Orthopaedic Trauma

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Musculoskeletal Assessment

- OLD CART
- O: Onset of complaint
- L: Location of symptoms
- D: Duration of symptoms
- C: Characteristics of the symptoms
- A: Aggravating factors
- R: Relieving factors
- T: Treatment tried and timing of symptoms
Components of Health History

• Typical musculoskeletal complaints include pain, loss of function, joint instability or stiffness, loss of sensation, or a newly discovered deformity

• An acute condition alerts the provider to a different set of differential diagnoses than a chronic condition

• Acute conditions involving trauma are suggestive of a fracture, dislocation, or rupture of tissue

• Mechanism of injury (twisting, blunt force, height of fall)

• Time of when pain occurs

• Location or distribution of pain
• Initial observation/impression
• Any sign of potential loss of life or limb is an emergency requiring immediate attention
• Attitude (position/posture of body part/extremity)
• Alignment (mal-alignment suggest soft tissue injury, fx, or dislocation)
• Deformity
• Color (redness, ecchymosis, pallor, cyanosis)
• Swelling (diffuse or localized)
Physical Exam: Palpation

- pain
- tenderness
- localized temperature changes
- capillary refill
- pulses
- size of lymph nodes
- muscle shape
- tone
- resistance
Physical Exam: Motion

- Joint ROM
- Affected side is compared to the contralateral
- Active and Passive ROM
- Note degree of ROM and pain
- Injuries to muscles (strains) or ligaments (sprains) may result in deformity, weakness, or loss of strength, which can impact ROM
Categories of Sprains and Strains

Degree of Strain (Muscle)

• 1\textsuperscript{st} Mild (few muscle fibers torn)
• 2\textsuperscript{nd} Moderate (almost half of muscle torn)
• 3\textsuperscript{rd} Severe (All ligament fibers torn/ruptured)

Degree of Sprain (Ligament)

• 1\textsuperscript{st} Mild (few ligament fibers torn)
• 2\textsuperscript{nd} Moderate (half of ligament torn)
• 3\textsuperscript{rd} Severe (All ligament fibers torn or ruptured)
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Assessing Fractures and Dislocations

• Pulses distal to the injury
• Color and temperature of the limb
• Capillary refill
• Neurological status of the area and distal site of the injury
First Aid

• Removal of any rings or bracelets
• Control any bleeding
• Application of dry dressing
• Application of sling
• Administer pain medication as needed
• Identification of tetanus status
Expected injury related to mechanism of trauma

- Pedestrian hit by car
- Pedestrian hit by large vehicle and dragged under vehicle
- Unrestrained front seat passenger
- Unrestrained driver
- Back-seat passenger without head restraint
- Fall landing on feet
- Fractures of femur, tibia, and fibula on the side of impact
- Pelvic fractures
- Fractures of femur and/or patella
- Head, chest, abdomen, and pelvis injuries
- Hyper-extension of neck, cervical fractures
- Compression fracture lower spine, calcaneus
Fractured Neck of Femur

• Elderly more prone to accidents that can be more serious
• Fractured femur neck is common in the elderly after falling
• Typical history is a trip and fall with inability to get up
• Marked displacement in 95% of cases
• External rotation and shortening of extremity
• Any movement of hip causes severe pain
Supracondylar fracture of the humerus

• Common in children age 3-11
• Very urgent priority due to risk of injury to the brachial artery and the median nerve
• Fall on outstretched arm
• Attention to circulation, color, sensation, and temperature of the forearm and hand
• Radial pulse documentation
Fracture-dislocations of the ankle

- Fractures of the malleolus with or without dislocation can occur in three different ways
- Abduction or lateral rotation force (or combination)
- Adduction force
- Vertical compression force
- Fracture dislocation of the ankle with neurovascular compromise is treated as an emergency
- Identified by gross deformity of ankle joint, high pain level
- Pedal pulse not present
- Foot cold to touch and cap refill poor
Fracture-dislocations of the ankle

