EXTREMITY INJURIES
EXTREMITY INJURIES

- Causes of Extremity Injuries
  - Direct force
    - External force directly affects the body to cause injury at the point of impact from a fall or striking of an object
  - Indirect force
    - Energy of a force transferred up or down extremity resulting in injury farther along extremity

continued on next slide
EXTREMITY INJURIES

- Causes of Extremity Injuries
  - Twisting force
    - Body remains stationary while hand or foot continues turning.
THERE ARE THREE BASIC TYPES OF MECHANISM OF INJURY.
MECHANISM OF INJURY – THE FORCE OR FORCES THAT MAY HAVE CAUSED THE PATIENT'S INJURY.

DIRECT FORCE – ENERGY THAT IS TRANSMITTED DIRECTLY TO AN EXTREMITY, CAUSING AN INJURY AT THE SITE OF IMPACT.

INDIRECT FORCE – ENERGY FROM A DIRECT FORCE BLOW THAT IS TRANSFERRED ALONG THE AXIS OF A BONE AND CAUSES AN INJURY FARTHER ALONG THE EXTREMITY.

TWISTING FORCE – THE FORCES CAUSED WHEN AN EXTREMITY OR PART OF AN EXTREMITY IS CAUGHT IN A TWISTING OR CIRCULAR MECHANISM, WHILE THE REST OF THE EXTREMITY OR THE BODY IS STATIONARY OR MOVING IN ANOTHER DIRECTION.

DOWNWARD BLOW – CLAVICLE AND SCAPULA

LATERAL BLOW – CLAVICLE, SCAPULA, AND HUMERUS

LATERAL BLOW – KNEE, HIP, FEMUR (VERY FORCEFUL)

INDIRECT FORCE – PELVIS, HIP, KNEE, LEG BONES, SHOULDER, HUMERUS, ELBOW, FOREARM BONES

TWISTING FORCE – HIP, FEMUR, KNEE, LEG BONES, ANKLE, SHOULDER, ELBOW, FOREARM, WRIST

FORCED FLEXION OR HYPEREXTENSION – ELBOW, WRIST, FINGERS, FEMUR, KNEE, FOOT
EXTREMITY INJURIES

▪ Types of Injuries
  ▪ Closed injury
    ▪ No break in skin
    ▪ Open laceration to the scalp while cranium remains intact
  ▪ Open injury
    ▪ Soft tissues adjacent to injury damaged and open

continued on next slide
EXTREMITY INJURIES

- Types of Injuries
  - Full extent of injury determined through x-ray
    - Do not try to diagnose injury.
EXAMPLES OF A CLOSED AND OPEN FRACTURE OF THE LOWER LEG.
EXTREMITY INJURIES

- Fracture
  - Any time bone is broken, chipped, cracked, or splintered

- Dislocation
  - One end of a bone that is part of a joint is pulled or pushed out of place.
  - Force of dislocation may cause a fracture of the adjoining bone.
EXTREMITY INJURIES

• Sprain
  • Excessive twisting forces cause ligaments and tendons to stretch or tear.
    • Ligaments connect 2 bones to form a joint.
    • Tendons attach muscle to bones.
EXTREMITY INJURIES

- Strain
  - Caused by overexerting, overworking, overstretching, or tearing of a muscle
EXTREMITY INJURIES

- Angulated (deformed) injuries
  - Extremity is bulging, bent, or angulated where it normally should be straight.
  - Major angulation may damage veins and disrupt blood flow.
  - Patient may have decreased sensation or motor function.
EXTREMITIES INJURIES

- Signs and Symptoms
  - Pain
  - Swelling
  - Discoloration
  - Deformity
  - Inability to move a joint or limb
  - Numbness or tingling sensation
  - Loss of distal pulse
EXTREMITIES INJURIES

- Signs and Symptoms
  - Slow capillary refill
  - Grating or crepitus
  - Sound of breaking at time of injury
  - Exposed bone
PATIENT ASSESSMENT
PATIENT ASSESSMENT

- Assess injuries for adequate circulation, sensation and motor function (CSM).
  - Before and after immobilization
  - Bleeding in the tissue will present as swelling and discoloration.
PATIENT ASSESSMENT

