Alterations in the Musculoskeletal System

NURS 142
ADN Program
Carole Chassereau

Musculoskeletal System

Normal structure
- Tissues
  - Cartilage
  - Ligaments/tendons
  - Fascia
  - Bursae
- Bones
- Muscles
- Joints

Function
- Support
- Protection
- Movement
- Mineral storage
- Hematopoiesis

Bone Structure & Development

Continuous process of bone remodeling
Osteoblasts = builders = deposition of new bone
Osteoclasts = removal of old bone = resorption

Growth zone for longitudinal growth in children
Epiphyseal plate
Normal Diarthrodial Joint (Freely movable)

Ligaments attach bone to bone – joint stability
Tendons attach muscle to bone – joint movement
Fibrous tissue – low blood supply
Cartilage - avascular

Factors Influencing Musculoskeletal Health

Age
- Infant
- Child
- Adolescent
- Senior

Environment
- Job
- Sun exposure
- Activity
Risk Factors for Alterations in Musculoskeletal Health

**History**
- Injuries
- Family history
- Medical conditions
  - Metabolic alterations
  - Gastrectomy
  - Renal tubular necrosis
  - Hypoparathyroidism
- Surgery
- Gender

**Age**

**Medications**
- Musculoskeletal drugs
- Antiseizure meds
- Phenothiazines
- Corticosteroids
- K-depleting diuretics

**Diet**

**Obesity**

**Posture**

**Assessment**

**History & interview**
- Chief complaint
- Movement behaviors
- Functional assessment
- Self-care behaviors
- Questions
Assessment

- General
  - Posture
  - Gait
  - Muscle strength
  - Assistive devices
- Vital signs
- Inspection & palpation
- Neurovascular assessment - CSM

Diagnostic Tests

Blood chemistry
- Calcium
- Alkaline phosphatase
- Creatine kinase (CK)
- ESR
- RF
- ANA

Diagnostics - Visualizations

- X-ray
- CT
- MRI
- Bone scan
- Biopsy
- Arthrogram
- Arthroscopy
- Arthrocentesis
- Electromyogram (EMG)
- Bone Mass Measurements
The Etiology of Injuries

- Be alert and be aware of the environment.
- The causes of musculoskeletal injuries are variable.

Health Alterations – Soft Tissue Injuries

- Strains/sprains
  - Cause
  - Healing time
  - RICE
- Dislocation/subluxation
  - Inspection
- Slipped Capital Femoral Epiphysis

Soft Tissue Injuries

- Rotator cuff tears
- Ligament injuries
- Meniscus injuries
- Repetitive motion injuries
Herniated Nucleus pulposus

Common cause of acute & chronic low back pain.

Degenerative disk disease leads to intervertebral narrowing & decreased efficiency of the “shock absorbing” affects of the disks

Risk factors for low back pain – undue strain, osteoarthritis, obesity, smoking, stress, prolonged periods of sitting

Osteomyelitis

Direct or indirect invasion of microorganisms (Staph A)

Bacteria lodge & grow – increase pressure – ischemia and vascular compromise – sequestration – infected island of bone.

Chronic if persists for more than 4 weeks

Osteoporosis

“Silent disease”

Resorption > deposition (formation)

– Porous & brittle bones

Risk factors

– Postmenopausal women
– Thin, small frame
– Family history
– Long-term steroid use
– Inactivity
– Caucasian/Asian-American
Osteoporosis

- Signs & symptoms
  - Bone mineral density (BMD) decreased – DEXA study
  - Pathological fractures
  - Loss of height
  - Kyphosis

- Management goal – prevent or stop process
  - Adequate calcium intake & Vitamin D
  - Exercise program
  - Medications
    - HRT
    - SERM
    - Biphosphonates
    - Calcitonin

Gout

- Metabolic disorder
  - Genetic/familial tendency
  - 90% middle-aged men

- Risk factors
  - Diabetes
  - Obesity
  - HTN

- Hyperuricemia
  - ↑purine synthesis and/or
  - ↑renal excretion

Arthritis

<table>
<thead>
<tr>
<th>Type</th>
<th>Osteoarthritis (OA) (DJD)</th>
<th>Rheumatoid Arthritis (RA)</th>
<th>Juvenile RA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process</td>
<td>Degeneration of joint cartilage ➔ Rough surfaces Malacia Cartilage fragmentation Bone spurs</td>
<td>Inflammation of joints Granulation tissue Fibrous connective tissue Ankylosis Immobilization Extraarticular manifestations</td>
<td>Inflammation of joints May have extraarticular manifestations</td>
</tr>
</tbody>
</table>
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<tbody>
<tr>
<td><strong>Response</strong></td>
<td>Local Noninflammatory</td>
<td>Systemic Inflammatory</td>
<td>Local /systemic Inflammatory</td>
</tr>
<tr>
<td><strong>Incidence</strong></td>
<td>1/3 of adults</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age 60 – 60-80% &gt;men</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;Native-Americans</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;women 75%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Young adult – Child-bearing age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;girls</td>
<td></td>
<td></td>
<td>Age 2-5 or 9-12 &amp; adolescence</td>
</tr>
<tr>
<td>Joints affected</td>
<td>Small &amp;/or large</td>
<td>Small &amp;/or large</td>
<td>Pauciarticular Systemic Polyarticular</td>
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<tr>
<td><strong>Pattern</strong></td>
<td>Asymmetrical Chronic</td>
<td>Symmetrical Chronic</td>
<td>Variable</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Acute</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Rarely chronic</td>
</tr>
<tr>
<td><strong>Etiology</strong></td>
<td>Age, Fractures Infection</td>
<td>Autoimmune response</td>
<td>Unknown</td>
</tr>
<tr>
<td>Congenital deformity</td>
<td>GenetiC Viral</td>
<td>Autoimmune response</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Course</strong></td>
<td>Usually self-limiting</td>
<td>Remissions &amp; Exacerbation</td>
<td>Mild to</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>progressive</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Resolution</td>
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<tr>
<td><strong>Mobility</strong></td>
<td>Stiffness after rest</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>and inactivity</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Impaired mobility</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>due to pain and swelling</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Nodules</strong></td>
<td>Heberden’s</td>
<td></td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Painful</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Interphalangeal joints</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rheumatoid Non-tender</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Subcutaneous</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Goals</strong></td>
<td>Control pain &amp; fatigue</td>
<td>Joint protection</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Maintain ROM</td>
<td>Education</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Promote mobility</td>
<td>Support measures</td>
<td></td>
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Fracture Classification by Location

