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
      | Muscle            | Location             | Function                        |
      |-------------------|----------------------|---------------------------------|
      | Sternocleidomastoid | Anterior aspect of the neck | Flex neck; rotate the head |
      | Trapezius         | Posterior aspect of the neck | Extends neck; adducts scapula |
   
   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
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
         (1) Neuropsychological Testing
            (a) If possible, preseason testing on a computerized system (ImPACT).
            (b) If a concussion occurs, retest injured athlete following recommended protocols.
         (2) Thorough evaluation of athlete: (Sport Concussion Assessment Tool (SCAT 2 – see additional resources) is a tool that can be used to evaluate a concussed athlete.
            (a) Physical Examination – evaluation of athletes physical symptoms as listed above
            (b) Cognitive testing
               (i) Immediate memory testing
                  1. What month is it?
                  2. What time is it?, etc.
               (ii) Concentration
                  1. Months of year backward
                  2. 100-7, continue backward
               (iii) Delayed Recall – have athlete remember words, repeat at later time
            (c) Balance/Coordination testing
               (i) Balance Error Scoring System (BESS – see additional resources)
               (ii) Romberg Test
               (iii) Finger to Nose
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 – Specific guidelines will depend on the level of play of the athlete involved. Currently, the NCAA, UHSAA, and a new Utah State law regarding youth sports (HB 204) will dictate a specific plan for concussion management and return to play guidelines. It will include some variation of the following (see additional resources for specific details):

(1) Progression through Return-To-Play stages on a case by case basis with final clearance by an approved, licensed health care professional:

<table>
<thead>
<tr>
<th>Stage</th>
<th>Functional Exercise or Activity</th>
<th>Objective</th>
<th>Recommended Tests Administered before advancing to next stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. No structured or cognitive activity</td>
<td>Only Basic Activities of Daily Living (ADLs). When indicated, complete cognitive rest followed by gradual reintroduction of schoolwork.</td>
<td>Rest and recovery, avoidance of overexertion</td>
<td>Initial Post-injury test battery; -Symptom checklist -Computer based Neuropsychological Testing -BEES</td>
</tr>
<tr>
<td>2. Light Aerobic Physical Activity</td>
<td>Non-impact aerobic activity (e.g. swimming, stationary biking) at &lt;70% estimated maximum heart rate for up to 30 minutes as symptoms allow.</td>
<td>Increase heart rate, maintain condition, assess tolerance of activity</td>
<td>-Symptom checklist</td>
</tr>
<tr>
<td>3. Moderate aerobic physical activity and Non-contact training drills at half speed</td>
<td>Non-contact sport specific drills at reduced speed; Aerobic activity at 70-85% estimated maximum heart rate; light resistance training (e.g. weights at &lt;50% previous max ability)</td>
<td>Begin assimilation into team dynamics, introduce more motion and non-impact jarring</td>
<td>-Symptom checklist</td>
</tr>
<tr>
<td>4. Non-contact training drills at full speed</td>
<td>Regular Non-contact training drills; aerobic activity at maximum capacity including sprints; regular weight lifting routine</td>
<td>Ensure tolerance of all regular activities short of physical contact.</td>
<td>-Symptom checklist Computer based Neuropsychological Testing -BEES</td>
</tr>
<tr>
<td>5. Full Contact Practice</td>
<td>Full Contact Practice</td>
<td>Assess functional skills by coaching staff, ensure tolerance of contact activities</td>
<td>-Symptom checklist -BEES</td>
</tr>
<tr>
<td>6. Return to Play</td>
<td>Regular game competition</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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.