- Assess injuries for adequate circulation, sensation and motor function (CSM).
  - Circulation compromise
    - No distal pulse
    - Pale and cool
    - Cyanosis
    - Capillary refill time of greater than 2 seconds
ASSESSING CAPILLARY REFILL IN THE FINGERS.
PATIENT ASSESSMENT

- Emergency Care
  - Scene size-up
    - Scene safety
    - BSI precautions
  - PPE
  - MOI
    - Consider the need for spinal precautions.
  - Total number of patients

continued on next slide
PATIENT ASSESSMENT

- Emergency Care
  - Primary assessment
    - Get impression of environment and patient.
    - Determine if patient needs to be moved and transported.
    - Assess ABCs.
    - Assess mental status.
    - Detect and correct life-threatening problems.
PATIENT ASSESSMENT

- Patient Assessment
  - Care for skeletal injuries in the following order:
    - Spine
    - Skull
    - Rib cage
    - Pelvis
    - Thighs
    - Extremity injuries with no distal pulse
PATIENT ASSESSMENT

- Emergency Care Steps
  - Take proper BSI precautions.
  - Perform primary assessment.
  - Cut away clothing to expose injury site.
  - Control bleeding if there is open wound.

continued on next slide
PATIENT ASSESSMENT

- Emergency Care Steps
  - Check for distal circulation, sensation, and motor function in affected extremity.
  - Immobilize extremity using manual stabilization or splints.

continued on next slide
PATIENT ASSESSMENT

- Emergency Care Steps
  - Apply cold pack or ice pack to injury site to help reduce pain and swelling.
  - Administer oxygen per local protocol.
  - Assess patient's vital signs.
  - Emotional support important when caring for patient with musculoskeletal injuries
You are treating a young woman who has been struck by a car. She has an angulated lower leg fracture. You ask her if her neck or back hurts and she says "No."

- How reliable is this answer?
- How will you proceed?
SPLINTING
SPLINTING

- Immobilization of the injury
- Any object that can be used to restrict the movement of injury
  - Piece of wood
  - Cardboard
  - Folded blanket
SPLINTING

- Manual stabilization
  - Using your hands to restrict movement of injured person or body part
MANUAL STABILIZATION OF AN INJURED LIMB.
SPLINTING

- Allows reposition and transfer of patients while minimizing movement of injury
Complications resulting from splinting include:
- Pain
- Damage to soft-tissues
- Bleeding
- Restricted blood flow
- Closed injuries becoming open injuries
COMPPLICATIONS ASSOCIATED WITH EXTREMITY INJURIES CAN BE PREVENTED OR DECREASED WITH SPLINTING.
General Rules for Splinting
- Assess and reassure patient.
- Expose injury site.
- Control all major bleeding.
- Dress open wounds.
- Check distal circulation, sensation, and motor function before and after splinting.
- Splint injuries before moving patient.

continued on next slide
SPLINTING

- General Rules for Splinting
  - Have materials ready before splinting.
  - Gently realign angulated limbs without distal circulation to anatomic position per protocol.
  - Immobilize suspected fracture site and joints above and below injury site.
    - Sling and swathe upper extremities.
    - Secure lower extremities to each other.

continued on next slide
SPLINTING

- General Rules for Splinting
  - Secure splints with cravats or roller gauze.
  - Elevate extremity.
  - Minimize effects of shock by maintaining body temperature and providing oxygen per local protocols.
SPLINTING

- Managing Angulated Injuries
  - Do only what you have been trained to do and what is allowed in your EMS system.
  - If no distal pulse, and skin in distal extremity is pale or blue and cold, take action immediately to minimize potential permanent damage.
SPLINTING

- Managing Angulated Injuries
  - Do not force limb if you meet resistance or if patient complains of too much pain.
  - Apply soft splint and elevate limb by propping it on blanket roll or pillow.
  - Provide oxygen (if allowed).
Types of Splints
- Soft splints
  - Pillows
  - Blankets
  - Towels
  - Cravats
  - Dressings
  - Triangle bandage
  - Sling, swathe
BRING THE LOWER END OF THE BANDAGE UP AND OVER THE SHOULDER ON THE INJURED SIDE. TIE A KNOT AT THE SIDE OF THE NECK.
PIN OR TAPE THE APEX TO FORM A POCKET AT THE ELBOW.
SECURE THE ARM TO THE BODY WITH A SWATHE.
SPLINTING

