Chapter 33

Nontraumatic Musculoskeletal Disorders

Learning Objectives

• Outline musculoskeletal structure and function.
• Describe how to perform a detailed assessment of the extremities and spine.
• Specify questions in the patient history that help identify musculoskeletal problems.
• Describe assessment and management of specific nontraumatic musculoskeletal disorders based on an understanding of the pathophysiology.
Anatomy and Physiology Review

• Musculoskeletal system
  – Bones
  – Muscles
  – Tendons and ligaments
  – Articulating surfaces
    • Joints
    • Bursa
    • Discs

Skeletal System

• Contains bony structures that provide support and protection for body
• Provides system of levers on which muscles act to produce body movement

Skeletal System

• Contains 206 individual bones, divided into two categories
  – Axial skeleton
    • Skull
    • Hyoid bone
    • Vertebral column
    • Thoracic cage
  – Appendicular skeleton
    • Bones of upper and lower extremities
    • Girdles, by which attached to body
Skeletal System

- Body movement made possible by bones connected to other bones
  - With exception of hyoid bone, every bone in body connects to at least one other bone by way of joints
  - Three major classes of joints
    - Fibrous
    - Cartilaginous
    - Synovial

Skeletal System

- Fibrous joints
  - Two bones united by fibrous tissue that have little or no movement
  - Example: suture in skull bones
- Cartilaginous joints
  - Unite two bones by means of hyaline cartilage and fibrocartilage
  - Slightly movable
  - Examples: epiphyseal plate of a growing bone, junctions of intervertebral discs
Skeletal System

- Synovial joints
  - Contain synovial fluid that allows for considerable movement
  - Most joints that unite bones of appendicular skeleton
  - Example: hinge joint of elbow and knee, ball-and-socket joints of shoulder and hip

Muscular System

- Responsible for execution of movement and postural maintenance
- Major types of muscles
  - Skeletal
  - Cardiac
  - Smooth muscle
Muscular System

• Skeletal muscle
  – Most common
  – Most involved in musculoskeletal disorders
  – Attached to bones by tendons
  – Ligaments connect bone or cartilage, helps strengthen and support joints

• Muscle tone
  – Postural maintenance is result of muscle tone
  – Constant tension produced by muscles of body for long periods of time
  – Responsible for keeping back and legs straight, head in upright position, abdomen from bulging
  – Postural maintenance balances distribution of body weight
    • Puts less strain on muscles, tendons, ligaments, bones
General Assessment Strategies

- General assessment of patient’s musculoskeletal system includes examination of
  - Extremities
  - Spine
  - Vascular system
  - Motor system

General Assessment Strategies

- Purpose of assessment
  - Pain or tenderness
  - Swelling
  - Abnormal or loss of movement
  - Decreased sensation
  - Circulatory changes
  - Deformity

Extremity Exam

- Examine for function and structure
  - General appearance
  - Body proportions
  - Ease of movement
  - Limitation in range of motion
  - Unusual increase in mobility of joint
Extremity Exam

• Abnormal findings
  – Signs of inflammation
    • Swelling
    • Tenderness
    • Increased heat
    • Redness
    • Decreased function
  – Asymmetry
  – Crepitus
  – Deformities
  – Decreased muscular strength
  – Atrophy

Extremity Exam

• Assessment should include
  – Evaluation of skin and tissue overlying muscles, cartilage, bones
  – Joints for soft tissue injury, discoloration, swelling
  – Reasonably symmetrical in structure and muscularity

Extremity Exam

• Circulatory status of each extremity
  – Skin color
  – Temperature
  – Sensation
  – Presence of distal pulses
Extremity Exam

• Joints
  – Full range of motion
  – All movement should be made without
    • Pain
    • Deformity
    • Limitation
    • Instability

Extremity Exam

• Hands and wrists
  – Inspect for contour and positional alignment
  – Hands, wrists, and joints of each finger for
    • Tenderness
    • Swelling
    • Deformity

• Elbows
  – Assess and palpate in flexed and extended positions
  – All movement should be made without pain or discomfort

Extremity Exam

• Shoulders
  – Both shoulders should be symmetrical and palpated for integrity of
    • Clavicles
    • Scapulae
    • Humeri
  – Should be able to shrug shoulders, raise and extend both arms without pain or discomfort
Extremity Exam

• Pelvis and hips
  – Structural integrity of patient’s iliac crest and symphysis pubis to determine stability
  – Should be no deformity or point tenderness during palpation

• Knees
  – Inspect and palpate for swelling and tenderness
  – Patella should be nontender and in midline position
  – Patient should be able to bend and straighten each knee without pain

Extremity Exam

• Ankles and feet
  – Inspect for contour, position, size
  – Abnormal findings: tenderness, swelling, deformity
    • Toes should be straight and aligned with each other
    • Surface of ankles and feet should be free of deformities, nodules, swelling, calluses

Spine Exam

• Visual assessment of cervical, thoracic, lumbar curves
• Abnormal findings
  – Curvature of spine from abnormal lordosis, kyphosis, scoliosis
  – Differences in height of shoulders or iliac crest that might result from abnormal spinal curvature
Spine Exam

• Neck
  – In midline position
  – Posterior neck should be free of point tenderness and swelling
  – Patient should be able to bend head forward, backward, from side to side without pain or discomfort

Spine Exam

• Thoracic lumbar spine
  – Inspect for signs of
    • Injury
    • Swelling
    • Discoloration
  – In normal exam, spine is nontender to palpation

Vascular Exam

• Peripheral vascular system
  – Components
    • Arteries
    • Veins
    • Lymphatic system
    • Fluids exchanged in capillary beds
  – Should be part of general assessment strategy
  – Upper and lower extremities assessed for color, texture, arterial insufficiency
  – Lymph nodes should be nonswollen and nontender
Vascular Exam

