**CORE Standards, Objectives, AND Indicators**

**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.
2. Bones (Frontal, Occipital, Parietal, Temporal, Mandible, Maxillae, Zygomatic, Nasal, Cervical Vertebrae)
3. Muscles (Sternocleidomastoid, Trapezius)
4. Structures (Brain, Intervertebral disks)
5. Nerves (Cervical plexus, Brachial plexus)
6. Identify the mechanism of injury.
7. Identify the signs and symptoms of the injury.
8. Indicate appropriate treatment for the injury.
9. Describe injury prevention strategies.

**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.
2. Bones (Scapula, Clavicle, Humerus, Radius, Ulna, Carpals, Metacarpals, Phalanges)
3. Joints (Shoulder – sternoclavicular, acromioclavicular, glenohumeral, scapulothoracic; Elbow, Wrist, Metacarpal Phalangeal, Interphalangeal)
4. Soft tissues (Subacromial bursa, AC ligament, Glenoid Labrum)
5. Muscles (Deltoid, SITS, Biceps Brachii, Triceps Brachii)
6. Identify the mechanism of injury.
7. Identify the signs and symptoms of the injury.
8. Indicate appropriate treatment for the injury.
9. Describe injury prevention strategies.

**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.
2. Bones (Femur, Tibia, Fibula, Patella, Talus, Calcaneus, Metatarsals, Phalanges)
3. Joints (Tibial Femoral, Patello Femoral, Talocrural, Subtalar)
4. Soft tissues (patellar tendon, ACL, MCL, PCL, LCL, lateral and medical meniscus. Anterior tibiofibular ligament, Anterior talofibular ligament, Deltoid ligament)
5. Muscles (Quadriceps, Hamstrings, Peroneals, Tibialis Anterior, Tibialis Posterior, Gastrocnemius, Soleus, Achilles Tendon)
6. Identify the mechanism of injury.
7. Identify the signs and symptoms of the injury.
8. Indicate appropriate treatment for the injury.
9. Describe injury prevention strategies.

Strand 4 – Head and Neck Injuries

Lecture Notes

**STANDARD 8**

**Students will explore specific sports injuries of the head and neck and apply athletic injury prevention principles.**

**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
	1. **Bones**
		1. **Cranium -** The cranium or the skull encloses and protects the brain.
			1. **Frontal**
				1. 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.
		2. **Facial**
			1. **Zygomatic** – Paired bones that give definition to the cheeks.
			2. **Nasal –** Paired bones that form the bridge of the nose.
		3. **Vertebrae** - Bones that compose the spinal column.

Parts of an individual vertebra include a spinous process, two transverse processes, the vertebral foramen and vertebral body.

* + - 1. **Cervica**l – Neck bones, 7 total; top 2 are named Atlas and Axis.
			2. **Thoracic** – Ribs attach to these vertebrae, 12 total.
			3. **Lumbar** – Low back, 5 total.
			4. **Sacrum** – Forms posterior wall of pelvic cavity; individual vertebrae fused together to form plate-like piece.
			5. **Coccyx** – Tail bone; individual vertebrae may fuse together.
	1. **Muscles**

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| Muscle | Location | Function |
| Sternocleidomastoid | Anterior aspect of the neck | Flex neck; rotate the head |
| Trapezius | Posterior aspect of the neck | Extends neck; adducts scapula |