- Types of Splints
  - Rigid splints
    - Plastic
    - Metal
    - Wood
    - Compressed cardboard

continued on next slide
SPLINTING

- Types of Splints
  - Commercial splints
    - Made of wood
    - Aluminum
    - Cardboard
    - Foam
    - Wire
    - Plastic

continued on next slide
SPLINTING

- Types of Splints
  - Inflatable splints (air splints)
    - Used for patients with injuries to arm or lower leg bones
  - Pneumatic anti-shock garment (PASG)
    - Special device for splinting suspected pelvic and femur fractures
    - Check local protocol.

continued on next slide
SPLINTING

- Types of Splints
  - Improvised splints
    - May be soft or rigid
    - Made from a variety of materials
SAM SPLINT CONFIGURED TO IMMOBILIZE AN INJURED FOREARM.
SAM SPLINT CONFIGURED TO IMMOBILIZE AN INJURED HUMERUS.
SAM SPLINT CONFIGURED TO IMMOBILIZE AN INJURED LOWER LEG.
THINK ABOUT IT

- You are treating a patient with a broken femur following a motor-vehicle crash. Before you apply a traction splint, what other assessment elements should you consider?

- Why might taking the time to apply a traction splint in this situation be ill-advised?
MANAGEMENT OF SPECIFIC EXTREMITY INJURIES
MANAGEMENT OF SPECIFIC EXTREMITY INJURIES

- Apply rigid splints for injuries to forearm and lower leg.
- Use soft or rigid splints for injuries to arm, elbow, wrist, or hand.
- Use soft splints for injuries to ankle or foot.
ELBOW (BENT). SECURE SHORT RIGID SPLINTS ON EITHER SIDE OF THE ARM, AND APPLY A SLING AND SWATHE TO ELEVATE AND SUPPORT THE LIMB.
ELBOW (STRAIGHT). PAD THE ARMPIT. THE SPLINT SHOULD EXTEND FROM THE ARMPIT BEYOND THE FINGERTIPS. USE ROLLER BANDAGES TO SECURE THE SPLINT TO THE ARM STARTING AT THE DISTAL END. SECURE THE ARM TO THE BODY WITH CRAVATS.
FOREARM, WRIST, HAND. THE SPLINT SHOULD EXTEND FROM THE ELBOW TO BEYOND THE FINGERTIPS. USE A SLING AND SWATHE FOR ELEVATION AND SUPPORT.
FINGER. USE A TONGUE DEPRESSOR AS A SPLINT, OR TAPE THE FINGER TO AN UNINJURED FINGER. NOTE: PLACE A ROLL OF DRESSING IN THE HAND TO MAINTAIN POSITION OF FUNCTION.
MANAGEMENT OF SPECIFIC EXTREMITY INJURIES

- Upper Extremity Injuries
  - Place the hand in position of comfort
    - Roll of gauze in patient's hand
    - Fingers extend over the splint.
MANAGEMENT OF SPECIFIC EXTREMITY INJURIES

- Injuries to the Shoulder
  - Knocked-down shoulder (dropped)
    - Injured shoulder will appear to droop.
  - Anterior dislocation
    - Shoulder joint bulging or protruding under skin at front of shoulder
  - Slinging and swathing with padding between the arm and chest is most beneficial.
DEFORMITY CAUSED BY DISLOCATION OF THE SHOULDER JOINT
Injuries to the Upper Arm
- Upper end (proximal) where shoulder joint is formed
- Along mid-shaft of bone
- Lower end (distal) where elbow joint formed
- Deformity key sign of injury to this bone
AFTER CONTROLLING BLEEDING, DRESS AND BANDAGE OPEN WOUNDS TO THE INJURED EXTREMITY.
CHECK DISTAL CIRCULATION, SENSATION, AND MOTOR FUNCTION BEFORE SPLINTING.
SELECT AN APPROPRIATE-SIZE SPLINT FOR THE INJURY, AND PAD THE SPLINT THOROUGHLY.
FIRMLY SECURE THE SPLINT, LEAVING FINGERTIPS OR TOES EXPOSED SO YOU CAN MONITOR DISTAL CIRCULATION, SENSATION, AND MOTOR FUNCTION.
AFTER IMMOBILIZATION, REASSESS DISTAL CIRCULATION, SENSATION, AND MOTOR FUNCTION.
ELEVATE THE EXTREMITY. FOR AN ARM, USE THE SLING TO IMMobilize IT AGAINST THE CHEST. FOR A LEG, PROP IT ON A PILLOW OR ROLLED BLANKET (IF THERE IS NO INDICATION OF SPINE INJURY).
MANAGEMENT OF SPECIFIC EXTREMITY INJURIES

