EMS Subspecialty Certification Review Course

Orthopedics
1.2.2.1 Fractures/Dislocations
1.2.2.1.1 Splinting Using Nontraditional Materials
1.2.2.1.2 Reductions without Anesthetics

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Learning Objectives

- Classify various types of fractures and dislocations
- Describe assessment and treatment of a suspected fracture or dislocation
- Identify proper splinting techniques
- Discuss the use of nontraditional splints
- Identify when dislocation reduction without anesthesia may be indicated
- Describe care of the amputated limb
- Describe compartment syndrome and its symptoms

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Management Approach

- Assessment begins with ABCDE
- Attention to life/limb threatening injuries
  - Address acute hemorrhage
  - Cover open fractures with sterile saline moist dressing
  - Assess neurovascular compromise
- Pain management is important
  - Splinting
  - Analgesia
- Decisions for reduction are situation dependent

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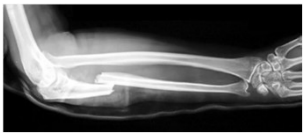

Fractures

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Fractures - Specific Considerations

Upper Extremity Fractures

- Clavicle - Typically uncomplicated, sling
- Scapula - 75% will have additional injuries (rib fxs, pneumothorax, upper extremity)
- Humerus – Risk of axillary n/a injuries
- Elbow – Supracondylar fxs are among most common in children
- Forearm/Wrist/Hand – Typically just splint in position found

Lower Extremity Fractures

- Hip – Common, 80% in elderly, if young likely other injuries
- Femur – Risk of hemorrhage, use of traction splint is standard*
- Tibia – Most commonly fractured long bone, risk of compartment syndrome (24-48 hrs after)
- Ankle – Ottawa ankle rules not validated for PH, splint and transport

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Pelvic Fractures

- High mortality (10-15%)
- Associated with other injuries (high force involved)
- Anterior-posterior highest HD instability
- Suspect when:
  - Significant torso trauma present
  - Patient in shock
  - Presence of perineal/flank hematoma, blood at urethra
  - Unstable pelvis (gentle assessment)
- Pelvic binder may be indicated
- Transport to Trauma Center

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Spine Fractures

- Cervical spine most common
- Suspect when:
  - Multiple traumatic injuries
  - Focal neuro symptoms
  - Neck/back pain and/or tenderness
  - Head injuries with ALOC (significant mechanism)
  - Distracting injuries
  - Torticollis in children
- Spinal shock: hypotension refractory to fluids, with bradycardia
- Spinal motion restriction indicated

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Dislocations

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Dislocations - Specific Considerations

Shoulder>Knee>Elbow

Upper Extremity Dislocations

- Shoulder – Most common major joint, typically anterior, risk of axillary n injury
- Elbow – Most posterolateral, risk of ulnar n and brachial a entrapment
- Clavicle – Posterior dislocation associated with serious intrathoracic injury (pneumothorax, vascular and tracheal injuries)
- Fingers – Typically splint in position found, reduce after analgesia in ED

Lower Extremity Dislocations

- Hip – Inherently stable joint, high force required, most have other major injuries (TC), 90% posterior, risk complications (AVN) if not reduced within 6 hours
- Knee – High risk of injury to popliteal artery, nerve bundle, delayed transport requires field reduction

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Special Emphasis

- Areas of particular risk for neurovascular injury
  - Hip
  - Knee
  - Elbow

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Splinting

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Splinting 101

- Indicated for fractures, dislocations, sprains
- Reduces: Pain, Hemorrhage, Risk for further injury, Loss of alignment after reduction
- General Principles:
  - Splint in position of comfort
  - Immobilize the joints above and below fracture site
  - Pad bony prominences
  - Assess neurovascular status before and after
  - Keep one surface visible for reassessments
  - Do not wrap too tight!
  - Document placement

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Splinting – Specific Considerations

Bone	Approach
Clavicle, scapula, shoulder	Sling and swathe
Humerus	Sling and swathe, short board
Elbow	Short board A-splint (bent) or straight with short boards
Forearm	Short board with sling
Wrist, hand	Short board or pillow in position of function with sling
Finger	Malleable metal splint or tongue depressor with buddy splinting

Bone	Approach
Hip	Backboard or long board splints, pillows
Femur	Traction splint
Knee	Short board A-splint (bent) or long board splints (straight)
Tibia, fibula	Long board splints
Ankle, foot	Pillow splint
Toe	Buddy taping

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Traction Splints

- Indicated for <u>isolated</u> mid-shaft femur fracture
  - swollen, painful, deformed thigh
- Contraindication: Known or suspected pelvic fracture, knee fracture, near amputation/mangled limb
- Benefits: Reduced pain, blood loss, neurovascular injury
- Downsides: Potential for scene delays, peroneal nerve palsies, pressure ulcers
- Optional equipment per NAEMSP*

*2025 NAEMSP Position Statement states either traction or static splinting is appropriate – content likely too new for exam

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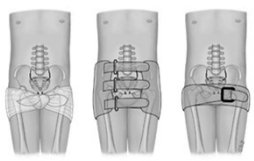
Pelvic Binders

- Unstable pelvic fractures can cause exsanguination
- High mortality (10-15%), A-P compression worst
- Typically, significant mechanism and associated injuries
- Field treatment with compressive binder may be indicated – reduce potential space / tamponade bleeding
- Theoretical risk of worsening injury 'bony fragments'
- Optional equipment per NAEMSP



Open book pelvic fracture before and after application of binder

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"Nontraditional" Splints

- Essentially, anything you can find that will safely and comfortably secure the injured part and minimize movement
- Key features
  - Padding to protect skin/soft tissue
  - Rigid component to immobilize injury
  - Flexible material to secure it
- Examples:
  - Pillows, Sleeping bags, Clothing
  - Tree branches, ski poles, Backpack frame
  - Water bottle (weighted traction)
  - "Buddy" taping

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Field Reductions

- Two main indications:
  1. Austere environment, delays to definitive care
  2. Pulseless or neurologically devastated extremity
- Risks of additional injury, converting to open, inadequate analgesia
- Assess neurovascular status before/after the procedure

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Amputations

DO

- Clean stump with saline and cover with saline moistened sterile gauze
- Splint (assume fracture present)
- Locate amputated part, wrap in saline moistened gauze, transport in plastic bag placed on ice
- Prioritize Trauma Center for major trauma (ideally reimplantation center)

DONT

- Prognosticate reimplantation
- Clamp vessels or manually debride
- Submerge amputated part in water or place directly on ice

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Compartment Syndrome

- Muscle and tissue ischemia caused by rising pressures within a closed fascial compartment.
- Common locations: Anterior tibia, forearm, wrist/hand, supracondylar fractures in children
- Symptoms: 5Ps
  - Pain
  - Pallor
  - Paresthesia
  - Paralysis
  - Pulselessness

- Caution when splinting
- Field management includes elevation, analgesia, loose dressings, transport

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Question

- Which of the following is a potential site of devastating neurovascular injury following dislocation?
  A. Ankle
  B. Finger
  C. Knee
  D. Shoulder

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Take-Home Points

- Assess neurovascular status BEFORE and AFTER care
- Treatment: splinting and pain control
- Indications/contraindications of traction splints
- Use of pelvic binders for unstable pelvic fractures
- Complications from dislocations (AVN, popliteal injury, etc.)
- Nontraditional splinting techniques - think outside the box
- Indications for field reduction without anesthesia
- Care of amputations and compartment syndrome

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