UNIT 8 – SPECIFIC SPORTS INJURIES
Lecture Notes

STANDARD 8
Students will explore specific sports injuries.

Objective 1: Recognize common injuries to the head and neck to include: concussion, cervical spine fractures, brachial plexus injuries, and nose bleeds.

1) Review the anatomy of the head and neck
   a) Bones
      i) Cranium - The cranium or the skull encloses and protects the brain.
         (1) Frontal
             (a) Forms the forehead (anterior part of the cranium), the roofs of the orbits (eye sockets), and most of the anterior part of the cranial floor.
         (2) Parietal - Paired bones that form the greater portion of the sides and roof of the cranial cavity.
         (3) Occipital - Forms the posterior part and the prominent portion of the base of the cranium.
         (4) Temporal – Paired bones that form the inferior sides of the cranium and part of the cranial floor.
         (5) Mandible - The lower jaw bone; the only moveable bone in the skull.
         (6) Maxillae - The upper jaw bone.
      ii) Facial
          (1) Zygomatic – Paired bones that give definition to the cheeks.
          (2) Nasal – Paired bones that form the bridge of the nose.
      iii) Cervical Vertebrae - Upper section of the spine containing seven separate bones.

   b) Muscles

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Location</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sternocleidomastoid</td>
<td>Anterior aspect of the neck</td>
<td>Flex neck; rotate the head</td>
</tr>
<tr>
<td>Trapezius</td>
<td>Posterior aspect of the neck</td>
<td>Extends neck; adducts scapula</td>
</tr>
</tbody>
</table>

   c) Soft tissues
      a. Brain - The brain is the part of the central nervous system that is contained within the bony cavity of the cranium.
         i. Cerebrum - coordinates all voluntary muscle activities and interprets sensory impulses. Controls higher mental functions such as memory, reasoning, intelligence, learning, judgment, and emotions.
         ii. Cerebellum - controls movements of skeletal muscles and play a critical role in coordinating voluntary movements.
         iii. Brainstem - controls the vital functions of the body including, heart rate, blood pressure, breathing, swallowing, coughing, etc.
      b. Intervertebral disks
         i. Cartilaginous disks that lie between each vertebrae.
         ii. Act as shock absorbers of the spine.
Exercise Science/Sports Medicine

d) Nerves:
   a. Cranial nerves; 12 pairs that branch off of the brain.
   b. Spinal nerves – nerve roots that branch off of each level of the spinal cord.
      i. Brachial Plexus (C5-T1) - Spinal nerve roots that exit between the vertebrae and form a bundle of nerves that innervate the shoulder and arm muscles.

1) Common injuries to the Head
   a) Cerebral Concussion - Post traumatic impairment of neural function
      i) Mechanism of Injury - Direct blow to the head by either a moving, or fixed object. Acceleration/deceleration results in bruising of the brain.
      ii) Signs and Symptoms – Vary but can include one or more of the following:
         (1) Headache
         (2) Loss of consciousness
         (3) Tinnitus
         (4) Nausea
         (5) Irritability
         (6) Confusion
         (7) Disorientation
         (8) Dizziness
         (9) Amnesia
         (10) Concentration difficulty
         (11) Photophobia
         (12) Sleep disturbances
         (13) Vision disturbances
         (14) Balance disturbances
      iii) Assessment/grading: Currently there is debate on whether to and/or when to grade levels of concussion. The grading dilemma comes down to the health care professional choosing which of the following three options they will use when caring for a concussed athlete:
         (1) Grade the concussion at the time of the injury.
         (2) Grade the concussion after all symptoms have resolved.
         (3) No use of a grading scale is OK; if focus is on recovery of symptoms, neuropsychological tests, & postural-stability tests

(After deciding on an approach, the ATC-physician team should be consistent in its use regardless of the athlete, sport, or circumstances surrounding the injury. Option #1 is not recommended; #2 or #3 are fine. The grade becomes more important for helping to manage the athlete’s next concussion.)

(4) If one of the grading options is used, the following grading system should be utilized.

