Part IV: Nursing management of patients with Musculoskeletal disorders.

Lecture Outlines

- Assessment and diagnostic test.
- Osteomyelitis.
- Osteoporosis.
- Arthritis.
- Joint replacement.

Learning objectives

At the end of this chapter, the student should be able to:

1. Describe the significance of physical assessment to the diagnosis of musculoskeletal dysfunction.
2. Specify the diagnostic tests used for assessment of musculoskeletal function.
3. Compare between adult and child bone.
4. Explain the pathophysiology, pathogenesis, prevention, and management of osteomyelitis, osteoporosis, and arthritis.
5. Use the nursing process as a framework for care of the patient with osteomyelitis, osteoporosis, and arthritis.
6. Describe the joint replacement, its indications, complications and management.
Assessment and diagnostic test

Assessment

The nursing assessment of the patient with musculoskeletal dysfunction includes an evaluation of the effects of the musculoskeletal problem on the patient.

- **Body Movements Produced by Muscle Contraction**.
- **Altered Sensations**
- **Assessment of peripheral nerve function** has two key elements: evaluation of sensation and evaluation of motion.
- **Posture**: Common deformities of the spine include:
  - **a. kyphosis**, an increased forward curvature of the thoracic spine.
  - **b. lordosis**, or swayback, an exaggerated curvature of the lumbar spine; and,
  - **c. scoliosis**, a lateral curving deviation of the spine.
- **Gait**: gait is assessed by having the patient walk away from the examiner for a short distance.
- **Bone Integrity**
  The bony skeleton is assessed for deformities and alignment. Symmetric parts of the body, such as extremities, are compared. Abnormal bony growths due to bone tumors may be observed. Shortened extremities, amputations, and body parts that are not in anatomic alignment are noted.
- **Joint Function.** The articular system is evaluated by noting range of motion, deformity, stability, and nodular formation.
- **Muscle Strength and Size**
- **Age-Related Changes of the Musculoskeletal System** as follow:

<table>
<thead>
<tr>
<th>Musculoskeletal</th>
<th>Structural</th>
<th>Functional</th>
<th>History and</th>
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<td></td>
<td>University of Mosul / College of Nursing</td>
<td>Adult 2</td>
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<tr>
<td>System</td>
<td>Changes</td>
<td>Changes</td>
<td>Physical Findings</td>
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<tr>
<td>Bones</td>
<td>Gradual, progressive loss of bone mass after age 30 yr Vertebrae collapse</td>
<td>Bones fragile and prone to fracture: vertebrae, hip, wrist</td>
<td>Loss of height Posture changes Kyphosis Loss of flexibility Flexion of hips and knees Back pain Osteoporosis Fracture</td>
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<tr>
<td>Muscles</td>
<td>Increase in collagen and resultant fibrosis Muscles diminish in size (atrophy); wasting Tendons less elastic</td>
<td>Loss of strength and flexibility Weakness Fatigue Stumbling Falls</td>
<td>Loss of strength Diminished agility Decreased endurance Prolonged response time (diminished reaction time) Diminished tone Broad base of support History of falls</td>
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<tr>
<td>Joints</td>
<td>Cartilage–progressive deterioration Thinning of intervertebral discs</td>
<td>Stiffness, reduced flexibility, and pain interfere with activities of daily living</td>
<td>Diminished range of motion Stiffness Loss of height</td>
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<td>Ligaments</td>
<td>Lax ligaments (less than normal strength; weakness)</td>
<td>Postural joint abnormality Weakness</td>
<td>Joint pain on motion; resolves with rest Crepitus Joint swelling/enlargement Osteoarthritis (degenerative joint disease)</td>
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### Diagnostic Procedures

1. **X-ray Studies**
X-ray studies are important in evaluating patients with musculoskeletal disorders. Bone x-rays determine bone density, texture, erosion, and changes in bone relationships.

2. Computed Tomography

A computed tomography (CT) scan shows in detail a specific plane of involved bone and can reveal tumors of the soft tissue or injuries to the ligaments or tendons. It is used to identify the location and extent of fractures in areas that are difficult to evaluate (eg, acetabulum).