1. **Soft tissues**
	1. **Brain -** The brain is the part of the central nervous system that is contained within the bony cavity of the cranium.
		1. **Cerebrum -** coordinates all voluntary muscle activities and interprets sensory impulses. Controls higher mental functions such as memory, reasoning, intelligence, learning, judgment, and emotions.
		2. **Cerebellum** - controls movements of skeletal muscles and play a critical role in coordinating voluntary movements.
		3. **Brainstem -** controls the vital functions of the body including, heart rate, blood pressure, breathing, swallowing, coughing, etc.
		4. **Meninges** – layers of tissues that surround the brain and spinal cord; has areas of space between each layer.
			1. **Dura Mater** – outer layer made up of arteries and veins.
				1. Subdural space – a fluid-filled space between the dura mater and arachnoid mater
			2. **Arachnoid Mater** – middle layer, contains a spider web of veins.
				1. Subarachnoid space – contains CSF, which protects, cushions and nourishes the central nervous system.
			3. **Pia Mater** – inner layer, lines brain and spinal cord.
	2. **Intervertebral disks**
		1. Cartilaginous disks that lie between each vertebrae.
		2. Act as shock absorbers of the spine
		3. Annulus Fibrosus: outer layer of disk composed of tough fibers and allows for movement.
		4. Nucleus Pulposus: inner gel-like portion of disk, acts as a shock absorber.
2. **Nerves:**
	1. **Cranial nerves;** 12 pairs that branch off of the brain.
	2. **Spinal nerves** – 31 pairs of nerve roots that branch off of each level of the spinal cord.
		1. 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.

**Standard 2: Recognize common injuries to the head and neck**

1. **Common injuries to the Head**
	1. **Cerebral Concussion -** Post traumatic impairment of neural function
		1. Mechanism of Injury - Direct blow to the head by either a moving, or fixed object. Acceleration/deceleration results in bruising of the brain.
		2. 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
		3. **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.)*

* + - 1. If one of the grading options is used, the following grading system should be utilized.

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| Concussion Grading System – Cantu 2001 |
| **Grade I (mild)** | **Grade II (moderate)** | **Grade III (severe)** |
| No loss of consciousness; amnesia lasting less than 30 minutes; other signs/symptoms last less than 24 hours | Loss of consciousness less than 1 minute *or* amnesia lasting more than 30 minutes but less than 24 hours *or* other signs/symptoms lasting more than 24 hours but less than 7 days | Loss of consciousness more than 1 minute *or* amnesia lasting more than 24 hours *or* other symptoms lasting more than 7 days |

* + 1. **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)
		2. **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
				1. Helmet
				2. Mouth guards
			7. Proper technique in sporting activities
			8. Following the rules of the sport (Ex. Spearing, illegal wrestling moves)
			9. NCAA, UHSAA and Utah State Law (HB 204) dictate a specific plan for concussion management and return to play guidelines.
				1. These plans must include a variation of both a Progression thru return to play stages and final clearance by an approved, licensed health care professional.
	1. **Post concussive syndrome –** persistent symptoms following concussion.
		1. 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
		2. Treatment
			1. No clear cut guidelines
			2. Athlete should not return to play until all symptoms have resolved.
	2. **Second impact syndrome** – Rapid swelling of the brain from additional head trauma; life threatening.
		1. **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.
		2. **Signs and Symptoms**
			1. No initial loss of consciousness
			2. Rapid worsening leading to:
				1. Loss of consciousness progressing to coma
				2. Dilated pupils
				3. Loss of eye movement
				4. Respiratory failure
		3. **Treatment** - Immediate transport to emergency care facility
		4. **Prevention:**
			1. DO NOT LET THE SITUATION OCCUR!
			2. Careful decision making regarding return to play following initial head trauma.
1. **Common Injuries to the Neck and Face**
	1. **Subdural Hematoma** – A collection of blood in the subdural space
		1. Tiny veins between the surface of the brain and the dura stretch and tear, allowing blood to collect. In older adults, the veins are often already stretched because of brain shrinkage (atrophy) and are more easily injured.
		2. **Mechanism of Injury**
			1. Most often the result of a severe head injury
				1. Bleeding fills the brain area very rapidly, compressing brain tissue.
				2. Often results in brain injury and may lead to death.
			2. Can also occur after a minor injury
				1. The amount of bleeding is smaller and occurs slower over time.
		3. **Signs and Symptoms** (depends on the size of the hematoma and where it presses on the brain)
			1. Confused or slurred speech
			2. Problems with balance or walking
			3. Headache
			4. Lack of energy or confusion
			5. Seizures
			6. Loss of consciousness
			7. Nausea or vomiting
			8. Weakness or numbness
			9. Vision problems
		4. **Treatment**
			1. This is an EMERGENCY!!!
			2. Emergency surgery may be necessary to reduce pressure within the brain. It may involve drilling a small hole in the skull to drain any blood and relieve pressure on the brain. Large hematomas or solid blood clots may need to be removed through a procedure called a craniotomy.
	2. **Epidural Hematoma** – Bleeding between the inside of the skull and the outer covering of the brain (called the dura).
		1. **Mechanism of Injury**
			1. Often caused by a skull fracture (motorcycle or automobile accidents)
			2. More common in young people because the membrane covering the brain is not as closely attached to the skull as it is in older people and children under 2 years.
			3. Can occur due to rupture of a blood vessel, usually an artery. The blood vessel then bleeds into the space between the dura and the skull.
		2. **Signs and Symptoms**: Symptoms can occur within minutes or take hours after a head injury. The symptoms of pressure on the brain do not occur right away.
			1. Confusion
			2. Dizziness
			3. Drowsiness or altered level of alertness
			4. Enlarged pupil in one eye
			5. Headache (severe)
			6. Head injury or trauma followed by loss of consciousness, a period of alertness, then rapid deterioration back to unconsciousness
			7. Nausea or vomiting
			8. Weakness in part of the body, usually on the opposite side from the side with the enlarged pupil
		3. **Treatment**
			1. This is a medical emergency, requiring prompt surgical intervention. Even with prompt medical attention, a significant risk of death and disability remains.
	3. **Spinal Column disorders**
		1. **Kyphosis** – Increased curvature of the thoracic spine. Commonly develops in athletes who wrestle or people with bad posture.
			1. Signs and Symptoms:
				1. Forward head
				2. Rounded shoulders
		2. **Lordosis** – Increased curvature of the lumbar spine. Commonly develops in gymnasts, cheerleaders and football linemen.
			1. Signs and Symptoms:
				1. Chest out
				2. Sway back
		3. **Scoliosis** – lateral curvature of the spine, usually in the thoracic vertebrae. Scoliosis can cause problems to internal organs and needs surgery to correct condition.
	4. Other injuries to the face and neck