<table>
<thead>
<tr>
<th>Concussion Grading System – Cantu 2001</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade I (mild)</td>
</tr>
<tr>
<td>No loss of consciousness; amnesia lasting less than 30 minutes; other signs/symptoms last less than 24 hours</td>
</tr>
</tbody>
</table>
iv) Treatment - Careful removal from play, thorough physical and neurological examination. Refer to physician for follow up examination. (More detailed information on athlete evaluation included in additional resources)

v) Return to Play Guidelines - Return to play is dependent upon the following:
   (1) Recommendation of the treating physician
   (2) Frequency of concussion
   (3) Severity of concussion
   (4) Length of time athlete is asymptomatic. 
   (5) Prevention Strategies
   (6) Protective Equipment
       (a) Helmet 
       (b) Mouth guards
   (7) Proper technique in sporting activities
   (8) Following the rules of the sport (Ex. Spearing, illegal wrestling moves)

b) Post concussive syndrome – persistent symptoms following concussion.
   i) Signs and Symptoms
      (1) Persistent headache
      (2) Impaired memory
      (3) Lack of concentration
      (4) Anxiety
      (5) Irritability
      (6) Fatigue
      (7) Depression
      (8) Continued visual disturbances
   ii) Treatment
       (1) No clear cut guidelines
       (2) Athlete should not return to play until all symptoms have resolved.

c) Second impact syndrome – Rapid swelling of the brain from additional head trauma; life threatening.
   i) Mechanism of Injury:
      (1) A second head injury that occurs before the symptoms of a previous head injury have resolved.
      (2) The second impact may be minor.
      (3) Could be caused by blow to the chest or back causing the head to accelerate.
   ii) Signs and Symptoms
      (1) No initial loss of consciousness
      (2) Rapid worsening leading to:
          (a) Loss of consciousness progressing to coma
          (b) Dilated pupils
          (c) Loss of eye movement
          (d) Respiratory failure
   iii) Treatment - Immediate transport to emergency care facility
   iv) Prevention:
      (1) DO NOT LET THE SITUATION OCCUR!
      (2) Careful decision making regarding return to play following initial head trauma.
2) Common Injuries to the Neck and Face:

**Objective 2:** Recognize common injuries to the upper extremity to include: clavicle fracture, impingement syndrome, rotator cuff injuries, glenohumeral dislocation, AC joint separation, epicondylitis, and interphalangeal dislocation.

1) Review the anatomy of the upper extremity.
   a) Bones
      i) Clavicle
      ii) Scapula
         (1) Spine of the scapula
         (2) Acromion process
         (3) Glenoid fossa/cavity
      iii) Humerus – epicondyles
      iv) Ulna
      v) Radius
      vi) Carpals
      vii) Metacarpals
      viii) Phalanges
   b) Joints
      i) Shoulder
         (1) Acromioclavicular
         (2) Glenohumeral
      ii) Elbow
      iii) Wrist
      iv) Metacarpal Phalangeal (MCP)
      v) Interphalangeal (PIP & DIP)
c) Soft Tissues:
   i) Subacromial Bursa - Bursa sac located below the acromion process of the scapula and superior to the head of the humerus.
   ii) Acromioclavicular (AC) Ligament -Attaches the acromion process of the scapula to the clavicle. It consists of anterior, posterior, superior and inferior portions.
   iii) Glenoid Labrum
      (1) Fibrocartilagenous rim around the glenoid fossa of the scapula.
      (2) This ring of cartilage helps to deepen the socket of the shoulder.