1. Magnetic resonance imaging (MRI) is a noninvasive imaging technique that uses magnetic fields, radiowaves, and computers to demonstrate abnormalities (ie, tumors or narrowing of tissue pathways through bone) of soft tissues such as muscle, tendon, cartilage, nerve, and fat.

2. Arthroscopy: it is a procedure that allows direct visualization of a joint to diagnose joint disorders. Treatment of tears, defects, and disease processes may be performed through the arthroscopy.

3. Arthrocentesis (joint aspiration): this procedure is carried out to obtain synovial fluid for purposes of examination or to relieve pain due to effusion.

4. Bone densitometry: it is used to estimate bone mineral density (BMD). This can be performed through the use of x-rays or ultrasound.

5. Electromyography (EMG): it provides information about the electrical potential of the muscles and the nerves leading to them.

6. Laboratory Studies:
• CBC
• serum calcium levels. are altered in patients with osteomalacia, parathyroid dysfunction, Paget's disease, metastatic bone tumors, or prolonged immobilization.
• Serum phosphorus levels are inversely related to calcium levels and are diminished in osteomalacia associated with malabsorption syndrome.
• thyroid studies and determination of calcitonin, parathormone, and vitamin D levels.
• Serum enzyme levels of creatine kinase and aspartate aminotransferase become elevated with muscle damage.

Osteomyelitis

• Osteomyelitis is an infection of the bone.
• In most cases, a bacteria called Staphylococcus aureus, a type of staph bacteria, causes osteomyelitis.
• Osteomyelitis is infection in the bone. Osteomyelitis can occur in infants, children, and adults. Different types of bacteria typically affect the different age groups.
• In children, osteomyelitis most commonly occurs at the ends of the long bones of the arms and legs, affecting the hips, knees, shoulders, and wrists.
• In adults, it is more common in the bones of the spine (vertebrae), feet, or in the pelvis.

Pathophysiology

Bacterial invasion (hematogenous, local extension, trauma)

↓

Neutrophil invasion/inflammatory reaction
Pus spreads into vascular channels

Bacterial invasion (hematogenous, local extension, trauma)

Neutrophil invasion/inflammatory reaction

Pus spreads into vascular channels

Increased intraosseous pressure

Decreased blood flow

Ischemic necrosis

Devascularized fragment of bone (sequestra)

**Causes**

1. Extension of soft tissue infection (eg, infected pressure or vascular ulcer, incisional infection).
2. Direct bone contamination from bone surgery, open fracture, or traumatic injury (eg, gunshot wound).
3. Hematogenous (blood borne) spread from other sites of infection (eg, infected tonsils, boils, infected teeth, upper respiratory infections). Osteomyelitis resulting from hematogenous spread
typically occurs in a bone in an area of trauma or lowered resistance, possibly from subclinical (nonapparent) trauma.

4. Patients with conditions or taking medications that weaken their immune system are at a higher risk of developing osteomyelitis. Risk factors include:

- cancer, chronic steroid use, sickle cell disease, human immunodeficiency virus (HIV), diabetes, hemodialysis, intravenous drug users, and the elderly people.

Risk group

- poorly nourished, elderly, or obese people
- impaired immune systems,
- chronic illnesses (eg, diabetes, rheumatoid arthritis), and,
- receiving long-term corticosteroid therapy or immunosuppressive agents.
- HIV or AIDS
- Rheumatoid arthritis
- Intravenous drug use
- Alcoholism

Signs & Symptoms

Acute osteomyelitis develops rapidly over a period of seven to 10 days. The symptoms for acute and chronic osteomyelitis are very similar and include:

1. Difficulty or inability to use the affected limb or to bear weight or walk due to severe pain.
2. Fever, irritability, fatigue.
3. Nausea.
4. Tenderness and swelling around the affected bone.
5. Lost range of motion.
6. Severe back pain, especially at night.

Diagnostic procedures
1. Magnetic resonance imaging (MRI) help with early definitive diagnosis.
2. Blood studies reveal leukocytosis and an elevated ESR.
3. Wound and blood culture studies are performed to identify appropriate antibiotic.
4. Bone scans.