• Abnormal findings
  – Pale or cyanotic skin
  – Weak or diminished pulses
  – Skin that is cold to the touch
  – Absence of hair growth
  – Pitting edema

Motor Exam

• Observe patient while moving and at rest
  – Note
    • Abnormal or involuntary movements
    • Posture
    • Level of activity
    • Fatigue

Motor Exam

• Observe patient while moving and at rest
  – Muscle strength should be equal on both sides of body
  – Assess for agility
  – Test for
    • Flexion
    • Extension
    • Abduction of upper and lower extremities
Motor Exam

• Evaluate coordination for
  – Point-to-point movements
    • Touch finger to nose
    • Touch each heel to opposite shin

Motor Exam

• Evaluate coordination for
  – Gait
    • Walk toe to toe
    • Walk on toes
    • Walk on heels
  – Stance
    • Romberg test
    • Pronator Drift test

Motor Exam

• Should be responsive to
  – Sensations of pain
  – Temperature
  – Position
  – Vibration
  – Touch
Motor Exam

- Conducted by sensory pathways of nervous system
  - Sensory exams can be performed on conscious patients by using light touch on each hand and foot
  - Proceed from head to toe, symmetrical on both sides of body

General Management Strategies

- General management for musculoskeletal disorder are same as for most other patient-care encounters
  - Prehospital care guided by patient’s chief complaint and severity of patient’s condition

General Management Strategies

- General management strategies
  - Scene size-up to ensure personal safety
  - Primary survey to ensure airway, ventilation, circulation
  - Secondary assessment, reassessment
  - Pharmacological and nonpharmacological measures to ensure comfort
  - Transport considerations
  - Effective therapeutic communications
Patient History

• Focus on patient’s chief complaint, ask particular questions
  – Complaint: joint pain
    • Where is the specific site of the pain?
    • Does the pain change during the course of the day?
    • Have you had a recent injury?
    • How long has there been pain in the joint?
    • Does the pain get better or worse with movement?

Patient History

• Focus on patient’s chief complaint, ask particular questions
  – Complaint: back pain
    • Is the pain confined to the back, or does it radiate to the upper or lower limbs?
    • Is the pain made worse by coughing or sneezing?
    • Was the pain sudden or gradual in onset?

Patient History

• Focus on patient’s chief complaint, ask particular questions
  – Complaint: gait or balance Issues
    • Do you trip when walking?
    • Do you stagger to one particular side?
    • Do you ever injure yourself when walking?
Management Guidelines

- Prehospital care
  - Primarily supportive
  - Limited to immobilization of affected area or body part
  - Application of ice and/or elevation of extremity to reduce pain, swelling
  - Analgesics to relieve pain
  - Gentle transport

Osteomyelitis

- Acute or chronic bone infection
  - Affects 2 out of every 10,000 people
  - Can be caused by number of microbial agents, most commonly *staphylococcus aureus*
  - Can result from
    - Open fracture or minor wound infection
    - Systemic infection that allows bacteria to spread in bloodstream and enter bone

Osteomyelitis

- If left untreated
  - Can become chronic, resulting in
    - Decreased blood supply to bone
    - Eventual death of bone tissue
  - Affects both children and adults, can affect any bone
    - In adults, vertebra and pelvis most often affected
    - In children, long bones most affected
Osteomyelitis

• Those at increased risk
  – Recent orthopedic surgery
  – Elderly
  – IV drug abusers
  – Sickle cell disease
  – Hemodialysis
  – Compromised immune systems

Osteomyelitis

• Signs and symptoms
  – Pain and/or tenderness in infected area
  – Swelling and warmth in infected area
  – Fever, chills
  – General malaise
  – Drainage of pus through skin
  – Excessive sweating
  – Back or neck pain (if spine involved)
  – Swelling of ankles, feet, legs
  – Walking that is painful or with limp

Osteomyelitis

• Diagnostic tools
  – Blood tests to confirm infection
  – Blood cultures to identify bacteria
  – Needle aspiration
  – Biopsy
  – Bone scans
Osteomyelitis

- Treatment
  - Oral or IV antibiotics to manage infection, prevent reinfection
  - Surgical drainage of wound or abscess
  - Immobilization of affected bone or surrounding joints
  - Surgery to scrape infection from affected bone
  - Rarely, amputation of affected limb may be required

Bone Tumors

- Abnormal growth of cells within bone
  - Can be malignant (cancerous) or benign (noncancerous)
  - Most are benign and not life threatening
  - Common benign bone tumors
    - Nonossifying fibroma unicameral bone cyst
    - Osteochondroma
    - Giant cell tumor
    - Enchondroma
    - Fibrous dysplasia

Bone Tumors

- Malignant tumors
  - Can spread cancer cells throughout body (metastasize) via blood or lymphatic system
  - Primary tumor
    - In original site where it first arose
  - Secondary
    - Originates in another area of body and spreads to bone
Bone Tumors

- Malignant tumors
  - Four most common primary bone tumors
    - Multiple myeloma
    - Osteosarcoma
    - Ewing's sarcoma
    - Chondrosarcoma

Bone Tumors

- Multiple myeloma
  - Most common
  - Malignant tumor of bone marrow
  - Affects approximately 20 people per million each year
  - Most seen in patients between the ages of 50 and 70
  - Any bone can be involved
Bone Tumors

• Osteosarcoma
  – Second most common bone cancer
  – Occurs in 2 or 3 new people per million each year
  – Most occur in teenagers
  – Most tumors occur around knee
  – Other common locations include hip and shoulder

Bone Tumors

• Ewing's sarcoma
  – Most commonly occurs between 5 and 20 years of age
  – Most common locations
    • Upper and lower leg
    • Pelvis
    • Upper arm
    • Ribs