d) Muscles - see chart below

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Location</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deltoid</td>
<td>Covers the shoulder</td>
<td>Abducts the arm</td>
</tr>
<tr>
<td>Supraspinatus (rotator</td>
<td>Posterior scapula</td>
<td>Abducts the arm, some external rotation of shoulder; stabilizes the head</td>
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<tr>
<td>cuff muscle)</td>
<td></td>
<td>of the humerus.</td>
</tr>
<tr>
<td>Infraspinatus (rotator</td>
<td>Posterior scapula</td>
<td>Externally rotates the shoulder; stabilizes the head of the humerus.</td>
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<tr>
<td>cuff muscle)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teres minor (rotator</td>
<td>Posterior scapula</td>
<td>Externally rotates the shoulder; stabilizes the head of the humerus.</td>
</tr>
<tr>
<td>cuff muscle)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subscapularis (rotator</td>
<td>Anterior scapula</td>
<td>Internally rotates the shoulder; stabilizes the head of the humerus.</td>
</tr>
<tr>
<td>cuff muscle)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biceps Brachii</td>
<td>Anterior aspect of the</td>
<td>Flexes the elbow</td>
</tr>
<tr>
<td></td>
<td>upper arm</td>
<td></td>
</tr>
<tr>
<td>Triceps Brachii</td>
<td>Posterior aspect of the</td>
<td>Extends the elbow</td>
</tr>
<tr>
<td></td>
<td>upper arm</td>
<td></td>
</tr>
</tbody>
</table>

2) Common Injuries to the upper extremity include, but not limited to:

<table>
<thead>
<tr>
<th>Common Injuries to the Upper Extremity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Injury</td>
</tr>
<tr>
<td>Clavicle Fracture</td>
</tr>
<tr>
<td></td>
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<tr>
<td></td>
</tr>
<tr>
<td>Shoulder Impingement</td>
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<tr>
<td>Syndrome</td>
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</tbody>
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### Rotator Cuff Strain
- High velocity arm rotation. (throwing)
- Pain with muscle contraction, tenderness, decreased strength, swelling.
- RICE initially, progressive rotator cuff strengthening, modify activity until asymptomatic.
- Progressive throwing program, shoulder complex strengthening.

### Glenohumeral dislocation (can lead to labral tears)
- Forced abduction, external rotation of shoulder.
- Flattened deltoid contour, pain, disability.
- Splint in position found, immediate transport to physician.
- Shoulder complex strengthening.

### AC joint separation
1. Falling on an outstretched arm.
2. Direct impact to the tip of the shoulder.
- Grade I: point tender, painful ROM, no deformity.
- Grade II: elevation of the end of the clavicle, decreased ROM.
- Grade III: dislocation of the clavicle, severe pain, loss of ROM.
- Ice, immobilization of the shoulder, refer to physician.
- Return to play at return of full strength and ROM.
- Proper fitting pads
- Strengthening of deltoid muscle.

### Lateral Epicondylitis
- "Tennis Elbow"
- Repetitive extension of the wrist.
- Aching pain in lateral elbow during and after activity.
- RICE, anti-inflammatory medications, strengthening exercises.
- Proper technique, progressive increase in frequency/intensity of training.

### Medial Epicondylitis
- "Little Leaguer's or Golfer's Elbow"
- Repetitive flexion of the wrist.
- Pain in medial elbow, could radiate down arm; point tenderness, mild swelling.
- RICE, anti-inflammatory medications, strengthening exercises
- Proper technique, progressive increase in frequency/intensity of training.

### Intertphalangeal dislocation
- Blow to the tip of the finger.
- Pain, deformity, no ROM.
- Splint in position found, immediate referral to a physician.

### Objective 3: Recognize common injuries to the lower extremity to include: collateral ligament sprains, cruciate ligament sprains, meniscal injury, patello-femoral injuries, ankle sprains, plantar fasciitis, turf toe, thigh contusions, quadriceps/hamstring strains, and medial tibial stress syndrome – "shin splints".