Treatments

1. Antibiotics therapy.
2. Splinting or cast immobilization
3. Surgical management
   - **Sequestrectomy.**
   - **Drain the infected area.** Opening up the area around infected bone allows surgeon to drain any pus or fluid that has accumulated in response to the infection.

Nursing Process: The Patient With Osteomyelitis

A: Assessment

1. Physical examination reveals an inflamed, markedly edematous, warm area that is tender. Purulent drainage may be noted
2. Assesses the patient for risk factors.

B: Nursing Diagnoses

- Acute pain related to inflammation and edema
- Impaired physical mobility related to pain, use of immobilization devices, and weight-bearing limitations
- Risk for extension of infection: bone abscess formation
- Deficient knowledge related to the treatment regimen.

C: Planning and Goals

- Relief of pain.
- Improved physical mobility within therapeutic limitations,
- Control and eradication of infection, and,
- Knowledge of the treatment regimen.
D: Nursing Interventions

1. Relieving Pain
   a. The affected part may be immobilized with a splint to decrease pain and muscle spasm.
   b. monitors the neurovascular status of the affected extremity.
   c. provide prescribed analgesics and other pain-reducing techniques.

2. Improving Physical Mobility
   a. The infected bone must be protected by immobilization devices and by avoidance of stress on the bone.
   b. activity restrictions.
   c. encourage the patient to full participation in ADLs within the physical limitations to promote general well-being.


E: Evaluation

1. Experiences pain relief
2. Increases physical mobility
3. Shows absence of infection
4. Adheres to therapeutic plan
   a. Takes medications as prescribed
   b. Protects weakened bones
   c. Demonstrates proper wound care
   d. Reports signs and symptoms of complications promptly
   e. Consumes a diet high in protein and vitamin C

Osteoporosis

- Osteoporosis is a condition characterized by a decrease in the density of bone, decreasing its strength and resulting in fragile bones.
• Osteoporosis literally leads to abnormally porous bone that is compressible, like a sponge. This disorder of the skeleton weakens the bone and results in frequent fractures (breaks) in the bones.

• Osteopenia is a condition of bone that is slightly less dense than normal bone but not to the degree of bone in osteoporosis.

Risk factors of osteoporosis

• Female gender

• Thin and small body frame

• Family history of osteoporosis (for example, having a mother with an osteoporotic hip fracture doubles your risk of hip fracture)

• Personal history of fracture as an adult

• Cigarette smoking, Excessive alcohol consumption

• Lack of exercise, Diet low in calcium, and Poor nutrition and poor general health

• Malabsorption (nutrients are not properly absorbed from the gastrointestinal system) from conditions such as celiac sprue.

• Low estrogen levels in women (such as occur in menopause or with early surgical removal of both ovaries)

• Low testosterone levels in men (hypogonadism)

• Chemotherapy that can cause early menopause due to its toxic effects on the ovaries

• Amenorrhea in young women is associated with low estrogen and osteoporosis; amenorrhea can occur in women who undergo extremely vigorous exercise training and in women with very low body fat.
Chronic inflammation, due to chronic diseases such as rheumatoid arthritis or liver diseases

Immobility, such as after a stroke, or from any condition that interferes with walking

Hyperthyroidism, and Hyperparathyroidism, and Vitamin D deficiency.

Certain medications can cause osteoporosis. These include long-term use of heparin (a blood thinner), antiseizure medications such as phenytoin (Dilantin) and phenobarbital, and long-term use of oral corticosteroids (such as prednisone).

**Signs and symptoms**

1. Osteoporosis can be present without any symptoms for decades because osteoporosis doesn't cause symptoms until bone fractures.
2. Fracture pain.

**Diagnostic procedures**

- **CBC**: serum calcium, phosphorus, and alkaline phosphatase; bloodureanitrogen (BUN); creatininelevel; urinarsis; and liver and thyroidfunction tests.
- A bonemineraldensity (BMO) measurementisrecommended for womenaround the time of menopause.
- A routine X-ray :the affected bones appear much thinner and lighter than normal bones.
- **DXA** to measure bone density in the hip, the spine, and the forearm.

