

FRACTURES

A fracture is a break in the continuity of bone. A fracture occurs when the stress placed on a bone is greater than the bone can absorb. Muscles, blood vessels, nerves, tendons, joints, and other organs may be injured when fracture occurs.

Types of Fractures

- ✧ **Complete:** involves entire cross section of bone, usually displaced (abnormal position).
- ✧ **Incomplete:** involves a portion of the cross section of the bone or may be longitudinal.
- ✧ **Closed (simple):** skin not broken.
- ✧ **Open (compound)**—skin broken, leading directly to fracture.
 - **Grade I:** minimal soft tissue injury.
 - **Grade II:** laceration greater than 1 cm without extensive soft tissue flaps.
 - **Grade III:** extensive soft tissue injury, including skin, muscle, neurovascular structure, with crushing.
- ✧ **Pathologic:** through an area of diseased bone (osteoporosis, bone cyst, bone tumor).

Patterns of Fracture

- ★ **Greenstick**—one side of the bone is broken and the other side is bent.
- ★ **Transverse**—straight across the bone.
- ★ **Oblique**—at an angle across the bone.
- ★ **Spiral**—twists around the shaft of the bone.
- ★ **Comminuted**—bone splintered into more than three fragments.
- ★ **Depressed**—fragments are driven inward (seen in fractures of the skull and facial bones).
- ★ **Compression**—bone collapses in on itself (seen in vertebral fractures).
- ★ **Avulsion**—fragment of bone pulled off by ligament or tendon attachment.
- ★ **Impacted**—fragment of bone wedged into other bone fragment.
- ★ **Fracture-dislocation**—fracture complicated by the bone being out of the joint.
- ★ **Other**—according to anatomic location: epiphyseal (end of large bones containing growth plate), supracondylar (above the articular prominence of a bone), midshaft, intra-articular.

Clinical Manifestations

Physical Findings

☆ Pain at site of injury	☆ Swelling
☆ False motion and crepitus (grating sensation)	☆ Tenderness
☆ Loss of function	☆ Deformity
☆ Ecchymosis	☆ Paresthesia

Altered Neurovascular Status

- ✧ Injured muscle, blood vessels, nerves.
- ✧ Compression of structures resulting in ischemia.
- ✧ Findings:

☆ Progressive uncontrollable pain.	☆ Pain on passive movement.
☆ Altered sensations (paresthesia).	☆ Loss of active motion.
☆ Diminished capillary refill & distal pulse.	☆ Pallor.

Shock

★ Overt hemorrhage through open wound.	
★ Bone is very vascular.	★ May be fatal if not detected.
★ Covert hemorrhage into soft tissues (in femoral fracture or with pelvic fracture).	

Diagnostic Evaluation

- ★ X-ray and other imaging studies to determine integrity of bone.
- ★ Blood studies (complete blood count [CBC], electrolytes) with blood loss and extensive muscle damage—may show decreased hemoglobin level and hematocrit.
- ★ Arthroscopy to detect joint involvement.
- ★ Angiography if associated with blood vessel injury.
- ★ Nerve conduction and electromyogram studies to detect nerve injury.

Management

- ✧ Factors influencing choice of management include:

☆ Type, location, and severity of fracture.	☆ Soft tissue damage.
☆ Age and health status of patient, including type and extent of other injuries.	

- ✧ Goals include:
 - ☆ To regain and maintain correct position and alignment.
 - ☆ To regain the function of the involved part.
 - ☆ To return patient to usual activities in the shortest time and at the least expense.
- ✧ The management process is a three-step process:
 - ☆ Reduction: restoration of fracture fragments into anatomic position and alignment.
 - ☆ Immobilization: maintains reduction until bone healing occurs.
 - ☆ Rehabilitation: regaining normal function of the affected part.

Approaches to Management

Vary by specific site of fracture

★ Closed reduction

- ☆ Bony fragments are brought into apposition (ends in contact) by manipulation and manual traction restoring alignment.
- ☆ May be done under anesthesia for pain relief and muscle relaxation.
- ☆ Cast or splint applied to immobilize extremity and maintain reduction.

★ Traction

- ☆ Pulling force applied to accomplish and maintain reduction and alignment.
- ☆ Used for fractures of long bones.
- ☆ Techniques
 - ⌚ Skin traction—force applied to the skin using foam rubber, tape.
 - ⌚ Skeletal traction—force applied to the bony skeleton directly, using wires, pins, or tongs placed into or through the bone.