Fracture Management
- **First** assess neurovascular status distal to the injury
- **Reduction** (alignment)
  - Open - surgical
  - Closed – manipulation or traction
- **Immobilization**
  - Skeletal or skin traction
  - External fixator
  - Cast
  - Splint
  - Brace

Healing Process of Fractures
- A. Hematoma formation
- B. Fibrous network
- C. Osteoblasts – collagen – calcium deposition
- D. Callus formation
- E. Ossification – consolidation – remodeling
**Immobilization With Traction**

- **Skin – Bryant’s, Buck’s, Russell**
  - No more than 5-10# weight
  - Concern – skin breakdown
  - Bryant’s – child < 35 # & <3 years

- **Skeletal**
  - Weight – 5 – 45#
  - Pins
  - Skin care

- **General**
  - Ropes & pulleys in straight alignment
  - Extremity in straight alignment
  - Knots not touching pulleys
  - Weights hang freely

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**Immobilization with Casts**

- **Drying**
  - Use palm of hands
  - Heat production

- **Assess**
  - CSM
  - Skin at cast edges

- **Teach**
  - Elevation
  - Ice @ fracture site for 24 hrs.
  - Keep cast dry
  - No foreign objects
  - Exercise joints above & below the cast
  - Elevate extremity
Hip Fracture – Internal Fixation

**ORIF**
- Femoral head endoprosthesis
  - Intracapsular fractures
- Compression screw with side plate
  - Extracapsular fractures

**Fracture Complications**
- Union
  - Delayed
  - Non-union
  - Malunion
- Compartment syndrome
  - Compression - edema
    - Fascia
    - Circumferential device
  - Consequences
  - CSM
  - Action
- Avascular necrosis
- Osteomyelitis
- Venous thrombosis
- Fat embolism
  - Long bones & pelvis
  - Bone marrow or catecholamine action
- S & S
  - 48 hours post fracture
  - Respiratory/Cardiac signs
  - Petechiae – neck, anterior chest wall, conjunctiva

**Muscular Dystrophy**
- Genetic - males
- Muscle fiber degeneration and muscle wasting
- Progressive weakness & muscle deformity
- Signs & symptoms
  - Generalized muscle weakness
  - Gower’s maneuver
  - Deficiency of dystrophin
- Management
  - Supportive
  - ROM
  - PT
Medical Management

- Medications
- Nutrition
- Immobilization
- Rest
- Exercise
  - Active/passive
  - Isometric
  - Isotonic

Medical Management

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Medical Management

- Closed Reduction
- Assistive devices
- Special beds & frames
**Surgical Management**

- Osteotomy
- Arthrodesis
- ORIF
- Total hip, knee replacements
  - Special restrictions
  - Special goals

**Surgical Management**

- Osteotomy
- Arthrodesis
- ORIF
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**Amputations**

- Assessment
- Support measures
- Psychosocial implications

**Fluid & Electrolytes**

- Fluid intake
- Electrolyte effects
  - ↓ K⁺
  - ↓ Ca⁺
- Acid-base imbalances
### Pharmacological Therapy

- **Analgesics**
  - Acetaminophen (Tylenol)
  - Propoxyphene hydrochloride (Darvon)

- **Salicylates**
  - Acetaminophen (Tylenol)
  - Propoxyphene hydrochloride (Darvon)

- **NSAIDs**
  - Aspirin (acetylated)
  - Arthropan (nonacetylated)
  - Ibuprofen (Advil, Nuprin, Motrin)
  - Indomethacin (Indocin)
  - Diclofenac (Cataflam, Voltaren)
  - Cox-2 inhibitors
    -Celebrex
  - Muscle relaxants
  - Calcium supplements

- **Estrogen**

- **Antibiotics**

- **Corticosteroids**

- **Disease-modifying antirheumatic drugs (DMARDs)**
  - Immunosuppressives/Cytotoxics
    - Methotrexate
    - Immuran
    - Cyclosporin
    - Arava

### Nutrition

- **Protein**
- **Vitamins**
- **Calcium**
- **Fluids**
- **Fiber**
- **Weight control**
Nursing Diagnosis
- Altered nutrition: < or > than body requirements
- Alteration in comfort
- Risk for infection
- Impaired physical mobility
- Altered health maintenance
- Social isolation
- Body image disturbance
- Risk for injury

Outcomes
- Adequate nutrition
- Vital signs WNL
- CSM WNL
- Mobility/ROM
- Decreased pain
- Normal elimination pattern
- Understanding of disease process

Nursing Interventions & Discharge Planning
- Assess
- Support
- Teach
  - Diet
  - Medications
  - Assistive devices
  - Safety
  - Pain management
- Referral
  - Community resources
  - Teach & evaluate activities
  - Coordinate home care
  - S & S to report
  - Medication usage
Legal & Ethical Issues

- Pain control management
- Use of cadaver bones, ligaments
- Autonomy
- Confidentiality
- Beneficence