Bone Tumors

• Chondrosarcoma
  – Most common in patients between 40 and 70 years of age
  – Most cases occur around hip, pelvis, or shoulder
Bone Tumors

- Signs and symptoms
  - Most experience dull or aching pain in area of tumor
    - Sometimes made worse with physical activity
    - Often awakes patient at night
  - Other patients will not complain of pain, discovered painless mass on self examination

Bone Tumors

- Pathologic fractures not common in these patients
  - Fractures result from trauma or a metabolic disease, such as osteoporosis, where bone weakened by tumor breaks

Bone Tumors

- Benign tumors may or may not require treatment (depending on specific tumor)
  - Some benign tumors can be aggressive and quickly destroy bone
- Malignant tumors may require medication therapy or surgical removal
  - Others resolve on their own (especially some bone tumors in children)
  - Most malignant tumors are surgically removed and treated with radiation
Bone Tumors

• If the cancer has metastasized, other care may include additional
  – Radiation
  – Chemotherapy
  – Cryosurgery
  - Freezing and killing cancer cells with liquid nitrogen

• In some patients, bone implant or amputation of affected limb will be needed
• Patient follow-up with regular blood tests and x-ray required because bone cancer can recur
• People who have had bone cancer, particularly children and adolescents, have increased likelihood of developing another type of cancer, such as leukemia, later in life

Lower Back Pain

• Americans spend at least $50 billion each year on lower back pain
  – Most common cause of job-related disability
  – Leading contributor to missed work
  – Back pain is second most common neurological ailment in U.S.
Lower Back Pain

- Vertebral C column consists of
  - 26 bones divided into 5 regions
    - 7 cervical vertebrae
    - 12 thoracic vertebrae
    - 5 lumbar vertebrae
    - 1 sacral bone
    - 1 coccygeal bone

- Together, vertebrae protect
  - Spinal cord
  - Rootlets
  - 31 pairs of spinal nerves that convey sensation

- Weight-bearing portion of vertebrae is bony vertebral body
  - Intervertebral discs located between bodies of adjacent vertebrae
    - Serve as shock absorbers
    - Allow for flexibility of back
    - Prevent vertebral bodies from rubbing against each other
Lower Back Pain

• Acute back pain
  – Usually of short duration, lasting only few days to few weeks
  – Most caused by trauma to lower back
  – Can be caused by
    • Arthritis
    • Degenerative joint disease of spine
    • Viral infections
    • Congenital abnormalities

Lower Back Pain

• Chronic back pain
  – Persists more than 3 months
  – Can be progressive and debilitating
Intervertebral Disc Disorders

- Intervertebral discs
  - Found between bodies of vertebrae
  - Act as shock absorbers
  - Prevent bones of spine from grinding against each other
  - Allow for flexibility of back
  - Each disc has a central area composed of jelly-like substance, called nucleus pulposus
    - Surrounded by concentric rings of fibrous tissue (annulus fibrosis)
    - Undue stress on disc can force gel against inner ring and crack it

- From there, gel pushes outward, cracking successive rings in its path
- If stress on back is severe enough, vertebral discs and fibrous tissues can be damaged, causing disc to bulge or protrude
- If gel eventually breaks through outer ring, it can pinch nerve root leading from vertebra
  - Result in “slipped” or herniated disc
Intervertebral Disc Disorders

• Disc injury most often affects lumbar spine in patients 25 to 45 years of age
• Most common risk factor for developing lumbar disc disease is lack of exercise that allows muscles of back to weaken
• Symptoms of herniated disc vary greatly depending on position of herniated disc and size of herniation

Intervertebral Disc Disorders

• Common signs and symptoms of herniation
  – Lower back ache
  – Numbness or weakness in lower extremities
  – Deep muscle pain and muscle spasms
  – Acute or gradual leg pain (usually in only one leg)

Intervertebral Disc Disorders

• Common signs and symptoms of herniation
  – “Shooting” pain in leg when sneezing, coughing, or straining
    • May be aggravated by sitting, prolonged standing, bending, twisting
  – Nerve-related symptoms
    • Muscle weakness in one or both legs
    • Pain in front of thigh
    • Sciatica
Intervertebral Disc Disorders

• Goals of treatment for herniated disc
  – Relieve pain
  – Weakness
  – Numbness in leg caused by pressure on spinal nerve root or spinal cord

Intervertebral Disc Disorders

• Treatment
  – Bed rest
  – Analgesics
  – Anti-inflammatories
  – Muscle relaxants
  – Corticosteroids
  – Physical therapy and exercise programs can help strengthen back and prevent recurrent injury
  – Most heal without surgery to remove herniated disc (discectomy)

Cauda Equina Syndrome

• Rare disorder of lumbar spine that affects bundle of nerve roots at lower end of spinal cord
  – Surgical emergency that occurs when nerve roots are compressed and paralyzed, cutting off sensation and movement
  – If not treated, syndrome can result in
    • Permanent paralysis
    • Impaired bladder and bowel function
    • Loss of sexual sensation
  – Even with surgery, nerve damage may be irreversible
Cauda Equina Syndrome

- Can be caused by
  - Herniated disc
  - Spinal tumor
  - Infection
  - Spinal stenosis (narrowing of spinal canal)
  - Spinal trauma
    - Direct trauma
    - Falls
    - Gunshot wounds
    - Stabbings

- Signs and symptoms
  - Bladder and/or bowel dysfunction
    - Loss of control
    - Inability to urinate or defecate
  - Severe or progressive weakness in lower extremities
  - Loss of sensation or altered sensation between legs, over buttocks, inner thighs, and back of legs (saddle area), and feet and heels
  - Pain, numbness, or weakness that spreads to one or both legs that may cause stumbling gait or difficulty rising from sitting position