★ Open reduction with internal fixation (ORIF)

- ☆ Operative intervention to achieve reduction, alignment, and stabilization.
 - ⌚ Bone fragments are directly visualized.
 - ⌚ Internal fixation devices (metal pins, wires, screws, plates, nails, rods).
 - ⌚ After wound closure, splints or casts may be used for stabilization & support.

★ Endoprosthetic replacement

- ☆ Replacement of a fracture fragment with an implanted metal device.
- ☆ Used when fracture disrupts bone nutrition or treatment of choice is bony replacement

★ External fixation device

- ☆ Stabilization of complex and open fracture with use of a metal frame and pin system.
- ☆ Permits active treatment of injured soft tissue.
 - ⌚ Wound may be left open (delayed primary wound closure).
 - ⌚ Repair damage to blood vessels, soft tissue, muscles, nerves & tendons as indicated
 - ⌚ Reconstructive surgery may be necessary (External Fixation).

Complications

- ☆ Muscle atrophy, loss of muscle strength and endurance.
- ☆ Loss of ROM due to joint contracture.
- ☆ Pressure sores at bony prominences from immobilizing device pressing on skin.
- ☆ Diminished respiratory, cardiovascular, GI function, resulting in possible pooling of respiratory secretions, orthostatic hypotension, ileus, anorexia, and constipation.
- ☆ Psychosocial compromise resulting in feelings of isolation and depression.

Other Acute Complications

☆ Venous stasis & thromboembolism—particularly with hip & lower extremities fractures.	
☆ Infection especially with open fractures.	☆ Neurovascular compromise.
☆ Shock due to significant hemorrhage.	☆ Pulmonary emboli.

Fat Emboli Syndrome

- ☆ Associated with embolization of marrow or tissue fat or platelets and free fatty acids to the pulmonary capillaries, producing rapid onset of symptoms.
- ☆ **Clinical manifestations**
 - ☆ Respiratory distress—tachypnea, hypoxemia, crackles, wheezes, acute pulmonary edema, interstitial pneumonitis
 - ☆ Mental disturbances—irritability, restlessness, confusion, disorientation, stupor, coma due to systemic embolization, and severe hypoxia
 - ☆ Fever
 - ☆ Petechiae in buccal membranes, hard palate, conjunctival sacs, chest, anterior axillary folds, due to occlusion of capillaries

NURSING ALERT: Restlessness, confusion, irritability, and disorientation may be the first signs of fat embolism syndrome. Confirm hypoxia with arterial blood gas (ABG) analysis. Young adults (ages 20 to 30) and older adults (ages 60 to 70) with multiple fractures or fractures of long bones or pelvis are particularly susceptible to development of fat emboli.

Bone Union Problems

- ✱ Delayed union (takes longer to heal than average for type of fracture)
- ✱ Nonunion (fractured bone fails to unite)
- ✱ Malunion (union occurs but is faulty—misaligned)

NURSING PROCESS

Nursing Assessment

- ✱ Ask patient how the fracture occurred to determine possible associated injuries.
- ✱ Ask to describe location, character, & intensity of pain to determine discomfort source
- ✱ Ask to describe sensations in injured extremity to evaluate neurovascular status.
- ✱ Observe patient's ability to change position to assess functional mobility.
- ✱ Note patient's emotional status & behavior indicators of ability to cope with injury stress
- ✱ Assess patient's support system; identify current and potential sources of support, assistance, and caregiving.
- ✱ Review findings on past and present health status to aid in formulating care plan.
- ✱ Conduct physical examination.
 - ☆ Examine skin for lacerations, abrasions, ecchymosis, edema, and temperature.

- ☆ Auscultate lungs to establish baseline assessment of respiratory function.
- ☆ Assess pulses and BP; assess peripheral tissue perfusion, especially in injured extremity, to establish circulatory status baseline.
- ☆ Determine neurologic status (sensations and movement) of extremity distal to injury.
- ☆ Note length, alignment, and immobilization of injured extremity.
- ☆ Evaluate behavior and cognitive functioning of patient to determine ability to participate in care planning and patient education activities.