### Common Injuries to the Head and Neck

<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>Cervical Spine Fracture</td>
<td>Axial loading and/or forceful rotation of the neck.</td>
<td>Pain over bony prominences, possible numbness or tingling in upper extremity.</td>
<td>Spinal immobilization including C-collar; refer to physician</td>
<td>Strengthening of neck musculature. Correct technique of sport skills.</td>
</tr>
</tbody>
</table>
| Nose Bleed                   | Trauma to the nose Dry air | Blood coming from the nose. | 1. Apply pressure by pinching nostrils together.  
2. Keep head tilted forward to prevent blood from going down throat.  
3. Apply ice to the nose. | Lubricant to inner nasal tissues. Nasal spray |

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  
   b) Joints  
      i) Shoulder  
        (1) Acromioclavicular  
        (2) Glenohumeral  
      ii) Elbow  
      iii) Wrist
iv) Metacarpal Phalengal (MCP)

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

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

<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>Clavicle Fracture</td>
<td>1. Fall on outstretched arm. 2. Fall on tip of shoulder. 3. Direct impact</td>
<td>Pain, deformity, swelling.</td>
<td>Immobilize shoulder. Refer to physician.</td>
<td>Don’t fall.</td>
</tr>
<tr>
<td>Shoulder Impingement Syndrome</td>
<td>Mechanical compression of the supraspinatus tendon, subacromial bursa, and long head of biceps tendon.</td>
<td>Pain around acromion with overhead arm position. Weak external rotators. Positive empty can and impingement tests.</td>
<td>Restore normal biomechanics. Strengthen shoulder complex muscles, stretch posterior joint capsule, modify activity until asymptomatic.</td>
<td>Decrease overhead activity, shoulder complex strengthening, improve technique</td>
</tr>
</tbody>
</table>
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>
<tbody>
<tr>
<td>Quadriceps Femoris</td>
<td>Anterior Thigh</td>
<td>Extends the knee</td>
</tr>
<tr>
<td>• Rectus Femoris</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Vastus Medialis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Vastus Lateralis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Vastus Intermedius</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hamstrings</td>
<td>Posterior Thigh</td>
<td>Flexes the knee</td>
</tr>
<tr>
<td>• Semimembranosus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Semitendinosus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Biceps Femoris</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tibialis Anterior</td>
<td>Anterior lower leg</td>
<td>Dorsiflexion of ankle</td>
</tr>
<tr>
<td>Gastrocnemius</td>
<td>Posterior lower leg</td>
<td>Plantar flexion of ankle; assists in knee flexion</td>
</tr>
<tr>
<td>Soleus</td>
<td>Deep to the gastrocnemius</td>
<td>Plantar flexion of the ankle</td>
</tr>
<tr>
<td>Tibialis Posterior</td>
<td>Posteromedial lower leg</td>
<td>Inversion of the foot/ankle</td>
</tr>
<tr>
<td>Peroneus Longus</td>
<td>Lateral lower leg</td>
<td>Eversion of the foot/ankle</td>
</tr>
<tr>
<td>Peroneus Brevis</td>
<td>Lateral lower leg</td>
<td>Eversion of the foot/ankle</td>
</tr>
</tbody>
</table>
2) Common Injuries to the lower extremity:

<table>
<thead>
<tr>
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<th>Treatment</th>
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</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</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 Type</td>
<td>Mechanism</td>
<td>Symptoms</td>
<td>Treatment</td>
<td>Prevention/Conditioning</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>---------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>Meniscus tear</td>
<td>Weight bearing with rotational force.</td>
<td>Swelling, joint line pain, loss of motion, locking or giving way.</td>
<td>RICE [Avascular area: Surgically trimmed and smoothed. Vascular area: Surgically repaired.]</td>
<td>Lower extremity strengthening and conditioning.</td>
</tr>
<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.</td>
<td>Lower extremity strengthening and conditioning.</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.</td>
<td>Progressive increase in frequency/intensity of training. Lower extremity strengthening and conditioning.</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, quadriceps strengthening, sleeve with buttress and/or McConnell taping, orthotic foot insert.</td>
<td>Lower extremity strengthening and conditioning.</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</td>
<td>Appropriate footwear for activity, lower leg flexibility and strengthening, orthotic foot inserts.</td>
</tr>
<tr>
<td>Injury</td>
<td>Description</td>
<td>Symptoms</td>
<td>Treatment</td>
<td>Prevention/Correction</td>
</tr>
<tr>
<td>-----------------</td>
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</tbody>
</table>
| Ankle sprain    | *Inversion:* forced inversion and plantar flexion “rolling”  
*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.                           |