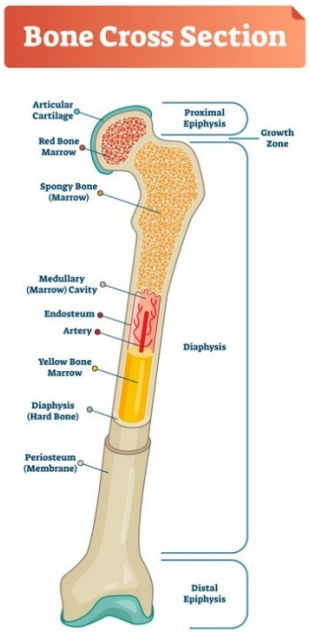
NR 283- Edapt

Mobility

Introduction to Mobility

- Walking, riding a bicycle, and waving to a friend are common activities for many. What do these things have in common? Each uses the powers of the musculoskeletal system to form purposeful movement.
- Physical mobility, or movement, is the body's ability to move freely and easily. The muscular, skeletal, and nervous systems work together to control body movements. Diseases, injuries, or impairments to any of these systems can adversely affect mobility, health, and overall well-being.
- Actual movement and its interaction with the environment can cause pathology through injury and increased stress to the musculoskeletal system. It is important to understand what types of injuries occur and how the body returns to homeostasis through inflammatory and healing processes.

Bone Growth



The epiphysis contains the growth plate, which is active during childhood and adolescence, and is responsible for bone growth. Injuries or fractures to this plate can cause reduced bone growth and maturation, and extremity length changes.

Joints

- **Synarthroses,** represented by the sutures in the skull, are immovable joints.

- **Amphiarthroses,** slightly movable joints, are joints in which the bones are connected by fibrocartilage or hyaline cartilage. Examples of this type of joint include the junction of the ribs and sternum and the symphysis pubis.
- **Diarthroses or synovial joints** are freely movable joints and are the most common type of joint in the body.

Bone Functions

- Bones provide support for the body and protection, adding stability by acting as a frame for the organs and soft tissue. Bones also produce red and white cells primarily in the middle (bone marrow) of long bones.
- Bones do not contract and expand. Muscles contract and expand to move bone. Bones do not stabilize joints. Muscles, tendons, and ligaments help to stabilize joints.

Skeletal Function

- Mobility has significant effects on bone. Stress, weight, and movement all contribute to building new bone (osteoblastic activity) and breaking down old bone (osteoclastic activity). This continuous cycle is called remodeling. Remodeling is how bones adapt and strengthen.
- Changes in the speed and quality of how remodeling occurs can lead to abnormal bone conditions. One example is osteoporosis, a condition in which the bone thins and becomes brittle, leading to fractures (breaks).
- Mobility or isometric exercises are used to stimulate more remodeling and can reduce or prevent these abnormal bone changes. Mobility with added weight and stress can strengthen bone and reduce the risk of fractures in anyone who experiences an imbalance in osteoblastic and osteoclastic activity.

Bone Activity

Increases in osteoclastic activity (bone breakdown) and decreased osteoblastic activity (bone rebuilding) will most likely decrease bone thickness and strength.

Muscle

- Skeletal muscle contraction and tone drive mobility, posture, joint stabilization, and body heat. When small amounts of stress are placed on muscle, it adapts by growing in size (strength training). When too much stress is added to muscle, it can tear or rupture, causing loss of function. Cardiac muscle and smooth muscle also contribute to other physiologic functions, including the movement of blood and the opening or closing of various ducts and openings.

- To function properly, muscles need oxygen and electrolytes. Lack of either of these things can cause muscle weakness, continual contractions, tremors, or other abnormal signs. For example, reduced calcium levels can lead to symptoms of muscle cramps and spasms. Therefore, electrolyte replacement can be important in certain situations.

Ligaments and Tendons

- Ligaments attach bone to bone and tendons attach bone to muscle. Joints are complex structures of ligaments, tendons, and muscles that allow for an increased range of movement at the ends of various bones.
- Injury to ligaments or tendons can cause reduced movement or complete loss of function, pain, and deformity. Tears and ruptures occur when there is significant stress on the structure. Commonly, repetitive motions (like someone may perform in the workplace) lead to increased pain or increased tendon or ligament weakness. This is considered an occupational injury and may require further testing or treatment to determine if physical therapy or surgery is needed.
- Because of the reduced blood supply available for ligaments and tendons, they heal much slower than other organs.
- Tendons or ligaments can tear, rupture, and experience an inflammatory response.
- Fractures and bone marrow suppression occur in bones.