NURSING ALERT: Change in behavior or cerebral functioning may be an early indicator of cerebral anoxia from shock or pulmonary or fat emboli.

Nursing Diagnoses

- ★ Risk for Deficient Fluid Volume related to hemorrhage and shock
- ★ Impaired Gas Exchange related to immobility & potential pulmonary emboli or fat emboli
- ★ Risk for Peripheral Neurovascular Dysfunction
- ★ Risk for Injury related to thromboembolism
- ★ Acute or Chronic Pain related to injury
- ★ Risk for Infection related to open fracture or surgical intervention
- ★ Bathing or Hygiene Self-Care Deficit related to immobility
- ★ Impaired Physical Mobility related to injury/treatment modality
- ★ Risk for Disuse Syndrome related to injury and immobilization
- ★ Risk for Posttrauma Syndrome related to cause of injury

Nursing Interventions

Evaluating for Hemorrhage and Shock

- ★ Monitor vital signs frequently as clinical condition indicates, observing for hypotension, elevated pulse, widening pulse pressure, cold clammy skin, restlessness, pallor.
- ★ Watch for evidence of hemorrhage on dressings or in drainage containers.
- ★ Review laboratory data; report abnormal values.
- ★ Administer prescribed fluids/blood to maintain circulating volume.
- ★ Monitor intake and output.

Monitoring for Impaired Gas Exchange

- ★ Evaluate changes in mental status and restlessness that may indicate hypoxia.
- ★ Review diagnostic evaluation data—especially ABG values and chest X-ray.
- ★ Position to enhance respiratory effort. Report any sudden or progressive changes in respiratory status.
- ★ Encourage coughing and deep breathing to promote lung expansion and diminish pooling of pulmonary secretions.

- ★ Monitor pulse oximetry. Administer oxygen as prescribed.
- ★ Maintain cervical spine precautions if spinal injury is suspected.

Preventing Neurovascular Compromise

- ★ Monitor neurovascular status for compression of nerve, diminished circulation, development of compartment syndrome.
 - ☆ Pain—progressive, localized, deep throbbing, persistent, unrelieved by immobilization and medications
 - ☆ Pain on passive stretch
 - ☆ Weakness progressing to paralysis
 - ☆ Altered sensation, hypoesthesia, paresthesia
 - ☆ Poor capillary refill (> 3 seconds)
 - ☆ Skin color—pale, cyanotic
 - ☆ Elevated compartment pressure—palpable tightness of muscle compartment, elevated measured tissue pressure
 - ☆ Pulselessness—a late sign
- ★ Reduce swelling.
 - ☆ Elevate injured extremity (unless compartment syndrome is suspected—may contribute to vascular compromise).
 - ☆ Apply cold to injury if prescribed.
- ★ Relieve pressure caused by immobilizing device as prescribed (such as bivalving cast, rewrapping elastic bandage, or splinting device).
- ★ Relieve pressure on skin to prevent development of pressure sore.
 - ☆ Frequent repositioning.
 - ☆ Skin care—do not massage bony prominences.
 - ☆ Special mattresses.

NURSING ALERT

Monitoring the neurovascular integrity of the injured extremity is essential. Development of compartment syndrome (increased tissue pressure causing hypoxemia) leads to permanent loss of function in 6 to 8 hours. This situation must be identified and managed promptly.

Preventing Development of Thromboembolism

GERONTOLOGIC ALERT

Older adults with fractures, trauma, immobility, obesity, or history of thrombophlebitis are at high risk for developing thromboembolism.

- ★ Encourage active and passive ankle exercises.
- ★ Use elastic stockings, foot pumps, or SCDs, as prescribed.
- ★ Elevate legs to prevent stasis, avoiding pressure on blood vessels.

- ★ Encourage mobility; change position frequently; encourage ambulation.
- ★ Administer anticoagulants as prescribed.
- ★ Monitor for development of thrombophlebitis.
 - ☆ Note complaint of pain and tenderness in calf.
 - ☆ Report calf pain.
 - ☆ Report increased size and temperature of calf.
 - ☆ Homans' sign has not been proved to be an effective screen for deep vein thrombosis (DVT); therefore, it is no longer an acceptable measure for assessing DVT.