**Treatment**

1. Prevention of bone fractures by reducing bone loss or, preferably, by increasing bone density and strength.
2. The following are osteoporosis treatment and prevention measures:

- **Lifestyle changes**, including quitting cigarette smoking, curtailing excessive alcohol intake, exercising regularly, and consuming a balanced diet with adequate calcium and vitamin D.
- **Medications that stop bone loss and increase bone strength**, such as:
  - a. Alendronate (Fosamax).
  - b. Risedronate (Actonel),
  - c. Raloxifene (Evista),
  - d. Ibandronate (Boniva),
  - e. Calcitonin (Calcimar), zoledronate (Reclast), and denosumab (Prolia)
- **Medications that increase bone formation** such as teriparatide (Forteo).

3. Calcium supplements: 1,000 mg for men and 1,500 mg for post-menopausal women are recommended (as well as vitamin D, 50,000 international units once or twice per week).

4. Weight-bearing exercise programs to improve muscle tone, such as walking.

**Consequences of osteoporosis**

- decreased quality of life.
- lost workdays, and disability.
- patients suffering a hip fracture will require long-term nursing-home care.
- Elderly patients can develop pneumonia and blood clots due to the inactivity.
- prolonged bed rest after the hip fracture increased the risk of death.
Nursing care of patient with osteoporosis

Assessment:

subjective data includes:

- questioning the patient about lifestyle practices and complaints of pain (low thoracic and lumbar) that worsens with sitting, standing, coughing, sneezing, and straining.

objective data includes assessing the patient for dowager's hump (spinal deformity and height loss that result from repeated spinal vertebral fractures) and increased lordosis, scoliosis, and kyphosis. Also assess gait impairment associated with inability to maintain erect posture.

Nursing diagnoses

- chronic pain related to osteoporosis.
- Activity intolerance related to pain.
- Sleep pattern disturbance related to pain.
- Risk for potential injury related to osteoporosis

Health Teaching

1. Explain complication and risk factors of her disease
2. Get plenty of weight-bearing exercise.
3. Do resistance exercises.
4. Increase intake of diet rich in calcium & vitamin D.
5. Provide Safe & Comfortable environment.
6. Explain the purpose of any treatment
Arthritis

- Arthritis is inflammation of one or more joints.
- Symptoms of arthritis include pain and limited function of joints.
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- Symptoms of arthritis include pain and limited function of joints.
- Arthritis is a joint disorder featuring inflammation.
- A joint is an area of the body where two different bones meet.
- A joint functions to move the body parts connected by its bones.
- Arthritis literally means inflammation of one or more joints.
- Arthritis is frequently accompanied by joint pain. Joint pain is referred to as arthralgia.

Causes of arthritis

- Injury (leading to osteoarthritis).
- Metabolic abnormalities (such as gout and pseudogout).
- Hereditary factors.
- The direct and indirect effect of infections (bacterial and viral), and,
- A misdirected immune system with autoimmunity (such as in rheumatoid arthritis and systemic lupus erythematosus).

Types and symptoms of arthritis

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<thead>
<tr>
<th>Types of arthritis</th>
<th>Symptoms</th>
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| Osteoarthritis     | - pain in a joint, stiff, and tenderness when pressure is applied to the joint.  
- The patient may find it harder to use the joint.  
- Hard lumps, or bone spurs may appear around the joint. In some cases the joint might swell.  
- The most common affected joints are in the hips, |

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| **Rheumatoid arthritis**             | • Symptoms are usually worst on waking up in the morning and the stiffness can last for 30 minutes at this time.  
• The joint is tender when touched.  
• Hands may be red and puffy.  
• There may be rheumatoid nodules (bumps of tissue under the skin of the patient's arms).  
• Many patients with rheumatoid arthritis feel tired most of the time. Weight loss is common. |
| **Infectious arthritis**             | • fever, joint inflammation and swelling.  
• tenderness and/or a sharp pain.  
• Often these symptoms are linked to an injury or another illness.  
• Most commonly affected areas are the knee, shoulder, elbow, wrist and finger. |
| **Juvenile rheumatoid arthritis**    | • The patient is a child.  
• intermittent fevers which tend to peak in the evening and then suddenly disappear.  
• poor appetite and lose weight.  
• There may be blotchy rashes on his arms and legs.  
• Anemia is also common.  
• A joint may suddenly swell and stay larger than it usually is.  
• The child may experience a stiff neck, hips or some other joint. |

**Diagnostic Procedures.**

1. Review the history of symptoms.
2. Examine the joints for inflammation and deformity, as well as ask questions about or examine other parts of the body for inflammation or signs of diseases that can affect other body areas.