Lower Back Strains and Sprains

- Lower back carries much of body’s weight during walking, running, lifting, other activities
- Because muscles, ligaments, bones of spine provide control and strength for many movements, sprains and strains of the lower back (especially lumbar spine) are common injuries
Lower Back Strains and Sprains

- Often caused by
  - Twisting or pulling
  - Improper lifting that puts back at risk for injury
    • Estimated that 50 percent of all EMS personnel develop back pain every year
    • 1 in 4 will have career-ending back injury within first 4 years of service

Lower Back Strains and Sprains

- Strain
  - Injury to muscle or tendon
- Sprain
  - Stretching or tearing of ligament beyond its normal range of movement
- Differentiating sprain from strain is difficult and unnecessary in prehospital setting
  - Signs, symptoms, treatment, and prognosis for both conditions are same

Lower Back Strains and Sprains

- Signs and symptoms
  - Pain
  - Warmth
  - Muscle spasms
  - Swelling of affected area
Lower Back Strains and Sprains

- Treatment
  - Most are successfully treated with bed rest for 24 to 48 hours to allow back to heal
  - Analgesics
  - Muscle relaxants
  - Anti-inflammatories
  - Physical therapy and exercise programs can help to strengthen back muscles and prevent future injury
  - Back pain that does not resolve with these measures requires further evaluation

Joint Disorders

- Any disease or injury that affects human joints
  - May be short lived or chronic
  - Produce inflammation as result of disease
    - Various forms of arthritis

Arthritis

- Inflammatory condition of joint, characterized by pain and swelling
  - Limits activity of nearly 19 million adults
  - Is most common cause of disability in U.S.
  - Grouped into three general categories
    - Osteoarthritis
    - Rheumatoid arthritis
    - Gout
Osteoarthritis

• Chronic, degenerative joint disease, most often seen in people over 40 years of age
• Onset of disease is gradual and affects women more often than men
• Mechanical in nature, resulting from normal wear-and-tear on joints over course of person’s life

Osteoarthritis

• Marked by
  – Breakdown of cartilage that covers surfaces of joints
  – Formation of bone spurs (bony growths formed on normal bone)

Osteoarthritis

• Wearing away of cartilage and overgrowth of bone lead to pain and stiffness
  – As disease progresses, bone rubs against bone, causing severe pain and reduced mobility
  – Joints most commonly affected
    • Knees
    • Hips
    • Hands
    • Cervical and lumbar spine
Rheumatoid Arthritis

- Inflammatory disease of joints that causes
  - Pain
  - Swelling
  - Stiffness
  - Loss of function
- Estimated that about 1.3 million people in U.S. have disease

Rheumatoid Arthritis

- Occurs in all races and ethnic groups
- Symptoms usually become apparent in middle and later life
  - Can develop in young adults and children

Rheumatoid Arthritis

- Develops when lymphocytes travel to synovium in joints, causing inflammation (synovitis)
  - During process, normally thin synovium becomes thick and makes joint swollen and puffy to touch
  - As disease progresses, inflamed synovium invades and damages cartilage and bone of joint
  - Surrounding muscles, ligaments, tendons become weakened
Rheumatoid Arthritis

- Can cause more generalized bone loss that may lead to osteoporosis
- Generally occurs in symmetrical pattern (e.g., both hands, both knees)

Rheumatoid Arthritis

- Hallmark of disease
  - Visible swelling and inflammation of finger joints closest to affected hand
  - May also affect other areas of body
  - Often associated with
    - Fatigue
    - Occasional fever
    - General malaise
Rheumatoid Arthritis

- Patients have varying degrees of disease
  - Some have only limited bouts, followed by remission and little damage
  - Others disease is regularly active, lasting many years
    - Often leads to severe joint damage and disability

Rheumatoid Arthritis

- Physician care
  - Anti-inflammatory to reduce pain and inflammation
  - Disease-modifying antirheumatic drugs (DMARDs) to slow course of disease
  - Analgesics
  - Physical therapy
  - Joint replacement
  - Tendon reconstruction
  - Synovectomy

When caring for a patient with severe rheumatoid arthritis or ankylosing spondylitis, how might you have to modify your care if you suspect spine injury?
Septic Arthritis

• Also known as infectious arthritis
  – Results from direct invasion of joint space by various microorganisms
    • Bacteria (most common)
    • Viruses
    • Mycobacteria
    • Fungi
  – Affects about 20,000 people in U.S. each year
  – Can occur in both children and adults

Septic Arthritis

• Disease process begins when infectious agent (most commonly *Staphylococcus aureus*) enters joint
  – Usually occurs from active infection elsewhere in body
    • Respiratory tract infection
    • Urinary tract infection
  – Can occur from direct invasion (e.g., open wound near joint, joint surgery)

Septic Arthritis

• When bacterium reaches synovium in joint, immune system is activated and cartilage begins to be destroyed
  – Results in inflammation and reduced blood flow to joint and surrounding structures
  – Previously damaged joints, especially from rheumatoid arthritis, are most susceptible to infection
  – Most commonly involved joint is knee, followed by hip, shoulder, ankle, wrist
Septic Arthritis

• Signs and symptoms
  – Fever
  – Shaking chills
  – Severe pain
  – Warmth
  – Swelling in affected joint

Septic Arthritis

• Treatment
  – Antibiotics to resolve infection
  – In severe cases, joint may need surgical reconstruction or replacement

Gout

• Form of arthritis marked by deposit of uric acid crystals (monosodium urate) in and around joint
  – Affects mostly men
  – Thought to be hereditary
  – Affects about 2.7 of every 1,000 adults
• For unknown reasons, gout surfaces most often in metatarsophalangeal joint of big toe
  – May also present anywhere in lower or upper extremities
Gout