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| Common Injuries to the Head and Neck |
| Injury | Mechanism of Injury | Signs and Symptoms | Treatment | Prevention Strategies |
| **Cervical Spine Fracture** | Axial loading and/or forceful rotation of the neck. | Pain over bony prominences, possible numbness or tingling in upper extremity. | Spinal immobilization including C-collar; refer to physician | Strengthening of neck musculature. Correct technique of sport skills. |
| **Brachial Plexus Injury (Stinger)** | Shoulder depression with head forced to opposite side. | Numbness and loss of function of entire arm. | Hold from participation until symptoms subside. | Strengthening of neck musculature. |
| **Epistaxis (Nose Bleed)** | Trauma to the noseDry 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 |

**Standard 3: Describe the basic principles and specialized equipment used in the prevention of athletic injury.**

1. The best method of managing and caring for athletic injuries is to prevent them from occurring.
	1. Many factors are important in the prevention of athletic injuries.
2. Proper fit and selection.
3. Design
	* + 1. To prevent injury
			2. To protect injured parts from further injury.
4. Practicality dictates that protective equipment should be:
	1. Simple to fit and maintain.
	2. Be durable and reliable.
	3. Not be extremely expensive.
	4. Minimal functional interference
5. Protective equipment can be abused
	1. By players who use the equipment as a weapon against their opponent,
	2. By players who take dangerous risks and rely on the equipment to protect them.
6. Modifications and improvements in sports equipment are continually being made, especially for sports in which injury is common.
7. Hazards demonstrated in each individual sport dictate the need for specific types of protection.
	1. In collision contact sports, exposed and vulnerable areas must be protected from impact with the surface or other players.
	2. Vital areas such as the head, neck, kidneys and genitalia must have priority for protection.
	3. Padding must also protect primary contact points
		1. Shoulders, elbows, forearms, hips, thigh, knee, shin
	4. High velocity hazards are seen in sports that use a type of projectile such as balls or pucks.
		1. Examples: Baseball, lacrosse, hockey, racquet sports
	5. Dental protection such as mouth guards prevent dental injuries and may help to decrease impact causing concussions.
8. Recognize types and functions of protective equipment.
	1. Helmets –

Are mandated in sports such as football, ice hockey, lacrosse, boxing, baseball, cycling, and automobile and motorcycle racing, etc.

