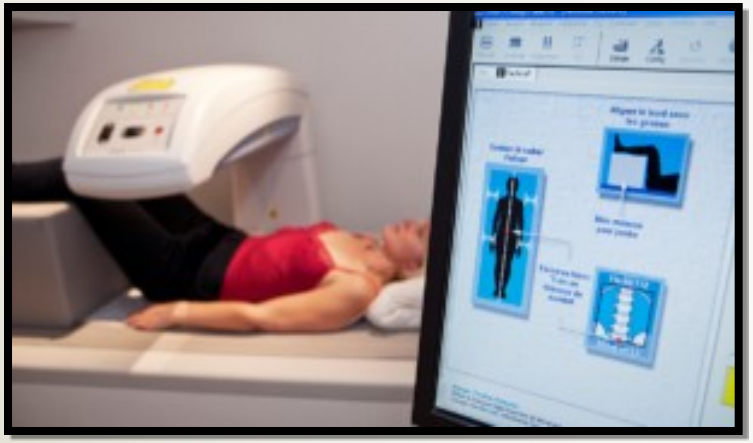
Bone Scan

- IV injection of radioisotope that is taken up by the bones
- Injected 2-3° prior to the scan
- ↑ uptake seen in osteomyelitis, osteoporosis, some fractures, and primary metastatic malignant lesions
- Purpose = primarily used to demonstrate the presence of metastatic disease
- Encourage 1-3 glasses of water to aid in excretion of the dye
- Radioisotopes cause no harm, painless, scanned for about 1°

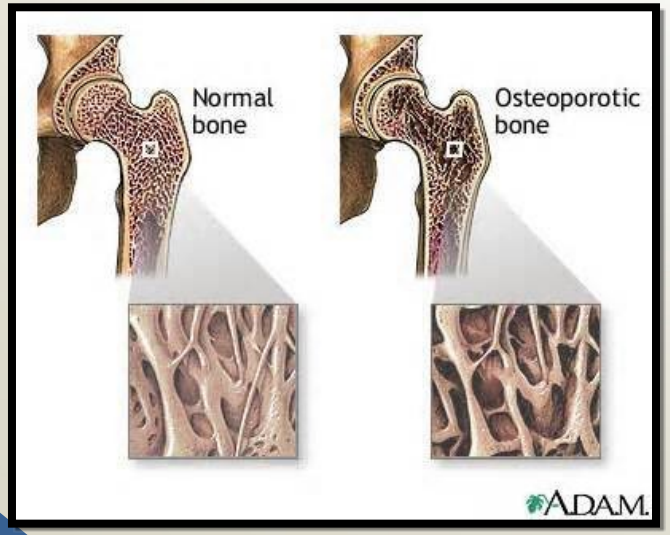
DEXA Scan (dual energy x-ray absorptiometry)

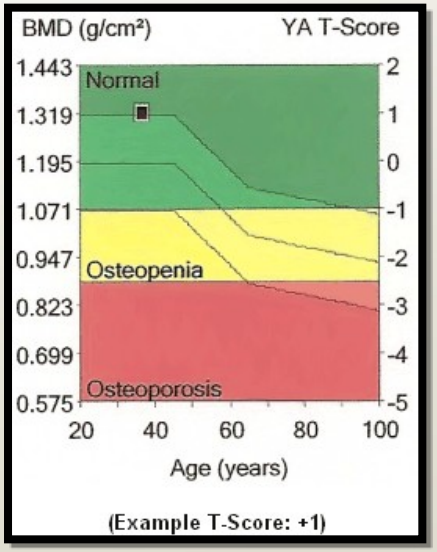
- Single or dual bone densitometry
- Purpose = measure bone mass & calculate total body calcium concentration (Osteoporosis)
- T-Score – comparison to mean bone mass of normal young adult

DEXA Scan (dual energy x-ray absorptiometry)