• If manipulation is not done immediately the patient may lose their foot

• Circulation needs to be restored to the foot

• Compartment syndrome of the muscles in the calf may develop within hours as a complication of a fracture dislocation of the ankle

• Muscles stiff on palpation
Soft tissue injuries

• Soft tissue injuries require inspection for the following
• Lacerations
• Abrasions and contusions
• Avulsions
• Puncture wounds
• Impaled objects
• Ecchymosis
• Oedema
• Deformity
• Open wounds
Peripheral Neurovascular Dysfunction

• Temporary or permanent damage to nerves and blood vessels may occur due to increased pressure
• Increased pressure within a limited space leads to compromised circulation and function of tissues
• High risk for compartment syndrome
• Fractures are the most common risk factor for compartment syndrome
Peripheral Neurovascular Dysfunction: Nursing Intervention

- The goal of care is to reduce the risk and to detect early signs of development
- Neurovascular observations are vital
- Not all blood vessels or nerves supplying a particular hand or foot may be affected by constriction
- Each digit must be checked separately for any neurovascular deficit
- Compare the limb being observed to the opposite limb
Assessment:  Color and Warmth

• Is the extremity pale and cold below the fracture or restriction, indicating an arterial insufficiency?

• Warmth with a bluish tinge indicates venous stasis

• Check capillary refill by pressing the nailbed; the color should return in 3-5 seconds
Sensation

• The patient should be asked to report any changes in sensation
• Reduced sensation
• Hyper-sensation
• Tingling
• Numbness
• Loss of sensation
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Compartment Syndrome

- Pain caused by muscle ischemia and necrosis
- Pain out of proportion to injury
- Pain unrelieved by analgesia
- Pain elicited on passive movements such as extending the fingers or toes
- When compartment syndrome is suspected an orthopaedic surgeon must be notified immediately as decompression surgery may be needed to prevent permanent loss of function
Compartiment Monitoring

• Normal pressures range from 0 to 20 mmHg
• Recommended thresholds for decompression by fasciotomy vary from 30 to 45 mmHg
• Pressure can be measured using a transcutaneous Doppler or ultrasound or percutaneously using a wick or slit catheter
• These devices provide instant report on pressure level
Reducing Risks

• Careful application of therapeutic restriction

• RICE measures (rest, ice, compression, and elevation) to reduce swelling in an injured limb

• However, if compartment syndrome is suspected, ice, compression, and elevation above heart level must be stopped immediately to reduce further impairing oxygenation of muscle tissue through reducing local arterial blood flow
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Physical Assessment: Cervical Spine (Neck)

• Note any recent trauma or injury involving the head

• Numbness, tingling, paralysis, and neck or arm positions that aggravate or induce the symptom

• Radicular symptoms which spread down the arm

• Neck pain w/o hx of trauma (degenerative OA, or RA)

• Pain in C-spine region may originate from adjacent structures (teeth, jaw, cardiovascular system, shoulders)
Acute Spinal Cord Injuries: Mechanism of Injury

- Compression
- Flexion
- Extension
- Rotation
- Direct trauma
Acute Spinal Cord Injuries: Incomplete Syndromes

- Central cord - results in sacral sensory sparing and greater weakness in the upper limbs than lower limbs
- Brown Sequard – damage to one half of the spinal cord resulting in motor loss on the same side as the lesion and sensory loss on the opposite side
- Anterior artery – supplies the front 2/3 of the cord, variable loss of motor function and pinprick and temperature sensations
Spinal shock

- Transient loss of all reflex activity below the injury level
- Onset is immediate or within minutes
- Spinal shock will affect both somatic and autonomic reflexes
- Complete injuries will have an absence of the following: somatic reflexes below the injury level, bladder and bowel reflexes, vasomotor tone below the injury level
- In patients with injuries above T6 there will be bradycardia, hypotension, and hypothermia
Implications of Acute SCI