Spread high-velocity impacts over a large surface area through a firm exterior shell and decelerate forces that act on the head through an energy-absorbing liner.

Ear-flaps provide additional protection to the ears and lower portions of the skull.

Wearing an improperly fitted helmet increases the opportunity for head injuries.

Fit should be monitored often as it can be altered by:

Temperature

Hair length

Deterioration of internal padding

Loss of air (Air bladder helmet)

Nothing can eliminate the possibility of a head injury; however, helmets do significantly lessen their severity.

* + - * 1. Face Masks –

Are used in a variety of sports to protect against flying or carried objects during a collision with another player.

In several sports, the addition of a face mask to a helmet is now more widely used.

A large variety of face masks styles are available, depending on the position played and the protection needed.

* + - * 1. Eye protection –

Is essential in those sports that are fast-moving and use projectiles or implements.

Glasses pose considerable danger during competition. Glasses may:

Bend or break

Slip on sweat

Fog from perspiration

Detract from peripheral vision

Be difficult to wear with protective headgear.

The following items can protect the eyes of an athlete:

Glass guards

Case-hardened or plastic lenses

* + - * 1. Ear guards –

Are essential in the following sport to help limit the amount of rubbing and friction that causes injury

Boxing, wrestling, rugby, water polo

 Irritation of the ears can occur to the point that permanent deformity can ensue. Some of these injuries may include:

Cauliflower-ear

Lacerations

Ruptured eardrum

 To avoid these problems, special ear guards should be routinely worn.

* + - * 1. Mouth guards –

Correctly fitted intra-oral mouth guard prevents the majority of dental trauma.

Fit should be:

Tight fit

Be comfortable

Unrestricted breathing

Should not impede speech during competition.

Fit is best when retained on the upper jaw and projects backward only as far as the last molar.

Composed of a flexible, resilient material.

 In addition to protecting the teeth, the intra-oral mouth guard absorbs shock and helps to prevent concussions.

* + - * 1. Neck Collars –

Used by players in collision contact sports to reduce extreme backward or lateral bending.

Also known as a:

Neck roll

Cowboy collar

Butterfly restrictor

Made from a variety of different materials (foam or plastic)

Generally fastened about the athletes shoulder pad around the rear and sides of a player’s neck.

Serves as a stop-gap between the player’s head and shoulders to prevent lateral bending as well as extension and may give some protection against axial compression.

* + - * 1. Padding –

Shoulder Pads –Protect against forceful contact with opponents and other hard surfaces.

Impact force is spread over a large surface area of the exterior shell and then distributed into an energy-absorbing design composed of a plastic hull having resilient padding attached to the inside.

This Convex-shape and cantilever design offers protection to the wearer’s shoulders and upper chest and back.

Offers no protection to the athlete’s ribs or sides between the arms and the waist.

Other types of pads –

Athletes who are exposed to repeated thoracic contusion or with prior rib cage injury benefit from rib and back pads.

Pads are also used in other regions of the body

 Hips, tailbone (sacral/coccyx), thighs, knees

These pads are often needed in collision and high-velocity sports.

Padding must be varied in structure, weight, and application according to the sport and size of the athlete for which it is used.

* + - * 1. Sports Bras –

Designed to provide support to women’s breasts and minimize movement while exercising or playing sports.

Motion is difficult to reduce without a sports bra because the ligaments in the breasts do not contain strong structural support.

Females, who play sports or exercise and do not wear a sports bra, put themselves at risk of causing irreversible damage to ligaments in the breasts.

* + - * 1. Compression shorts / Cup –

Athletic Supporter (Jock strap) –Consists of an elastic waistband and leg straps which connect to a pouch designed to support the male genitals as well as keep a protective cup in place.