1) Review the anatomy of the lower extremity.
   a) Bones
      i) Femur
      ii) Patella
      iii) Tibia
(1) Tibial Tuberosity  
(2) Medial malleolus  
iv) Fibula -Lateral malleolus  
v) Tarsals  
 (1) Calcaneus  
 (2) Talus  
 (3) Metatarsals  
 (4) Phalanges  
b) Joints  
i) Tibialfemoral - Allows knee flexion/extension  
ii) Patellofemoral  
iii) Tibiotalar (ankle joint; can also be called talocrural) - Allows ankle plantar/dorsiflexion  
iv) Subtalar (joint between talus and calcaneus) - Allows inversion/eversion  
v) Midfoot (joints where tarsals meet metatarsals)  
vi) Metatarsal Phalangeal (MP) - Allows toe flexion/extension  
vii) Interphalangeal (PIP & DIP) - Allows flexion/extension of toe segments  
c) Soft Tissues  
i) Menisci of the knee – cartilage rings that deepens the joint. Outer 1/3 has a blood supply, rest is avascular.  
 (1) Lateral Meniscus  
 (2) Medial Meniscus -Has a deep attachment to the MCL.  
ii) Knee Ligaments  
 (1) Medial Collateral (MCL) – resists valgus forces  
 (2) Lateral Collateral (LCL) – resists varus forces  
 (3) Anterior Cruciate (ACL) - resists anterior displacement of the tibia  
 (4) Posterior Cruciate (PCL) – resists posterior displacement of the tibia  
 (5) Patellar Tendon - Attaches the quadriceps muscle group to the tibia  
 (6) Achilles Tendon - Attaches the calf muscles to the calcaneus.  
iii) Ankle Ligaments  
 (1) Anterior tibiofibular – resists forced dorsiflexion and rotation of the talus  
 (2) Anterior talofibular – resists plantar flexion and inversion forces  
 (3) Deltoid – resists eversion forces  
d) Muscles  
<table>
<thead>
<tr>
<th>Muscle</th>
<th>Location</th>
<th>Function</th>
</tr>
</thead>
</table>
| Quadriceps Femoris  
 • Rectus Femoris  
 • Vastus Medialis  
 • Vastus Lateralis  
 • Vastus Intermedius | Anterior Thigh | Extends the knee |
| Hamstrings  
 • Semimembranosus  
 • Semitendinosus  
 • Biceps Femoris | Posterior Thigh | Flexes the knee |
| Tibialis Anterior | Anterior lower leg | Dorsiflexion of ankle |
| Gastrocnemius | Posterior lower leg | Plantar flexion of ankle; assists in knee flexion |
| Soleus | Deep to the gastrocnemius | Plantar flexion of the ankle |
| Tibialis Posterior | Posteromedial lower leg | Inversion of the foot/ankle |
| Peroneus Longus | Lateral lower leg | Eversion of the foot/ankle |
| Peroneus Brevis | Lateral lower leg | Eversion of the foot/ankle |
2) Common Injuries to the lower extremity:

