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Musculoskeletal Trauma
OBJECTIVES

30.1 Define key terms introduced in this chapter. Slides 11–12, 19–20, 22–23, 37

30.2 Describe the anatomy of elements of the musculoskeletal system. Slides 11–16

30.3 Associate mechanisms of injury with the potential for musculoskeletal injuries. Slide 18

continued
OBJECTIVES

30.4  Describe the four types of musculoskeletal injury (fracture, dislocation, sprain, and strain) and define open and closed extremity injuries. Slides 19–21

30.5  Discuss the assessment of musculoskeletal injuries, including compartment syndrome. Slides 22–24
OBJECTIVES

30.6 Discuss the general care of musculoskeletal injuries. Slides 26–27

30.7 Discuss specific considerations for splinting. Slides 28–37

continued
OBJECTIVES

30.8 Discuss considerations in the assessment and management of specific types of injuries, including shoulder girdle injuries, pelvic injuries, hip dislocation, hip fracture, femoral shaft fracture, knee injury, tibia or fibula injury, ankle or foot injury. Slides 39–52
MULTIMEDIA

- Slide 53  Hip Fractures Video
- Slide 54  Immobilizing a Long Bone Video
CORE CONCEPTS

- Understanding bones, muscles, and other elements of the musculoskeletal system
- Understanding general guidelines for emergency care of musculoskeletal injuries

continued
CORE CONCEPTS

• Purposes and general procedures for splinting
• Assessment and care of specific injuries to the upper and lower extremities
Topics

• Musculoskeletal System
• General Guidelines for Emergency Care
• Emergency Care of Specific Injuries
Musculoskeletal System
Components of Musculoskeletal System

- Bones
- Joints
- Muscles
- Cartilage
- Ligaments
- Tendons
Physiology of Musculoskeletal System

- Bones: framework
- Joints: bending
- Muscles: movement
- Cartilage: flexibility
- Ligaments: connect bone to bone
- Tendons: connect muscle to bone
Bones

- Formed of dense connective tissues
- Vascular and susceptible to bleeding on injury
Shapes of Bones

- Irregular
- Long
- Short
- Flat
Self-Healing Nature of Bone

• Break causes soft tissue swelling and a blood clot in the fracture area
• Interruption of blood supply causes the bone section to die
• Cells further from fracture divide rapidly forming tissue that heals the fracture and develops into new bone
Muscles, Cartilage, Ligaments, and Tendons
General Guidelines for Emergency Care
Mechanisms of Musculoskeletal Injury

- Direct force
- Indirect force
- Twisting (rotational) force
Injury to Bones and Connective Tissue

• Fracture: any break in a bone (open or closed)
  – Comminuted—broken in several places
  – Greenstick—incomplete break
  – Angulated—bent at angle

• Dislocation: “coming apart” of a joint
Injury to Bones and Connective Tissue

- Sprain: stretching and tearing of ligaments
- Strain: overstretches of muscle
Injury to Bones and Connective Tissue

- Not all injuries can be confirmed as a fracture in the field
- Splinting an extremity with a suspected fracture helps prevent blood loss from bone tissues
Assessment: Musculoskeletal Injuries

- Rapidly identify and treat life-threatening conditions
- Be alert for injuries besides grotesque wound
- Pain and tenderness
- Deformity and angulation

continued
Assessment: Musculoskeletal Injuries

- Grating (crepitus)
- Swelling
- Bruising
- Exposed bone ends
- Nerve/blood vessel compromise (decreased CMS)
- Compartment syndrome
Six P’s of Assessment

- Pain or tenderness
- Pallor (pale skin)
- Parasthesia (pins and needles)
- Pulses diminished or absent
- Paralysis
- Pressure
Think About It

- Do my patient’s musculoskeletal injuries add up to serious multiple trauma?
- Does my patient have circulation, sensation, and motor function distal to the suspected fracture or dislocation?
Treatment: Musculoskeletal Injuries

- Take standard precautions
- Perform primary assessment
- Take spinal precautions, if necessary
Treatment: Musculoskeletal Injuries

- Splint any suspected extremity fractures after treating life-threatening conditions
- Cover open wounds with sterile dressings
Advantages of Splinting

• Minimizes movement of disrupted joints and broken bone ends
• Prevents additional injury to soft tissues (nerves, arteries, veins, muscles)
• Decreases pain
• Minimizes blood loss
• Can prevent a closed fracture from becoming an open fracture
Principles of Splinting

- Care for life-threatening problems first
- Expose injury site
- Assess distal CSM
- Align long-bone injuries to anatomical position
- Do not push protruding bones back into place

continued
Principles of Splinting

• Immobilize both injury site and adjacent joints
• Choose splinting method based on severity of condition and priority decision
• Apply splint before moving patient to stretcher
• Pad voids
Realigning Deformed Extremity

- Assists in restoring effective circulation to extremity and to fit it to splint
- If not realigned, splint may be ineffective, causing increased pain and possible further injury
Realigning Deformed Extremity

• If not realigned, increased chance of nerves, arteries, and veins being compromised

• Increased pain is only momentary
Hazards of Splinting

- “Splinting patient to death”—splinting before life-threatening conditions addressed
- Not ensuring ABC’s
- Too tight—compresses soft tissues
- Too loose—allows too much movement
- Splinting in deformed position
Treatment: Splinting Long Bone and Joints