• In elderly, many joints may be affected
  – May also develop tophi (masses of urate crystals deposited in soft tissue)
  – Usually affects cooler areas of body such as elbows, ears, distal finger joints
  – Also associated with increased risk for developing kidney stones

Gout

• In acute gout, affected joint and surrounding tissues appear hot, red, swollen
  – Pain is usually intense and made worse by stimulation or light touch
  – May remit for long periods, followed by flares that last days to weeks
  – Chronic gout can lead to degenerative form of arthritis called gouty arthritis

Gout

• Risk factors
  – Joint injury
  – Obesity
  – Hypertension
  – Alcohol use
  – Diuretics that lead to hyperuricemia
  – Diets rich in meat and seafood
Gout

- Most treatable form of arthritis
  - Pain medicine
  - Anti-inflammatories
  - IM and oral corticosteroids
  - Acute episode usually subsides within 24 hours after treatment begins

Muscle Disorders

- Muscles purposes
  - Movement
  - Postural maintenance
  - Heat production
- Inflammation of skeletal muscle can result from
  - Injury
  - Infection
  - Autoimmune disease

Myalgia

- Means muscle pain or pain in multiple muscles
  - Many causes and various types
  - Can be acute and temporary, or can be chronic
- Most often results from
  - Overuse
  - Muscle injury
  - Stress
  - Virus
  - Infection
  - Autoimmune disorders
Myalgia

• Can be indication of serious illness
  – Inflammatory myopathies
  – Chronic fatigue syndrome

Inflammatory Myopathies

• Group of diseases that involve chronic muscle inflammation accompanied by muscle weakness
  – Causes
    • Injury
    • Infection
    • Autoimmune disease
    • Alcohol
    • Illicit drug use
    • Prescribed medications

Inflammatory Myopathies

• Three main types
  – Polymyositis
  – Dermatomyositis
  – Myositis
Inflammatory Myopathies

• General symptoms common to these disorders
  – Slow and progressive muscle weakness that begins in muscles closest to trunk of body
  – Fatigue after walking or standing
  – Frequent trips and falls
  – Difficulty swallowing or breathing

Inflammatory Myopathies

• Dermatomyositis
  – Characterized by skin rash that precedes or accompanies progressive muscle weakness
    • Rash looks patchy, with bluish-purple or red discolorations
    • Develops on eyelids and on muscles used to extend or straighten joints, including knuckles, elbows, heels, toes

Inflammatory Myopathies

• Dermatomyositis
  – Red rashes and swelling may also occur on face, neck, shoulders, upper chest, back, other locations
  – Rash sometimes occurs without obvious muscle involvement
  – May be associated with collagen-vascular or autoimmune diseases, such as lupus
Inflammatory Myopathies

• Polymyositis
  – Affects skeletal muscle on both sides of body
  – Rarely seen in persons under age 18
    • Most cases are in adults between ages of 31 and 60
    • Slow, progressive muscle weakness leads to difficulties climbing stairs, rising from sitting position, lifting objects, or reaching overhead

Inflammatory Myopathies

• Polymyositis
  – May also experience
    • Arthritis
    • Shortness of breath
    • Difficulty swallowing and speaking
    • Cardiac dysrhythmias

Inflammatory Myopathies

• Polymyositis
  – Muscles farther away from trunk of body may be affected as disease progresses
    • Forearms
    • Around ankles and wrists
  – May be associated with collagen-vascular or autoimmune diseases (e.g., lupus) and with infectious disorders, such as HIV-AIDS
Inflammatory Myopathies

- Myositis
  - Also known as inclusive body myositis (IBM)
  - Characterized by progressive muscle weakness and wasting
  - Often begins with weakness in wrists and fingers that causes difficulty with pinching, buttoning, gripping objects

Inflammatory Myopathies

- Myositis
  - May be weakness of wrist and finger muscles and atrophy of muscles in forearms and legs
  - Difficulty swallowing occurs in about half of patients
  - Symptoms usually begin after age 50, although disease can occur much earlier

Inflammatory Myopathy Management

- No cure for inflammatory myopathies
  - Options for dermatomyositis and polymyositis
    - Medication to reduce inflammation
    - Physical therapy
    - Exercise
    - Heat therapy
    - Orthotics
    - Assistive devices
    - Rest
Inflammatory Myopathy Management

- No cure for inflammatory myopathies
  - Standard treatment
    - Oral or IV corticosteroid drugs and immunosuppressant drugs
    - Periodic treatment using IV immunoglobulin may also improve recovery

Inflammatory Myopathy Management

- No standard course of treatment for myositis
  - Generally unresponsive to corticosteroids and immunosuppressive drugs
  - Physical therapy may be helpful in maintaining mobility
  - Other therapy is symptomatic and supportive

Chronic Fatigue Syndrome

- Debilitating and complex disorder
  - Characterized by profound fatigue not improved by bed rest
    - May be worsened by physical or mental activity
  - Affects between 1 and 4 million Americans
    - 25 percent of whom are unemployed or on disability because of illness
Chronic Fatigue Syndrome

• Debilitating and complex disorder
  – According to CDC, about 40 percent of people in general population who report symptoms of CFS have serious, treatable, previously unrecognized medical or psychiatric condition
    • Diabetes
    • Thyroid disease
    • Substance abuse

Chronic Fatigue Syndrome

• Primary signs and symptoms
  – Difficulties with memory and concentration
  – Problems with sleep
  – Persistent muscle pain that lasts 6 months or more
  – Joint pain (without redness and swelling)
  – Headache
  – Tender lymph nodes
  – Sore throat
  – Malaise following exertion