It was believed that athletic supporters helped to protect from inguinal hernias. When a portion of the intestines descends through the canal that contains the spermatic cord. However athletic supporters have been shown to offer no protection against this relatively common injury.

Some athletes have moved away from the traditional athletic supporter into a more complete and supportive compression short or girdle.

These devises allow for more support to the entire groin and hip joint as well as provide pockets for protective cup and pads.

Cup –

Sports involving high-velocity projectiles require that athletes wear a proactive cup, usually made of a hard plastic with perforations for ventilation.

A more flexible, soft cup is also offered for low contact sports or female athletes.

* 1. Discuss the legal ramifications of manufacturing, buying, and issuing equipment.

As in other aspects of sports participation, there is increasing litigation related to legal ramifications of manufacturing, buying, and issuing equipment. Manufacturers and purchasers of sports equipment must foresee all possible uses and misuses of the equipment and must warn the user of any potential risks inherent in the use or misuse of that equipment.

* + - * 1. To decrease the possibilities of sports injuries and litigation stemming from the equipment:

Buy protective equipment from reputable manufacturers.

Buy the safest equipment resources permit.

Ensure that all equipment is assembled correctly – follow the manufacturer’s instructions to the letter.

Maintain all equipment properly – follow the manufacturer’s guidelines.

Use equipment only for the purpose for which it was designed.

Warn athletes who use the equipment about all possible risks that using the equipment could entail.

Use great caution in the customizing of any piece of equipment.

Use no defective equipment.

* + - * 1. NOCSAE warning –

A major influence on standardization of productive equipment in the United States has been the National Operating Committee on Standards for Athletic Equipment (NOCSAE).

To be NOCSAE approved, protective equipment must be able to tolerate forces applied to many different areas of it.

Example: Football helmets must withstand repeated blows and high-mass- low-velocity impacts.

All helmets must have a NOCSAE certification.

Even though a helmet is certified does not mean that it is completely fail-safe.

The following warning is placed on all football helmets:

 “Do not use this helmet to butt, ram or spear an opposing player. This is a violation of football rules, and can result in severe head, brain, neck injury, paralysis, or death to you and possible injury to your opponent. There is a risk these injuries may also occur as a result of accidental contact without intention to butt, ram, or spear. No helmet can prevent all such injuries.”

* + - * 1. Modification of equipment –

Modifications and improvements in sports equipment are continually being made by manufactures to insure the safety of the athlete.

Alteration of sports equipment by an athlete or someone other than the manufacture could result in the loss of the manufacturer’s warranty of that product.

Any modification of equipment will void any legal liability the manufacturer would have as a result of failure of the product.

Example: If one were to drill a hole in a piece of plastic material and the material later failed, the manufacturer would have every right to suggest that the drilling altered the structure of the material and caused the failure.

Liability resulting from the improper care or modification of manufactured products is separate from manufacturer’s liability.

Only equipment that is unaltered and regularly inspected and reconditioned can be considered within the scope of the manufacturer’s responsibility.

* + - * 1. Proper fit and selection –

Correctly fitting equipment is of the utmost importance for injury prevention and protection.

Standards of correct fit are set and should be adhered to.

To fit athletic equipment correctly, the following factors should be considered:

Size (of Athlete and Equipment)

Sport and Position

Strength(of Athlete and Equipment)

Age and Physical Development.

* + - * 1. Use of defective or worn out equipment –

Routine inspection of protective equipment and their parts is very important to the safety of the athlete.

Observe for:

Parts that can wear down

Cracked or broken

Missing parts or pieces

Frayed, torn or faded

Daily, weekly and seasonal inspections as well as repairs, refurbishing and replacement of protective equipment is important and could prevent an injury.

