THE PROBLEM
Overview

• History and Mechanism of Injury
• Unstable v. Stable
• Evaluation of Extremity and Pelvis Trauma
• Principles of Immobilization
• Priority Situations
History

- Mechanism
- Time since injury
- Blunt versus penetrating
- Crush
- Hemodynamic instability
- Entrapment
Hemodynamic Stability

- Signs and Symptoms?
  - Blood pressure
  - Heart rate
  - Hemorrhage
  - Pallor
Unstable

- Airway
- Bleeding
- C-spine stabilization
- Rapid Evaluation
  - Long bone injury
  - Open fractures
  - Perfusion
  - Pelvis
- Load and Go
  - Trauma capable facility
Stable Patients

- ABC’s still apply
- More detailed assessment
- Transport decision may change
- May begin treatment
Physical Exam: Pelvis

- Pelvis
- Skin
- Stability
- Neurological
Physical Exam: Pelvis

- Pelvis
  - Skin
  - Stability
  - Neurological
Physical Exam: Extremity

- Extremity
  - Palpation
  - Deformity
  - Extremity Inventory
    - Perfusion
    - Skin
    - Muscle
    - Nerve
    - Bone
Perfusion

- Pulses
- Cap refill/color
- Doppler
- Grossly realign extremity
Assessing NV Status
Ischemic Limbs

- 4-6 hour warm ischemia limit
- Time line for decision making is constricted
Skin

- Open wounds
- Contusions
- Degloving
- Abrasion
- Loss
Muscle

- Loss
- Viability
- Contamination
- Indirect injury
  - Avulsion
  - Crush
  - Ischemia
Nerve

- Indirect evidence of injury
  - Motor
  - Sensation
  - Ischemia confounds exam
  - Document exam
  - Predictor of ultimate outcome?
Bone

- Fracture/Dislocation
- Bone loss
- Articular injury
The ultimate viability of some tissues may not be predictable.
Communication

- **Know the language**
Anatomy

- Bony Skeleton
- Muscle
- Cartilage
- Joint Capsule
- Ligaments
Long Bone Anatomy

- Epiphysis
- Physis
- Metaphysis
- Diaphysis
Upper Extremities

- Shoulder
  - Clavicle
  - Scapula (Glenoid Fossa)
  - Humerus
- Humerus (arm or brachium)
- Radius and Ulna (forearm or antebrachium)
- Hand and Wrist (carpal bones, metacarpals, phalanges)
Pelvis

- Sacrum + Ilium/Ischium/Pubis
- SI joints posteriorly
- Symphysis pubis anteriorly
- Adjacent neurovascular structures
Lower Extremities

- Thigh/ Femur
- Leg/ Tibia + Fibula
- Ankle - Tibio-Talar Joint
- Hindfoot - Talus + Calcaneus
- Midfoot - Tarsals + Metatarsals
- Forefoot - Metatarsals + Phalanges
Joint Injuries

- Sprains
- Subluxations
- Dislocations
Fractures

- Open v. Closed
- Displaced v. Non-Displaced
- Ability to bear weight?
- Associated injuries to soft tissue
  - Muscle & tendon injury as important
Treatment Principles

- Beware of associated local injury
- Distracting pain
- Don’t miss additional injuries
Pelvis

- Assess stability
- Treat shock if appropriate
- Stabilize ?
  - Sheet
  - Binder
- Transport to trauma center
Pelvic Binder
Hip Fractures

• Typical presentation
  • Fall from standing
  • Leg shortened/rotated
• Usually low energy
• Usually elderly patient
  • May tolerate less blood loss
  • May have co-morbidities
  • Trauma center?
Femur Shaft Fractures

- Typically high-energy
- Often significant muscle damage
- Beware of multi-system injury
  - Distracting pain
- Traction splint for stable patients
Knee Dislocations

• Distinct from patellar dislocation
• High-energy injury
• 30-50% incidence of associated vascular injury
• Always warrant trauma center referral
Knee Injuries