Chronic Fatigue Syndrome

• Other symptoms may include
  – Irritable bowel
  – Depression, irritability, mood swings, anxiety, panic attacks
  – Chills and night sweats
  – Visual disturbances (blurring, sensitivity to light, eye pain)
  – Allergies or sensitivities to foods, odors, chemicals, medications, or noise
  – Brain fog (feeling like you’re in mental fog)
  – Difficulty maintaining upright position, dizziness, balance problems, or fainting
Chronic Fatigue Syndrome

- Often follows cyclical course, alternating between periods of illness and relative well-being
- Some patients experience partial or complete remission of symptoms during course of illness, but symptoms often reoccur

Chronic Fatigue Syndrome Management

- Prehospital care is primarily supportive
- Diagnosis is based on history and clinical signs and symptoms

Chronic Fatigue Syndrome Management

- Management
  - Combination of therapies tailored to severity of illness
    - Counseling and behavioral therapy
    - Drug therapy to relieve symptoms
    - Relaxation therapy to reduce anxiety
    - Support groups with others who have illness
  - No cure
Overuse Syndromes

• Overuse of muscles, tendons, ligaments, supporting structures can result in numerous injuries and ailments (overuse syndromes)
  – Bursitis
  – Muscle strain
  – Tendonitis

Bursitis

• Inflammation of one or more bursae often caused by excessive use of joint
  – Small sac containing synovial fluid that helps ease friction between tendon and skin or between a tendon and bone
  – Causes
    • Inflammation from injury, compression, overuse
    • Infection
Bursitis

• Other causes
  – Crystal deposits (uric acids) associated with some diseases such as
    • Gout
    • Rheumatoid arthritis
    • Scleroderma

Bursitis

• Areas most commonly affected
  – Elbow
  – Shoulder
  – Hip
  – Knee
  – Achilles tendon

Bursitis

• Risk factors
  – Overuse or repetitive use
    • Running
    • Stair climbing
    • Bicycling
    • Standing for prolonged periods
  – Disease
    • Arthritis
    • Thyroid disease
    • Diabetes

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Bursitis

• Risk factors
  – Leg-length inequality
    • When leg is shorter than other by inch or more, it affects walking and could lead to irritation of hip bursa
  – Previous surgery
    • Around hip or prosthetic implants in hip can irritate bursae

• Risk factors
  – Leg bone spurs or calcium deposits:
    • Can develop within tendons that attach to trochanter, causing irritation and inflammation to bursa
  – Crystal deposits
    • Uric acid may be deposited as crystals in joints, causing bursitis

• Most commonly affects people over 40 years of age
  – Primary symptom
    • Pain, which may be sudden and severe
    • Loss of motion in joint caused by crystal deposits
Bursitis

• Treatment
  – Corticosteroids
  – Antibiotics
  – Physical therapy
  – Needle aspiration of bursal fluid
  – Surgical removal or drainage of infected bursal sac

Muscle Strains

• "Pulled muscles" are slight tears in muscles or tendons
  – Usually result from excessive stretching or use
  – Tiny tears in damaged muscle cause muscle fibers to spasm
    • Results in pain that can last for days to weeks
  – When strained muscles heal, scar tissue replaces injured muscle fibers
    • May cause some weakening of muscle and may allow muscle injury to recur

Muscle Strains

• Two commonly injured muscles in athletes
  – Hamstring
  – Quadriceps
    • Both cross hip and knee joints
  – Another common site for muscle strains is lower back
Muscle Strains

- Graded according to their severity
  - Grade 1 strain is mild and usually heals readily
  - Grade 3 strain is severe tear of muscle that may take months to heal
- Treatment
  - PRICEM formula
  - Therapeutic ultrasound
  - Torn muscles are broken down to allow them to heal properly
  - Surgical repair

Tendonitis

- Inflammation of tendon
- Tendon
  - Tough and flexible band of fibrous tissue that connects muscles to bones
  - Most often becomes inflamed from overuse
    - Results in tendon and surrounding tissues being swollen and tender
    - Movement may be painful or limited
    - Most any tendon can become inflamed

Tendonitis

- Most common areas affected are wrist, ankle and heel, knee, and rotator cuff of shoulder
- Risk factors
  - Advancing age
  - Occupations that involve repetitive motions
  - Forceful exertion
  - Awkward positions
  - Certain sports, such as bowling, swimming, tennis, baseball, and basketball
Tendonitis

• Usually diagnosed by way of history and physical examination
  – X-ray or other imaging tests not needed unless suspicion of fracture or underlying illness
• Treatment
  – PRICEM
  – Exercise and physical therapy to prevent recurrent injury

 Peripheral Nerve Syndromes

• Made up of all nerves that exit brain and spinal cord
  – Two common peripheral nerve syndromes:
    • Carpal tunnel syndrome
    • Ulnar nerve entrapment
    • Both can cause pain, tingling, and numbness in arms, wrists, fingers
Carpal Tunnel Syndrome

- Entrapment neuropathy that occurs when median nerve becomes pressed or squeezed at wrist in carpal tunnel
  - Carpal tunnel is narrow, rigid passageway of ligament and bones at base of hand
    - Houses median nerve and tendons
    - Median nerve controls sensations to palm side of thumb and fingers

Carpal Tunnel Syndrome

- Median nerve provides impulses to small muscles in hand that allow fingers and thumb to move
- Compression of median nerve can cause
  - Pain
  - Weakness
  - Numbness in hand and wrist, radiating up arm
- Compression can be caused by any condition that decreases space in carpal tunnel

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Carpal Tunnel Syndrome

• Condition most likely due to a congenital predisposition
  – Carpal tunnel is simply smaller in some people than in others
  – Women are three times more likely than men to develop carpal tunnel syndrome
    • Carpal tunnel itself may be smaller in women than in men