- Injuries to the Elbow
  - Joint formed by distal end of humerus and proximal end of the radius and ulna
  - Immobilize elbow in position in which it is found.
CHECK CIRCULATION, SENSATION, AND MOTOR FUNCTION PRIOR TO SPLINTING.
SECURE RIGID SPLINT(S) TO THE ARM.
APPLY A SLING AND SWATHE.
RECHECK CIRCULATION, SENSATION, AND MOTOR FUNCTION.
ENSURE THE HAND IS IN THE POSITION OF FUNCTION.
SPLINTING AN INJURED ELBOW IN A STRAIGHT POSITION USING A CARDBOARD SPLINT.
MANAGEMENT OF SPECIFIC EXTREMITY INJURIES

- Injuries to the Forearm, Wrist, and Hand
  - Most effective splint is a rigid one.
  - Patient can be made comfortable with pillow splint.
MANUALLY STABILIZE THE LIMB PRIOR TO SPLINTING.

continued on next slide
CHECK CIRCULATION, SENSATION, AND MOTOR FUNCTION.
APPLY A RIGID SPLINT TO THE LIMB.
PLACE THE LIMB IN A SLING, AND RECHECK CIRCULATION, SENSATION, AND MOTOR FUNCTION.
A PILLOW MAKES A GOOD SOFT SPLINT FOR WRIST AND HAND INJURIES.
MANAGEMENT OF SPECIFIC EXTREMITY INJURIES

- Injuries to the Fingers
  - Not all injuries to fingers require rigid splinting.
  - Immobilize injured finger by taping finger to adjacent, uninjured finger.
    - Tongue depressor
    - Aluminum splint
    - Pen or pencil
SAM SPLINT CONFIGURED TO IMMobilize AN INJURED FINGER.
MANAGEMENT OF SPECIFIC EXTREMITY INJURIES

- Lower Extremity Injuries
  - When patient has multiple injuries or multisystem trauma, totally immobilize on long spine board or scoop (orthopedic) stretcher.
  - Be sure you have proper equipment and sufficient number of rescue personnel on hand to assist.
MANAGEMENT OF SPECIFIC EXTREMITY INJURIES

- Lower Extremity Injuries
  - Pelvic injuries can damage major blood vessels and internal organs.
  - Pelvic girdle injuries may be managed with long spine boards, scoop stretchers, and blankets.
  - Pneumatic anti-shock garment (PASG) may be considered for immobilization.
    - Check local protocol.
MANAGEMENT OF SPECIFIC EXTREMITY INJURIES

- Lower Extremity Injuries
  - Anterior hip dislocation
    - Leg from hip to foot rotated outward (laterally) farther than uninjured side
  - Posterior hip dislocation
    - Leg rotated inward (medially)
    - Knee is usually bent.
PLACE THE DEVICE UNDER THE PATIENT AT THE LEVEL OF THE PELVIS.

continued on next slide
WRAP THE DEVICE OVER THE TOP, AND PULL UNTIL YOU HEAR THE BUCKLE CLICK. THIS SIGNIFIES THE APPROPRIATE AMOUNT OF PRESSURE.
THE SAM SLING APPLIED TO AN INJURED PELVIS.
MANAGEMENT OF SPECIFIC EXTREMITY INJURIES