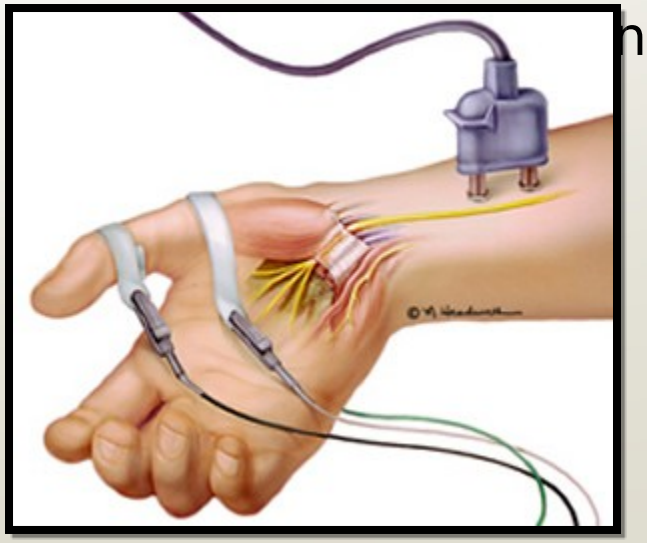
Achilles Test





Electromyography (EMG)

- Measures the electrical activity of muscles via needle electrodes inserted into skeletal muscles
- Purpose = dx motor dysfunction
  - Dysfunction in the motor neuron, neuromuscular junction, or muscle fibers
  - Helpful with dx lower motor neuron disease, primary muscle disease, & defects in the transmission of electrical impulses at the
    - i.e. myasthenia gravis



Nerve Conduction Velocity

- Measures the time it takes for a muscle to respond after the nerve to that muscle has been electrically stimulated
- Often done with EMG
- Electrodes attached to skin over the muscle that is stimulated by the nerve that is being studied
- Time between stimulation of the nerve and the muscle contraction response is recorded
- Purpose = identify diseases or injuries of the peripheral NS

Biopsy

- Tissue extracted for microscopic study
- Purpose = to determine benign vs. malignant tissues, muscle disease, or arthritic disease
- Can have a bone biopsy, muscle biopsy , or synovial biopsy

Arthroscopy

- Insertion of an arthroscope (endoscope) into a joint cavity for visualization of its' structure & contents
- Usually done in the OR or outpatient surgery center
- Purpose:

  -Exploratory surgery – remove loose bodies

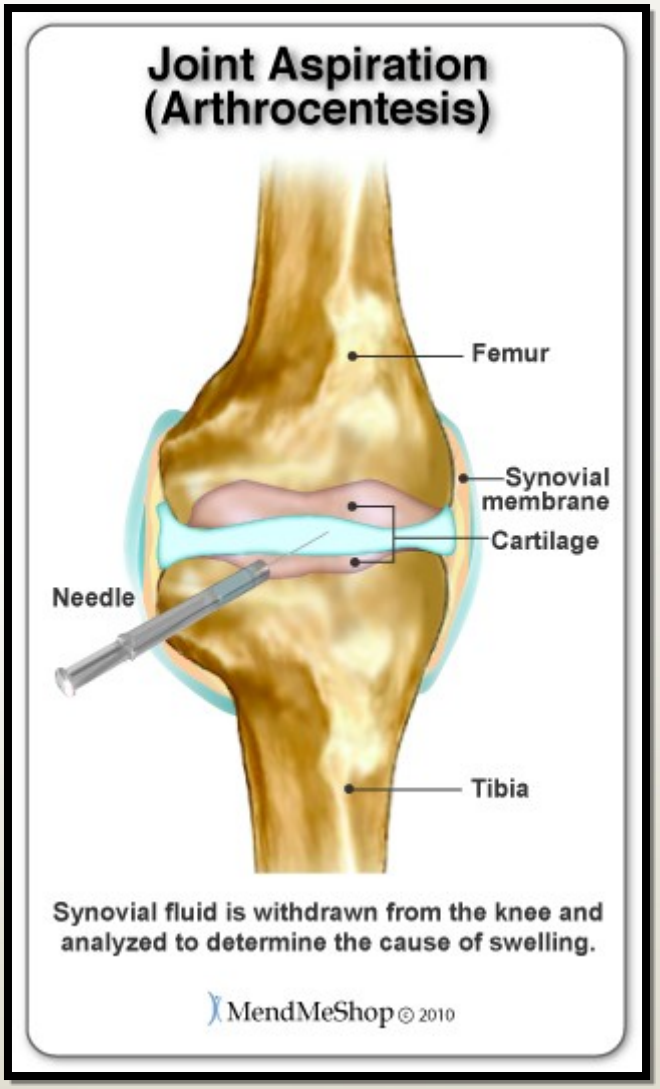
  -Diagnosis of abnormalities of meniscus, articular cartilage, ligaments, or joint capsule
- Must be able to flex the knee at least 40°
- *#1 Priority post-procedure: ✓ neurovascular status of that extremity!*
- Ice & Elevation for first 24°