**Standard 4: Vocabulary**

1. Amnesia: Lack or loss of memory, usually due to head injury, shock, fatigue or illness.
2. Articulation: The site at which two bones meet to form a joint.
3. Innervate: To supply with nerves.
4. Mechanism of Injury (MOI): The circumstance in which an injury occurs.
5. Point Tenderness: Pain at the sorest spot of an injury.
6. Range of Motion (ROM): Movement of a joint around a central point
	1. Active ROM (AROM): Athlete moves joint
	2. Passive ROM (PROM): Athlete relaxes and examiner moves joint
	3. Resistive ROM (RROM): Athlete pushes against resistance
7. Referred Pain: Pain away from the site of injury.

**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.
	1. **Bones**
		1. **Clavicle**
		2. **Scapula**
			1. Spine of the scapula
			2. Acromion process
			3. Glenoid fossa/cavity
		3. **Humerus** – epicondyles
		4. **Ulna**
		5. **Radius**
		6. **Carpals**
		7. **Metacarpals**
		8. **Phalanges**
	2. **Joints**
		1. **Shoulder**
			1. Acromioclavicular
			2. Glenohumeral
		2. **Elbow**
		3. **Wrist**
		4. **Metacarpal Phalengeal (MCP)**
		5. **Interphalengeal (PIP & DIP)**
	3. **Soft Tissues:**
		1. **Subacromial Bursa** - Bursa sac located below the acromion process of the scapula and superior to the head of the humerus.
		2. **Acromioclavicular (AC) Ligament -**Attaches the acromion process of the scapula to the clavicle. It consists of anterior, posterior, superior and inferior portions.
		3. **Glenoid Labrum**
			1. Fibrocartilanenous rim around the glenoid fossa of the scapula.
			2. This ring of cartilage helps to deepen the socket of the shoulder.
	4. Muscles - see chart below

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| Muscle | Location | Function |
| **Deltoid** | Covers the shoulder | Abducts the arm |
| **Supraspinatus (rotator cuff muscle)** | Posterior scapula | Abducts the arm, some external rotation of shoulder; stabilizes the head of the humerus. |
| **Infraspinatus (rotator cuff muscle)** | Posterior scapula | Externally rotates the shoulder; stabilizes the head of the humerus. |
| **Teres minor (rotator cuff muscle)** | Posterior scapula | Externally rotates the shoulder; stabilizes the head of the humerus. |
| **Subscapularis (rotator cuff muscle)** | Anterior scapula | Internally rotates the shoulder; stabilizes the head of the humerus. |

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| **Biceps Brachii** | Anterior aspect of the upper arm | Flexes the elbow |
| **Triceps Brachii** | Posterior aspect of the upper arm | Extends the elbow |

1. Common Injuries to the upper extremity include, but not limited to:

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| Common Injuries to the Upper Extremity |
| Injury | Mechanism of Injury | Signs and Symptoms | Treatment | Prevention Strategies |
| **Clavicle Fracture** | 1. Fall on outstretched arm.2. Fall on tip of shoulder.3. Direct impact | Pain, deformity, swelling. | Immobilize shoulder. Refer to physician.  | Don’t fall. |
| **Shoulder Impingement Syndrome** | Mechanical compression of the supraspinatus tendon, subacromial bursa, and long head of biceps tendon. | Pain around acromion with overhead arm position. Weak external rotators. Positive empty can and impingement tests. | Restore normal biomechanics. Strengthen shoulder complex muscles, stretch posterior joint capsule, modify activity until asymptomatic. | Decrease overhead activity,shoulder complex strengthening, improve technique |

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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. |

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| **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 padsStrengthening 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. |
| **Interphalengeal 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.
	1. **Bones**
		1. **Femur**
		2. **Patella**
		3. **Tibia**
			1. Tibial Tuberosity
			2. Medial malleolus
		4. **Fibula** -Lateral malleolus
		5. **Tarsals**
			1. Calcaneus
			2. Talus
			3. Metatarsals
			4. Phalanges
	2. **Joints**
		1. **Tibialfemoral** - Allows knee flexion/extension
		2. **Patellofemoral**
		3. **Tibiotalar** (ankle joint; can also be called talocrural) - Allows ankle plantar/dorsiflexion
		4. **Subtalar** (joint between talus and calcaneus) - Allows inversion/eversion
		5. **Midfoot** (joints where tarsals meet metatarsals)
		6. **Metatarsal Phalengeal (MP)-** Allows toe flexion/extension
		7. **Interphalengeal (PIP & DIP)** - Allows flexion/extension of toe segments
	3. **Soft Tissues**
		1. **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.
		2. **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.
		3. **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
	4. Muscles