- Lower Extremity Injuries
  - Injuries to femur can be life-threatening even when injury is closed.
    - Bleeding inside tissues can be severe.
  - Traction splints
    - Mechanical devices that allow for application of constant traction of injured extremity

continued on next slide
MANAGEMENT OF SPECIFIC EXTREMITY INJURIES

- Lower Extremity Injuries
  - Knee injuries
    - You will not be able to tell if knee is fractured, dislocated, or both.
    - Do not attempt to reposition or straighten injured knee.
  - Boot-top injury
    - Transverse fracture of tibia and/or fibula when skier falls forward off the ski tips
ASSESS DISTAL CIRCULATION, SENSATION, AND MOTOR FUNCTION (PMS).
ASSESS DISTAL CIRCULATION, SENSATION, AND MOTOR FUNCTION.
APPLY RIGID SPLINTS ON EITHER SIDE OF THE LIMB.
PAD THE SPLINTS ON BOTH SIDES OF THE ANKLE.
SECURE THE DISTAL ENDS OF THE SPLINTS.
SECURE THE PROXIMAL END OF THE SPLINTS.
REASSESS DISTAL CIRCULATION, SENSATION, AND MOTOR FUNCTION.
MANAGEMENT OF SPECIFIC EXTREMITY INJURIES

- Lower Extremity Injuries
  - Provide care for injuries to lower leg with rigid or soft splints.
  - Rigid splints used for injuries to ankle or foot
  - Soft splint most comfortable for patient
  - Immobilize in position found.
ASSESS CIRCULATION, SENSATION, AND MOTOR FUNCTION PRIOR TO SPLINTING THE EXTREMITY.
CHOOSE A SPLINT THAT EXTENDS FROM THE HEEL TO WELL ABOVE THE KNEE.
SECURE THE SPLINT ABOVE AND BELOW THE KNEE AND AT THE ANKLE.
REASSESS CIRCULATION, SENSATION, AND MOTOR FUNCTION AFTER THE SPLINT IS SECURE.
IMMOBILIZATION OF THE LOWER LEG USING A TOWEL.
You are treating a person who requires airway management but he also has a severely bleeding open fracture of his leg.

How would you establish the treatment priorities?

Under the circumstance, is treating the fracture important?
SUMMARY

- Musculoskeletal system
  - Muscles
  - Bones
  - Joints
  - Connective tissues
  - Blood vessels
  - Nerves

continued on next slide
SUMMARY

- Musculoskeletal system
  - Primary functions
    - Support
    - Movement
    - Protection
    - Cell production

continued on next slide
SUMMARY

- Skeletal system
  - Bones of axial skeleton
    - Skull, spine, ribs, sternum
  - Appendicular skeleton
    - Upper and lower extremities

continued on next slide
SUMMARY

- Signs and symptoms of musculoskeletal injury
  - Pain
  - Swelling
  - Discoloration
  - Deformity
SUMMARY

- Strain
  - Stretching or tearing of muscle

- Sprain
  - Partial or complete tearing of ligament

- Fracture
  - Cracking or breaking of bone

continued on next slide
SUMMARY

- Dislocation
  - End of bone is pulled partially or completely away from joint.

- Open skeletal injury
  - Broken bone end or bone fragments tear through skin.

- Care includes assessment and monitoring patient's ABCs and appropriate immobilization of injury.

continued on next slide
SUMMARY

- Critical to assess circulation, sensation, and motor function of extremities distal to injury to determine if blood vessels or nerves may have been damaged
**SUMMARY**

- Direct force
  - Injury at point where it impacts body

- Indirect-force injury
  - Energy is transmitted from point of contact to different area of body where it causes injury.

*continued on next slide*
SUMMARY

- If injured extremity is angulated, it should be splinted in place.
- If there is no distal circulation, limb can be placed back into correct anatomical position with ease and without causing pain for patient.
SUMMARY

- Skeletal injuries should be stabilized to prevent them from worsening.
  - Such as a closed fracture becoming an open fracture

continued on next slide
SUMMARY

- Open skeletal injury
  - Begin with primary assessment.
  - Expose injury site.
  - Control excessive bleeding.
  - Administer oxygen, if allowed.
  - Monitor patient's vital signs until transport.

continued on next slide
SUMMARY

- Care for Multisystem Trauma Patient
  - Assess and monitor ABCs.
  - Assume and care for spine injury.
  - Control any severe bleeding.
  - Treat for shock.
  - Coordinate rapid transport.