- Patella
- Patellar tendon
- Quad tendon
- Cruciate ligament injury
Knee Injuries

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Knee Injuries

- Patella
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Tibia Fractures

- Often open
  - Limited soft tissue envelope
  - NV injury frequent
- Cover open wounds
- Do not explore wounds
- Splint appropriately
- Transport to definitive care center
- Evaluate for compartment syndrome
Foot and Ankle Injuries

- Fractures/Dislocations/Open Injuries
- Assess NV status as appropriate
- Splint
- Appropriate dressings
Foot & Ankle Treatment
Shoulder Injuries

- Dislocations
- Fractures
Shoulder Injuries - Treatment
Humerus Fractures

- Be aware of associated injuries
- Chest injuries common
- Radial nerve injuries common
- Immobilize to chest
Humerus Fractures - Treatment

- Immobilize joint above and below
- Check pulse/motor before and after splinting
- Dress any open wounds
Elbow Injuries

- Fractures
- Dislocations
- Open injuries
- Pediatric injuries (common)
Treatment of Elbow Injuries
Fractures of the Forearm & Wrist

- Common in children & elderly
- Neurovascular injury common
- Common deformity patterns
Treatment of Forearm Injuries

• Splint joint above & below
• Dress open wounds
• Check NV status before & after splint
Priority Situations

- Pelvis fractures
- Open fractures
- Hip dislocations
- Knee dislocations
- Compartment syndrome
- Pulseless or ischemic limbs
- Amputations
Amputations

- **Fingers**
  - Wrap in saline moistened gauze
  - Keep on ice but don’t freeze
  - Trauma center or hand center

- **Other**
  - Hand?
  - Arm?
Hip Dislocation

- Usually posterior
- Position of modesty
- Commonly has acetabular fracture and or sciatic nerve injury
- Needs
  - Urgent reduction
  - May need repair of fx
Compartment Syndrome

• Definition

  Increased pressure within a closed space which leads to decreased tissue perfusion
Compartment Syndrome

- Lower Extremity
  - Gluteal
  - Thigh
  - Lower leg
  - Foot

- Upper Extremity
  - Deltoid
  - Arm
  - Forearm
  - Hand
Compartment Syndrome

When Does it occur?

• Risk factors - History
  – Crush injury
  – Entrapment
  – Ischaemia
  – Shock / Hypotension
  – Overdose / Unconsciousness
Compartment Syndrome

- **Risk factors - Injury**
  - Tibia fractures (open and closed)
  - Ipsilateral tibia and femur fracture
  - Distal humerus fractures
  - Forearm fractures (GSW)
  - Arterial injury
  - Venous injury

- **Risk factors - Associated conditions**
  - Coagulopathy
  - Shock
  - Ischaemia
  - DVT

- **Risk factors - Treatment**
  - Fluid administration
  - Tourniquets
  - Positioning
  - MAST
  - Dressings
Compartment Syndrome

• Clinical diagnosis
  – Pain out of proportion to the injury
  – Numbness / Paresthesias
  – Weakness
Compartment Syndrome

- Physical Exam
  - Firm compartments?
  - Loss of pulses?
  - Pain on passive stretch

- Compartment Pressure?
Compartment Syndrome

- Who do we measure?
  - Risk factors but minimal signs/symptoms
  - Altered level of consciousness
  - Altered sensation
    - Nerve injury
    - Anesthesia
  - When diagnosis is in question
Compartment Syndrome

• How do we treat it?
  – Immediate fasciotomy
    • Skin
    • Muscle fascia
    • Debridement of necrotic tissue if present
Compartment Syndrome

- **Immediate fasciotomy**
  - **Lower Leg**
    - Two incisions
    - Release all four compartments
    - Skin can also be a limiting factor
Compartment Syndrome

Summary
- High index of suspicion
- Clinical diagnosis
- Prompt fasciotomy
- Treat complications
Summary

• History and mechanism of injury
• Unstable v. Stable
• Evaluation and effective communication of information
• Principles of immobilization
• Priority situations
Questions?