• Select splint appropriate to injury
• Standard precautions
• Manually stabilize injury site

continued
Treatment: Splinting Long Bone and Joints

- Assess circulation, sensation, and motor function
- Realign injury if deformed or if distal extremity is cyanotic or pulseless
Treatment: Splinting Long Bone and Joints

- Measure or adjust splint; move it into position
- Apply and secure splint to immobilize injury site, adjacent joints
- Reassess CSM distal to injury
Treatment: Traction Splint
Emergency Care of Specific Injuries
Shoulder Girdle Injuries

• Assessment
  – Pain in shoulder
  – Dropped shoulder
  – Severe blow to back over scapula
Shoulder Girdle Injuries

• Treatment
  – Assess distal CSM
  – Use sling and swathe
  – Do not attempt to straighten or reduce
  – Reassess distal CSM
Forearm, Wrist, and Hand Injuries

• Signs
  – Forearm: deformity and tenderness
  – Wrist: deformity and tenderness
  – Hand: deformity and pain; dislocated fingers
Splinting Forearm, Wrist, and Hand Injuries

- Padded rigid splint
  - From elbow past fingertips
  - Roll of bandage placed in hand
  - Sling and swathe

continued
Splinting Forearm, Wrist, and Hand Injuries

- **Soft splint**
  - Roll of bandage placed in hand
  - Tie forearm, wrist, and hand into fold of one pillow or between two pillows
  - Tape finger to adjacent uninjured finger
Pelvic Injuries

• Assessment
  – Pain in pelvis, hips, or groin
  – Pain when pressure applied
  – Cannot lift legs
  – Lateral rotation of foot
  – Unexplained pressure in bladder

continued
Pelvic Injuries

- Treatment
  - Move patient as little as possible
  - Determine CSM distal to injury
  - Straighten lower limbs to anatomical position
  - Stabilize lower limbs
  - Assume spinal injuries
  - Treat for shock
Hip Dislocation/Fracture

- **Assessment**
  - Anterior hip dislocation
  - Posterior hip dislocation
    - Rotation of leg and foot
  - Pain and unable to stand
Hip Dislocation/Fracture

- Treatment
  - Assess distal CSM
  - Move patient onto spine board
  - Immobilize limb with pillows and blankets
  - Secure patient to spine board
  - Reassess distal CSM
Femoral Shaft Fracture

- **Assessment**
  - Intense pain
  - Possibly open fracture
  - Injured limb may be shortened

- **Treatment**
  - Control bleeding
  - Assess distal CSM
  - Apply traction splint
  - Reassess distal CSM
  - Treat for shock
Knee Injury

• Assessment
  – Pain and tenderness
  – Swelling
  – Deformity with swelling

• Treatment
  – Assess distal CSM
  – Immobilize in current position
  – Reassess distal CSM
Tibia/Fibula Injury

• Assessment
  – Pain and tenderness
  – Swelling
  – Possible deformity

• Treatment
  – Air inflated splint
  – Two-splint method
  – Single splint with ankle hitch
Ankle/Foot Injury

• Assessment
  – Pain
  – Swelling
  – Possible deformity

continued
Ankle/Foot Injury

• Treatment
  – Assess distal CSM
  – Stabilize limb
  – Lift limb
  – Place cravats under ankle
  – Lower limb into pillow
  – Tie pillow around ankle
  – Apply ice pack as needed
Hip Fractures Video

Click [here](#) to view a video on the subject of hip fractures.
Immobilizing a Long Bone Video

Click [here](#) to view a video on the subject of splinting a long bone injury.
Chapter Review

• Bones bleed. Fractures cause blood loss within the bone.
• Splinting of long bone fractures involves immobilizing adjacent joints.
• Splinting protects the patient from further injury.
Chapter Review

• You may need to be creative while splinting. There are many correct ways to splint the same extremity.
• Injuries to bones and joints should be splinted prior to moving the patient.
Chapter Review

- If patient has multiple trauma or appears to have shock do not waste time splinting individual fractures. Place patient on long spine board and secure limbs to board. Splint individual fractures en route if time and priorities allow.
Remember

• Bones, joints, muscles, cartilage, tendons, and ligaments make up the musculoskeletal system.

• Bones provide the body with structure, store metabolic materials, and produce red blood. Joints are the places where bones articulate to create movement.
Remember

- Fractures, dislocations, sprains, and strains are musculoskeletal injuries that are caused by direct force, indirect force, and twisting force. Injuries should be splinted prior to moving the patient.
Remember

• A closed extremity injury is one in which the skin has not been broken. An open extremity injury is one in which the skin has been broken.

• Pelvic fractures and femoral shaft fractures often indicate more severe internal injuries.

continued
Remember

- EMTs must learn specific techniques for immobilizing particular injuries but at the same time must foster creativity while applying the general rules of splinting.
Questions to Consider

• Have I fully addressed life threats and maintained my priorities even in the presence of a grossly deformed extremity?
• Does the patient have an injury that requires splinting?

continued
Questions to Consider

- Does the patient have multiple fractures, multiple trauma, or shock?
- Does the patient have adequate CSM distal to the musculoskeletal injury?
- Should I align the angulated extremity fracture?
Critical Thinking

• Patients who suffer fractures can be in extreme pain. Pain can cause anxiety and elevated pulse rates. How could you differentiate between a patient with a rapid pulse and anxiety from pain versus a patient with rapid pulse and anxiety from shock?
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