Joints and Injury

- Joints are complex structures that allow for increased movement. There are several different types of joints classified based on their ability to move and other functions they may have. Some joints move in two or more directions (synovial joints), while others may move much less (synarthrotic joints).
- Damage can occur in joints due to repetitive motion, over flexion or extension of the joint, direct impact, infection, or excessive immune response. When an injury occurs to the joint, mobility is restricted, an inflammatory response is activated, and pain and/or swelling occur.

There are many different types of treatment, including steroids, restricted movement (splinting or casting), thermotherapy (ice or heat applied directly), or physical therapy. Joint replacement surgery may be indicated in severe cases.

Risks of Mobility

- Mobility is extremely healthy. So, it seems surprising that with increased mobility, there are risks of pathophysiologic conditions. View this presentation for information on things that put a client at higher risk for injuries during mobility.

Osteoporosis or Osteopenia

- Weakened or thinning bone, which can be caused by genetic predisposition, endocrine imbalances, or electrolyte abnormalities and can lead to fractures.

Reduced Oxygen Levels

- Muscles switch to lactic acid when oxygen is not available. Reduced oxygen, either caused by localized trauma or respiratory problems, can increase muscle pain and reduce muscle strength.

Neurological Conditions

- The inability of nerves to stimulate muscle contractions can lead to muscle that is not used enough to maintain its strength or bulk. This can lead to shrinking muscles that lose their elasticity and bulk (atrophy).

Environmental Factors

- Weather conditions and rough terrain can lead to an increased risk of bone fracture, muscle tear, or ligament and tendon injury.

Improper Safety Precautions

- Avoiding the use of pads or braces during sports or other activities can lead to bone, muscle, or nerve in

Mobility Injury

- An elderly female with osteoporosis may be a fall risk without an assistive device. An adolescent playing volleyball without joint protection is at a higher risk of joint injury. A young adult jogging up a steep mountain is at higher risk for ligament or tendon injury.
- Long distance driving does not cause a mobility risk. Walking in a safe environment is not a higher risk for injury.

Mobility-Related Injuries

Injuries associated with increased mobility include:

- Fractures: A break in the bone.
- Ligament sprains: Tears or ruptures of the ligament leading to reduced strength and/or stability between bones.

- Tendon strains: Tears or ruptures of the tendons can lead to a reduced ability for muscle movement or contraction.
- Muscle atrophy: Prolonged immobility of the muscle causes it to shrink and cause deformity.

Sprains, Strains, and Fractures

- When a mobility-related injury occurs, the body's inflammatory response is immediately activated. With all sprains, strains, and fractures, the symptoms are very similar. Redness (erythema), swelling (edema), and pain are the hallmark symptoms of a mobility injury. Other clues may identify one over the other. For example, a deformity can indicate a fracture. Inability to flex or extend a specific muscle can suggest a complete tendon tear. Common with more severe mobility injuries is damage to ligaments, muscles, and bones.
- To better understand the injury, radiographs (x-rays) can show bone fractures. Magnetic resonance imaging (MRI) is needed to see tendon or ligament injuries.
- The immediate treatment for any inflammatory response, especially a sprain, can be remembered with the pneumonic **RICE**: **r**est, **i**ce, **c**ompression, and **e**levation.

Mobility

- Ligaments and tendons have little blood supply and they are difficult and slow to heal.
- The danger of the sport has no impact on healing time. Bone loss and immune response decrease in the fifth to sixth decade of life. Mike is not elderly, therefore, he will not take as long to recover. Hormones are usually balanced thanks to homeostasis.

Working Together

- Bones, muscles, and joints play a pivotal role in mobility. All three work in tandem to provide strength, stability, and coordination. Diseases and disabilities also play a role in altering mobility.
- In addition, as the body ages, there is a decrease in muscle tone and bone strength. Physical therapy, assistive devices, appropriate exercises, and/or stretching are used to either maintain or improve mobility.

Fracture

Introduction to Fractures