- Cardiovascular
- Respiratory
- Gastrointestinal
- Musculoskeletal
- Psychological
- Urinary
Management of the Respiratory Implications

• Dependent on the level and severity of injury
• Respiratory muscle innervation
• The higher the level of injury the greater the respiratory risk
• Ineffective airway clearance
• Ineffective breathing pattern
• High risk of chest infection
Management of Cardiovascular Implications

- Injuries above T6
- Major sympathetic nervous system disruption impacting heart rate
- Hypotension
- Bradycardia
- Hypothermia
- DVT
- PE
Gastrointestinal complications

- Paralytic ileus
- Gastric Ulceration
- Vomiting
- Abdominal injury
- Neurogenic bowel
Urinary Implications

• During the period of spinal shock the bladder is flaccid
• Risk for decreased output with hypotension
• UTI
• Bladder reflex decreased
• Autonomic dysreflexia with bladder distention
Musculoskeletal Management: SCI

- Fracture pain
- Shoulder pain
- Phantom pain
- Hypersensitivity
Psychological Implications: SCI

- Sensory deprivation
- Confusion
- Restlessness
- Decreased concentration
- Hallucinations
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Rotator Cuff Tear

- Repetitive use
- Most common after age 40
- Tears result in limited abduction beyond 25 degrees
- Limited backward extension
Clavicle Fractures

• Mid-shaft fractures from violent upwards and backwards thrust typically from falling with arm outstretched

• Risk of damage to the great blood vessels near to the clavicle, the subclavian vessels and lung

• The arm is supported in a broad arm sling for up to 10 days
Humeral Fractures

• Humeral neck fractures generally seen in the elderly
• Comminuted fractures may require surgical treatment
• Caused by direct blow or fall onto arm
• Radial nerve risk of being trapped between the bone ends
Fractures of Forearm and Wrist

• A fall on the hand may produce a crack in the head of the radius
• Olecranon fractures due to direct fall onto the elbow
• Rare to fracture the radius and ulna separately
• Radial and ulna fractures can result in vascular damage and risk for compartment syndrome
Pelvic Fractures and Injury

- Stable and minimally displaced fractures
- Fractures not involving the pelvic ring
- Rotationally unstable
- Trauma
- Stress fractures
- Avulsion fractures
Physical assessment

- Systemic exam of abdomen, pelvis, back, perineum and thighs
- Cullen’s sign (bruising around the umbilicus)
- Grey Turner’s sign (bruising in the flank)
- Observe for changed abdominal contours
- Hypovolemic shock
- Pain
Fractures of Femoral Shaft

• Largest and strongest bone
• Covered by the largest and strongest muscles
• Pathologic fractures
• Greatest risk for hypovolemic shock
• Fat embolism
Fractures of Tibia and Fibula

- Tibia is a main weight bearing bone
- Fractures from fall, sports injuries, motor vehicle accidents, etc
- Oblique and spiral fractures common
- Major complications of lower leg fractures are compartment syndrome and DVTs
The most common outpatient hip problems are related to bursitis, arthritis, avascular necroses of the hip, fractures, metastatic disease, vascular occlusions, and or referred pain from the low back.

Trauma related hip pain in the elderly is highly suggestive of a hip fracture.

Younger patients with trauma-induced pain in the absence of fracture are suspect for hip labral tears.

Structures adjacent to the hip (lumbar spine, knee, lower GI tract and reproductive tract) should be evaluated for referred pain.
Knee

• Presence of knee pain associated with trauma
• Did the injury occur while suddenly accelerating or decelerating after moving at constant speed?
• Was an audible pop heard?
• Did it occur while bearing weight and rotating the leg?
• Swelling in the knee immediately following an injury signifies trauma within the joint
• Any functional limitation (kneeling, cutting, pivoting, twisting, climbing)
Fractures of the Patella

- Occur due to direct fall onto patella
- Pain management
- Full joint assessment
- Elevation, support, and application of ice to the anterior aspect of the knee
Every life deserves world class care.