Arthrocentesis

- Joint Aspiration
- Purpose = to remove synovial fluid for examination, instill meds, or remove excess fluid to relieve pain
- Can dx joint inflammation, infection, meniscus tears
- Performed at bedside under local anesthetic
- Post procedure – compression dressing & joint rest for 8-24°
- Synovial Fluid *(Normal-WBC < 200 & no bacteria)*
  - Usually, < 1 tsp in any joint
  - Normally clear & light yellow
  - ↑ WBC & Protein = inflammatory process
  - Gout – whitish yellow color
  - Infection – purulent & thick

Joint Procedures

Arthroscopy



Lab Studies

- CBC – done to R/O infection
- Muscle enzymes
  - **AST** – found in skeletal muscle but primarily an enzyme of cardiac & hepatic cells
  - **CPK (creatine phosphokinase)** – highest concentration found in skeletal muscle
    - ↑ in muscular dystrophy & traumatic injuries
  - **Aldolase** – ↑ with muscular and hepatic injury
    - Used to monitor muscular dystrophy

Lab Studies

- Mineral Metabolism
  - **Alkaline Phosphatase (ALP)**
    - Produced by osteoblasts of bone
    - ↑ in healing fx's, bone cancers, osteoporosis, osteomalacia, & Paget's disease
    - Also high in adolescents because of bone growth
  - **Calcium**
    - Bone is the primary organ for calcium storage
    - Ca+ provides bone with a rigid consistency
    - ↓ in osteomalacia, renal disease, hypoparathyroidism
    - ↑ in hyperparathyroidism, bone tumors, acute osteoporosis

Lab Studies

- Mineral Metabolism
- **Phosphorus**
  - Related to calcium metabolism
  - *Has an inverse relationship with Ca^{+}*
  - ↑ in chronic renal disease, healing fx, & some metastatic tumors

Serology

- **Rheumatoid factor (RF)**
  - Assesses presence of auto-antibodies helps confirm RA but not specific for RA
  - Seen in other connective tissue diseases
- **Erythrocyte Sedimentation Rate (ESR)**
  - *Non-specific index of inflammation*: good to measure progression of the dx.
  - ↑ in inflammatory processes (RA)
- **Lupus Erythematosus Cells (LE)**
  - ↑ in lupus
- **Antinuclear Antibody (ANA)**
  - ↑ in connective tissue diseases (lupus, RA, scleroderma)

Serology

- **Uric Acid**
  - End product of purine metabolism that is normally excreted in urine
  - ↑ in gout
- ***Highly sensitive* C-reactive protein (hsCRP)**
- Measures inflammation
  - *More sensitive to inflammatory changes than ESR*
  - Can also detect infection

Urinary Tests

- 24° urine for uric acid
- Helpful in dx and evaluating the effectiveness of treatments for gout

Nursing Problems

- Impaired Physical Mobility (Usually #1)
- Risk for Peripheral Neurovascular Dysfunction
- Risk For Injury
- Risk For Falls
- Self Care Deficit
- Pain (acute or chronic)

Case Study

Musculoskeletal Assessment of the Older Adult

- **Patient Profile**
  S.T. is a 72-year-old female patient. Her husband died 6 months ago and she lives alone now. She is seeing the health care provider for her annual physical exam. She has a history of hypertension and osteoarthritis. She currently takes the following medications:

-Triamterene/Hydrochlorothiazide (Dyazide) 37.5 mg/25 mg PO daily every morning.

-Celecoxib (Celebrex) 200 mg PO daily every morning.

- **Subjective Data**

-Has “some” pain in her right knee

-States “It looks like I lost a half an inch this past year”

- **Objective Data**

-Temperature 98.2° F, pulse 72, respirations 16, blood pressure 130/76

-Height 5 feet 2½ inches, weight 170 lbs., BMI 30.6 kg/m^2

-Unsteady gait, walks with a limp