Carpal Tunnel Syndrome

• Other contributing factors
  – Trauma or injury to wrist that causes swelling (e.g., sprain or fracture)
  – Overactivity of pituitary gland
  – Hypothyroidism
  – Rheumatoid arthritis
  – Mechanical problems in wrist joint
  – Repeated use of vibrating hand tools
  – Fluid retention during pregnancy or menopause
  – Cyst or tumor in canal

Carpal Tunnel Syndrome

• Symptoms usually begin gradually, often during sleep
  – Frequent burning, tingling, or itching numbness in palm of hand and fingers
  – Sleep is often interrupted with need to “shake out” wrist or hand
    • As symptoms worsen, tingling may occur during day
  – Patient may have decreased grip strength
    • Difficult to form fist, grasp small objects, perform other manual tasks
Carpal Tunnel Syndrome

- Early diagnosis and treatment are important in preventing permanent damage to median nerve
  
  - Diagnosed through various tests
    - Percussion of the median nerve (Tinel test)
    - Wrist-flexion tests (Phalen's test)
    - Compression tests
    - Nerve conduction studies

Carpal Tunnel Syndrome

- Treatment
  - Drug therapy to control pain, decrease swelling, and reduce inflammation
  - Wrist splinting to maintain correct wrist position
  - Exercise and physical therapy to restore wrist strength
  - Surgery to release pressure in carpal tunnel

Ulnar Nerve Entrapment

- Occurs when ulnar nerve in arm becomes compressed
  
  - Often called “funny bone” travels from under clavicle and along inside of upper arm
  - Passes through cubital tunnel, behind inside of elbow, where it can be palpated
  - Beyond elbow, nerve travels under muscles on inside of arm and into hand on side of palm with little finger
Ulnar Nerve Entrapment

- Ulnar nerve
  - Provides sensation to little finger and half of ring finger
  - Controls most of small muscles in hand that help with fine movements, and some larger muscles in forearm that help make strong grips
  - Entrapment most commonly occurs behind elbow

Ulnar Nerve Entrapment

- Causes
  - Previous injury to elbow
  - Bone spurs
  - Swelling
  - Cysts
Ulnar Nerve Entrapment

• Signs and symptoms
  – Similar to those caused by compression of medial nerve
  – Numbness
  – Pain
  – Tingling in elbow, forearm, wrist, fingers
  – Hand has “fallen asleep”
  – Symptoms frequently occur during sleep when elbows are commonly flexed, during daytime activities that involve elbow bending

Ulnar Nerve Entrapment

• Diagnosed and treated with tests and therapies similar to those for carpal tunnel syndrome
  – Surgery is sometimes used to reposition ulnar nerve to avoid compression and entrapment

Soft Tissue Infections

• Can destroy muscles, skin, underlying tissue
  – Most are rare and are caused by bacterial infection
  – Soft tissue infections specific to nontraumatic musculoskeletal disorders
    • Gangrene
    • Paronychia
    • Flexor tenosynovitis of hand
Fasciitis

- Inflammation of the fascia
  - Fascia is strong connective tissue that forms under skin
    - Envelops and isolates muscles/groups of muscles in body
    - Provides support and protection for body organs and structures

Fasciitis

- Necrotizing fasciitis
  - “Flesh-eating bacteria”
  - Rare infection of deep layers of skin and subcutaneous tissues
  - Rapidly spreads in deep fascial plane with secondary necrosis (tissue death) in subcutaneous tissue
  - Most likely to occur in people with compromised immune systems
  - Many bacteria can cause disease
    - Some resistant to antibiotics

Fasciitis

- The infection begins slowly, usually at site of broken skin (minor or major trauma or surgery)
  - Often patient will complain of intense pain out of proportion to appearance of injury
  - As disease progresses, affected area quickly becomes red, hot, swollen
    - Skin color may become violet-purple, blisters may form as necrosis develops in subcutaneous tissues
    - Fever, diarrhea, vomiting are common
    - If left untreated, infection may become systemic, leading to death
Fasciitis

• Necrotizing fasciitis management
  – Surgical debridement of affected area
  – IV antibiotics
  – Support of vital functions
  – Aggressive surgical removal of infected tissue is usually necessary
  – Need for skin grafts common
  – Most patients require intensive care monitoring

Fasciitis

• Hyperbaric oxygen therapy may be option
  – Can increase O₂ within body’s tissues
  – Force O₂ into hypoxic tissue
  – Decrease edema
  – Destroy anaerobic bacteria
  – Promote growth of new blood vessels within soft tissue

Gangrene

• Complication of tissue necrosis
  – Characterized by decay and death of body tissue, which becomes black (and/or green) and malodorous (foul smelling)
  – Causes
    • Decreased blood supply to body part or organ, most commonly toes, fingers, feet, hands
    • Infection
    • Disease
    • Frostbite
    • Other soft tissue injury
Gangrene

- **Dry gangrene**
  - Caused by reduction of blood flow through arteries (not infection)
  - Appears gradually and progresses slowly
  - Associated with
    - Arteriosclerosis
    - Diabetes
    - Cigarette smoking
    - Genetics
    - Other factors
  - Tissues appear dry and discolored and will eventually slough away

Gangrene

- **Wet gangrene (moist gangrene)**
  - Develops as complication of untreated, infected wound
  - Swelling results from bacterial infection that causes sudden decrease in blood flow
  - Gas gangrene is type of wet gangrene caused by bacteria *Clostridia* that produces poisonous toxins and gas
  - Tissues appear moist and produce oozing fluid or pus
Gangrene Management

• Treatment
  – Depends on type of gangrene (dry vs. wet) and how much tissue is compromised
  – Immediate treatment is needed in all cases of wet gangrene, in some cases of dry gangrene

Gangrene

• Treatment
  – Treatment for both usually involves:
    • Surgery
    • Antibiotic therapy
    • Anticoagulant therapy
    • Pain management
    • Supportive care
    • Rehabilitation (especially with surgical or autoamputation)
    • HOBT