3. Blood, urine, joint fluid tests, and,

4. X-ray tests might be ordered.

Management of arthritis

1. Physical therapy.

2. Splinting, cold-pack application.

3. Paraffin wax dips.

4. Anti-inflammatory medications.

5. Pain medications (ranging from acetaminophen [Tylenol] to narcotics).

6. Immune-altering medications, and,

7. Surgical operations. For treatments of particular forms of arthritis.

8. keep sugary and/or fatty foods to a minimum - such as red meat, cream and cheese.

9. eating plenty of fruit and vegetables, as well as whole grains.

10. Omega-3 essential fatty acids are thought to relieve to some extent the symptoms of arthritis. A common source of Omega-3 fatty acids is oily fish, such as sardines, herring, trout, and salmon.


Joint Replacement
- Joint replacement surgery is removing a damaged joint and putting in a new one.
- Sometimes, the surgeon will not remove the whole joint, but will only replace or fix the damaged parts.
- Replacing a joint can relieve pain and help patient to move and feel better.
- Hips and knees are replaced most often.
- Other joints that can be replaced include the shoulders, fingers, ankles, and elbows.
- Patients with severe joint pain and disability may undergo joint replacement.
- Conditions contributing to joint degeneration include osteoarthritis (degenerative joint disease), rheumatoid arthritis, trauma, and congenital deformity. Some fractures (eg, femoral neck fracture) may cause disruption of the blood supply and subsequent avascular necrosis.
- With joint replacement, excellent pain relief is obtained in most patients.
- Return of motion and function depends on preoperative soft tissue condition, soft tissue reactions, and general muscle strength.
- Early failure of joint replacement is associated with excessive activity and preoperative joint and bone pathology.

Nursing Process

A: Assessment
• Assessment of the patient is focused on hydration status by assesses the skin and mucous membranes, vital signs, urinary output, and laboratory values.
• Current medication history, and,
• Possible infection.

B: Nursing Diagnosis

• Acute pain related to fracture, joint degeneration, swelling, or inflammation.
• Risk for peripheral neurovascular dysfunction related to swelling, constricting devices, or impaired venous return.
• Risk for ineffective therapeutic regimen management related to insufficient knowledge or lack of available support and resources.
• Impaired physical mobility related to pain, swelling, and possible presence of an immobilization device.
• Risk for situational low self-esteem and/or disturbed body image related to impact of musculoskeletal disorder.

C: Planning and goals

1. Relief of pain.
2. Adequate neurovascular function.
3. Health promotion, improved mobility, and,

D: Nursing Interventions

1. Periodic rest, Distraction and relaxation techniques
2. Medication therapy (eg, nonsteroidal anti-inflammatory drugs, opioid analgesics): actions of medications, administration, schedule, side effects
3. Safe use of assistive devices
4. Weight-bearing limits
5. Change positions frequently
6. Limitations on hip flexion and adduction (eg, avoid acute flexion and crossing legs)
7. Avoidance of low-seated chairs
8. Sleeping with pillow between legs to prevent adduction
9. Gradual increase in activities and participation in prescribed exercise regimen
10. Use of important medications such as warfarin (Coumadin) and aspirin
11. Keep pressure off heel.
12. Instruct and supervise safe use of ambulatory aids.

**E: Evaluation**

1. Reports relief of pain.
2. Exhibits adequate neurovascular function.
   a. Exhibits normal skin color.
   b. Has warm skin.
3. Promotes health
   a. Eats balanced diet appropriate to meet nutritional needs.
   b. Maintains adequate hydration.
4. Maximizes mobility within therapeutic limits.
a. Requests assistance when moving.
b. Elevates edematous extremity after transfer.
c. Uses immobilizing.