<table>
<thead>
<tr>
<th>Injury</th>
<th>Mechanism of Injury</th>
<th>Signs and Symptoms</th>
<th>Treatment</th>
<th>Prevention Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thigh Contusion</td>
<td>Severe impact to the thigh musculature</td>
<td>Pain, loss of function, swelling, decreased ROM</td>
<td>Ice, compression with knee flexed. MUST be managed appropriately to avoid complications.</td>
<td>Protective equipment</td>
</tr>
<tr>
<td>Muscle strains (Quads/hamstrings)</td>
<td>Sudden stretch or sudden contraction</td>
<td>Pain, spasm, loss of function, swelling, possible deformity</td>
<td>RICE, flexibility and strengthening exercises.</td>
<td>Proper warm-up, stretching and strengthening.</td>
</tr>
<tr>
<td>Medial Collateral ligament sprain (knee)</td>
<td>Valgus force or tibial external rotation</td>
<td>Pain medial knee, mild swelling, joint stiffness, possible joint instability.</td>
<td>RICE, ROM and strengthening exercises, restrict activity until asymptomatic.</td>
<td>Lower extremity strengthening and conditioning.</td>
</tr>
<tr>
<td>Lateral Collateral ligament sprain (knee)</td>
<td>Varus force or tibial internal rotation</td>
<td>Pain lateral knee, mild swelling, possible joint laxity.</td>
<td>RICE, ROM and strengthening exercises, restrict activity until asymptomatic.</td>
<td>Lower extremity strengthening and conditioning.</td>
</tr>
<tr>
<td>Anterior Cruciate ligament sprain</td>
<td>Noncontact: - deceleration - foot planted - rotation - valgus stress Contact: hyperextension w/foot planted</td>
<td>Hears or feels a &quot;pop&quot;, rapid swelling, joint instability.</td>
<td>RICE, restore ROM and strength, surgery required to reconstruct the ligament.</td>
<td>Lower extremity strengthening and conditioning.</td>
</tr>
<tr>
<td>Posterior Cruciate ligament sprain</td>
<td>- Falling on bent knee - direct force to front of knee - rotational forces</td>
<td>Hears or feels a &quot;pop&quot;, minimal swelling, posterior tibial sag.</td>
<td>RICE, restore ROM and strength. Surgery is controversial.</td>
<td>Lower extremity strengthening and conditioning.</td>
</tr>
<tr>
<td>Injury Description</td>
<td>Symptoms</td>
<td>Treatment</td>
<td>Prevention/Conditioning</td>
<td></td>
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<td>-----------------------------------------------</td>
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<tr>
<td>Patellar subluxation or dislocation</td>
<td>Combination of foot planted, deceleration, and change of direction.</td>
<td>Obvious deformity, pain, swelling, limited ROM.</td>
<td>RICE and immobilization initially, then ROM and strengthening exercises. McConnell taping or bracing. Lower extremity strengthening and conditioning.</td>
<td></td>
</tr>
<tr>
<td>Patellar tendinitis “Jumper’s knee”</td>
<td>Repetitive deceleration</td>
<td>Vague pain and tenderness of patellar tendon that worsens with running/jumping activities.</td>
<td>Rest, ice, NSAID medications, patellar strap, friction massage, and lower extremity strengthening. Progressive increase in frequency/intensity of training. Lower extremity strengthening and conditioning.</td>
<td></td>
</tr>
<tr>
<td>Patellofemoral syndrome (abnormal tracking of patella in femoral groove)</td>
<td>-tight hamstring and calf muscles - increased Q-angle -weak quadriceps muscles -poor foot mechanics</td>
<td>Tenderness of one or more patellar edge, dull ache, crepitus, pain with compression, positive Apprehension test.</td>
<td>NSAIDs, quadricep strengthening, sleeve with buttress and/or McConnell taping, orthotic foot insert. Lower extremity strengthening and conditioning.</td>
<td></td>
</tr>
<tr>
<td>Medial tibial stress syndrome “shin splints”</td>
<td>Repetitive running activities.</td>
<td>Diffuse pain in distal medial tibia, increasing with activity.</td>
<td>Correct faulty foot mechanics with footwear, or orthotic foot insert, calf stretching. Appropriate footwear for activity, lower leg flexibility and strengthening, orthotic foot inserts.</td>
<td></td>
</tr>
</tbody>
</table>
### Ankle sprain

**Inversion:**
- forced inversion and plantar flexion “rolling”
- Pain, swelling, decreased ROM, possible joint laxity.
- RICE, symptomatic modalities, taping and/or bracing.
- Appropriate footwear for activity, lower leg strengthening, proprioceptive training, taping and/or bracing of joint.

**Eversion:**
- forced eversion of ankle – high risk for fracture.
- Syndesmosis (high):
  - forced inversion with rotation of the talus.
- Pain, swelling, decreased ROM, possible joint laxity.
- RICE, symptomatic modalities, taping and/or bracing.
- Appropriate footwear for activity, lower leg strengthening, proprioceptive training, taping and/or bracing of joint.

### Plantar fasciitis

- Tight calf muscles, poor arch support, possible leg length discrepancy, over striding while running.
- Medial heel pain, particularly in the morning; pain with forced dorsiflexion of the toes.
- Calf stretching, plantar fascial stretching, heel cup, orthotic foot inserts.
- Calf flexibility, correction of faulty foot mechanics.

### “Turf toe”

- Hyperextension sprain of the great toe. MP joint. Can be related to either trauma or overuse.
- Pain at MP joint of great toe, increasing with extension of the joint.
- Steel toe insoles or taping, symptomatic modalities.
- Appropriate footwear, correction of faulty foot mechanics.