Paronychia

• Common skin infection that occurs around nails
  – Usually caused by injury (e.g., nail biting, pulling hangnail, trimming cuticle) that allows for invasion of bacteria, yeast, fungus
  – Common in persons with diabetes and those who have their hands submerged in water for long periods of time
Paronychia

• Symptoms
  – Pain and redness around nail
  – Pus-filled blisters (especially with bacterial infection)
  – Nails that are abnormally shaped or have unusual color

Paronychia

• Physician care
  – Incision and drainage of infection
  – Nail removal
  – Antibiotic therapy
  – Warm hand soaks may relieve discomfort
• Usually responds well to treatment
Paronychia

- Rarely, some infections can be prolonged
  - Signs of systemic infection
    - Chills
    - Red streaks proximal to infection
    - Fever
    - Malaise
    - Joint pain
    - Muscle spasm

Flexor Tenosynovitis

- Pathologic state that causes disruption of tendon function in hand
  - Most cases are result of infection
  - Can be secondary to acute or chronic inflammation as result of overuse or disease (e.g., diabetes, arthritis)
  - When infectious agents enter closed space of tendon sheath, immune response causes swelling
    - Interferes with gliding mechanism of wrist, hand, fingers
    - Can result in disruption of tendon sheath
    - May lead to tendon necrosis

Flexor Tenosynovitis

- Considered orthopedic emergency
  - If left untreated, infection may become systemic, spreading to fascia, synovial joint spaces, skin
  - Subsequent osteomyelitis may result
Flexor Tenosynovitis

- Primary cause of infectious flexor tenosynovitis is penetrating trauma that allows native skin flora (both *Staphylococcus* and *Streptococcus*) to invade tendon sheath
- May present with fever and chills

Flexor Tenosynovitis

- Other signs and symptoms include (Kanavel's sign)
  - Severe pain on passive range of motion
  - Swollen digits (“sausage links”)
  - Fingers that are held slightly flexed
  - Swelling and tenderness along flexor sheath

Flexor Tenosynovitis

- In most cases, surgical drainage is required
  - Other treatments
    - Antibiotics
    - Splinting
    - Elevation of hand
  - Require physician care and follow-up
  - Prehospital care is primarily supportive
Summary

- While more common in advanced age, nontraumatic musculoskeletal disorders affect patients of all ages
- Musculoskeletal system is composed of bones, muscles, tendons, ligaments, and articulating surfaces
  - Three types of joints are fibrous, cartilaginous, and synovial
  - Muscles are responsible for movement, posture, and heat production

Summary

- Extremities and spine should be examined to determine structure and function
  - Specific assessments include range of motion, vascular evaluation, and a motor and sensory exam
- Prehospital management of nontraumatic musculoskeletal disorders includes routine care and pain management

Summary

- Important historical data to gather on a patient with this type of disorder should relate to onset of signs and symptoms; nature and location of pain; presence of weakness or other alteration in motor function; and presence of sensory abnormalities
Summary

• Osteomyelitis is a bone infection
  – May result from an open fracture, wound infection, or systemic infection
  – Signs and symptoms include pain, signs of inflammation, fever, pus, and other functional alterations

Summary

• Bone tumors are benign or malignant abnormal cell growths within bone
  – Multiple myeloma is most common type of primary bone cancer and is characterized by pain and fractures
• Acute or chronic lower back pain is common, and may be caused by trauma, arthritis, infections, or congenital abnormalities

Summary

• Intervertebral discs can herniated and compress adjacent nerves, causing severe pain and weakness
• Cauda equina syndrome is caused by compression of nerve roots at the distal end of the spine
  – If compression is not relieved promptly, permanent paralysis and incontinence can occur
Summary

• Strain is an injury to a muscle or tendon
  — Sprain is stretching or tearing of a ligament
  — Both conditions cause pain

Summary

• Arthritis is an inflammatory condition of a joint characterized by pain and swelling
  — Osteoarthritis is a chronic degenerative joint disease that has a gradual onset
  — Rheumatoid arthritis is an autoimmune disease that affects synovial joints and causes severe pain, disability, and deformity

Summary

• Arthritis is an inflammatory condition of a joint characterized by pain and swelling
  — Ankylosing spondylitis is a form of arthritis that primarily affects the spine and requires modifications in prehospital care
  — Septic arthritis is infection of a joint
  — Gout is a type of arthritis caused by deposits of uric acid in joint space
Summary

- Myalgia is pain in one or more muscles and can be caused by an autoimmune disorder, overuse, or infection
- Inflammatory myopathies are a group of diseases characterized by muscle inflammation and weakness
  - Can be caused by autoimmune disease, injury, infection, or drugs

Summary

- Chronic fatigue syndrome is characterized by severe fatigue not improved by rest
- Fibromyalgia causes fatigue and “tender points” on neck, shoulders, back, hips, arms, and legs
- Bursitis is inflammation of one or more bursae
  - Often caused by overuse

Summary

- Muscle strains are slight tears in muscle caused by overuse or by injury
- Tendonitis is inflammation of a tendon
- Carpal tunnel syndrome is a type of neuropathy caused by entrapment of median nerve after repetitive movement
  - Causes pain, numbness, and weakness
Summary

- Ulnar nerve entrapment occurs when ulnar nerve (funny bone) is compressed
- Fasciitis is inflammation of the connective tissue that lies under the skin
  - Necrotizing fasciitis (flesh-eating bacteria) is a rare infection that begins in the fascia and can become systemic

Summary

- Gangrene is a complication of tissue necrosis
  - Occurs when tissue decays
- Paronychia is a skin infection around the nails
- Flexor tenosynovitis is often caused by infection
  - Can lead to dysfunction, necrosis, and systemic infection

Questions?