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| Muscle | Location | Function |
| **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 |

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| **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 |

1. Common Injuries to the lower extremity:

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| Common Injuries to the Upper Extremity |
| Injury | Mechanism of Injury | Signs and Symptoms | Treatment | Prevention Strategies |
| **Thigh Contusion** | Severe impact to the thigh musculature | Pain, loss of function, swelling, decreased ROM | Ice, compression with knee flexed. MUST be managed appropriately to avoid complications. | Protective equipment |
| **Muscle strains****(Quads/hamstrings)** | Sudden stretch or sudden contraction | Pain, spasm, loss of function, swelling, possible deformity. | RICE, flexibility and strengthening exercises. | Proper warm-up, stretching and strengthening. |
| **Medial Collateral ligament sprain (knee)** | Valgus force or tibial external rotation | Pain medial knee, mild swelling, joint stiffness, possible joint instability. | RICE, ROM and strengthening exercises, restrict activity until asymptomatic. | Lower extremity strengthening and conditioning. |
| **Lateral Collateral ligament sprain (knee)** | Varus force or tibial internal rotation. | Pain lateral knee, mild swelling, possible joint laxity. | RICE, ROM and strengthening exercises, restrict activity until asymptomatic. | Lower extremity strengthening and conditioning. |

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| **Anterior Cruciate ligament sprain** | *Noncontact:*- deceleration- foot planted- rotation- valgus stress*Contact:*hyperextension w/foot planted | Hears or feels a “pop”, rapid swelling, joint instability. | RICE, restore ROM and strength, surgery required to reconstruct the ligament. | Lower extremity strengthening and conditioning. |
| **Posterior Cruciate ligament sprain** | -Falling on bent knee- direct force to front of knee- rotational forces | Hears or feels a “pop”, minimal swelling, posterior tibial sag. | RICE, restore ROM and strength. Surgery is controversial. | Lower extremity strengthening and conditioning. |

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| **Meniscus tear**  | Weight bearing with rotational force. | Swelling, joint line pain, loss of motion, locking or giving way. | RICE*Avascular area:*Surgically trimmed and smoothed.*Vascular area:*Surgically repaired. | Lower extremity strengthening and conditioning. |
| **Patellar subluxation or dislocation** | Combination of foot planted, deceleration, and change of direction. | Obvious deformity, pain, swelling, limited ROM. | RICE and immobilization initially, then ROM and strengthening exercises. McConnell taping or bracing. | Lower extremity strengthening and conditioning.  |
| **Patellar tendinitis****“Jumper’s knee”** | Repetitive deceleration | Vague pain and tenderness of patellar tendon that worsens with running/jumping activities. | Rest, ice, NSAID medications, patellar strap, friction massage, and lower extremity strengthening. | Progressive increase in frequency/intensity of training. Lower extremity strengthening and conditioning. |

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| **Patellofemoral syndrome (abnormal tracking of patella in femoral groove)** | -tight hamstring and calf muscles- increased Q-angle-weak quadriceps muscles-poor foot mechanics | Tenderness of one or more patellar edge, dull ache, crepitus, pain with compression, positive Apprehension test. | NSAIDs, quadriceps strengthening, sleeve with buttress and/or McConnell taping, orthotic foot insert. | Lower extremity strengthening and conditioning. |
| **Medial tibial stress syndrome****“shin splints”** | Repetitive running activities. | Diffuse pain in distal medial tibia, increasing with activity.  | Correct faulty foot mechanics with footwear, or orthotic foot insert, calf stretching | Appropriate footwear for activity, lower leg flexibility and strengthening, orthotic foot inserts. |

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| **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. |