Relieving Pain

-  Perform a comprehensive pain assessment.
 - ☆ Have patient describe the pain, location, characteristics (dull, sharp, continuous, throbbing, bony, radiating, aching).
 - ☆ Ask patient what causes the pain, makes the pain worse, relieves pain. Evaluate patient for proper body alignment, pressure from equipment (casts, traction, splints).
-  Initiate activities to prevent or modify pain.
 - ☆ Assist patient with pain-reduction techniques—cutaneous stimulation, distraction, guided imagery, TENS, biofeedback.
 - ☆ Immobilize injured part.
 - ☆ Position patient in correct alignment.
 - ☆ Support splinted fracture above & below fracture when repositioning or moving patient.
 - ☆ Reposition patient with slow and steady motion; use additional personnel as needed.
 - ☆ Elevate painful extremity to diminish venous congestion.
 - ☆ Apply heat or cold modalities as prescribed. Heat versus cold is controversial. One randomly controlled trial found significantly less edema with cold packs versus heat 3 to 5 days post-injury.
 - ☆ Modify environment to facilitate rest and relaxation.
-  Administer prescribed pharmaceuticals as indicated. Encourage use of less potent drugs as severity of discomfort decreases.
-  Establish a supportive relationship to assist patient to deal with discomfort.
-  Encourage patient to become an active participant in rehabilitative plans.

NURSING ALERT

Meperidine (Demerol) may cause toxicity as it breaks down into the metabolite normeperidine, which has a 15- to 20-hour half-life, especially in patients with impaired renal function or elderly patients.

Monitoring for Development of Infection

- ✧ Clean, debride, and irrigate open fracture wound, as prescribed, as soon as possible to minimize risk of infection.
- ☆ All open fractures are contaminated.
- ☆ Begin prescribed antibiotic therapy promptly after wound culture obtained.
- ✧ Use sterile technique during dressing changes to minimize infection of wound, soft tissues, and bone.
- ✧ Evaluate patient for elevation of temperature every 4 hours.
- ✧ Note and report elevated white blood cell (WBC) counts.
- ✧ Report areas of inflammation and swelling around incision or open wound.
- ✧ Report purulent odiferous drainage.
- ✧ Obtain specimens for culture and sensitivity to determine causative organism.
- ✧ Administer antibiotic therapy as prescribed.

Promoting Adequate Hygiene

- ✧ Encourage participation in care.
- ✧ Arrange patient area and personal items for patient convenience and to promote independence.
- ✧ Modify activities to facilitate maximum independence within prescribed limits.
- ✧ Allow time for patient to accomplish task.
- ✧ Teach safe use of mobility and necessary aids.
- ✧ Assist with ADLs as needed.
- ✧ Teach family how to assist patient while promoting independence in self-care.

Promoting Physical Mobility

- ✧ Perform active and passive exercises to all non-immobilized joints.
- ✧ Encourage patient participation in frequent position changes, maintaining support to fracture during position changes.
- ✧ Minimize prolonged periods of physical inactivity, encouraging ambulation when prescribed.
- ✧ Administer prescribed analgesics judiciously to decrease pain associated with movement.

Preventing Disuse Syndrome

- ✧ Teach and encourage isometric exercises to diminish muscle atrophy.
- ✧ Encourage use of immobilized extremity within prescribed limits.

Minimizing the Psychological Effects of Trauma

- ✧ Monitor patient for symptoms of posttraumatic stress disorder.
- ☆ Memory of event; anger, helplessness, vulnerability, mood swings, depression, cognitive impairment, sleep disturbance, increased dependency, and social withdrawal.

- ☛ Assist patient to move through phases of posttraumatic stress (outcry, denial, intrusiveness, working through, completion).
- ☛ Establish trusting therapeutic relationship with patient.
- ☛ Encourage patient to express thoughts and feelings about traumatic event.
- ☛ Encourage patient to participate in decision making to reestablish control and overcome feelings of helplessness.
- ☛ Teach relaxation techniques to decrease anxiety.
- ☛ Encourage development of adaptive responses and participation in support groups.
- ☛ Refer patient to psychiatric liaison nurse or refer for psychotherapy, as needed.

Community and Home Care Considerations

- ★ Assist patient to actively exercise joints above and below the immobilized fracture at frequent intervals.
 - ☆ Isometric exercises of muscles covered by cast—start exercise as soon as possible after cast application.
 - ☆ Increase isometric exercises as fracture stabilizes.
- ★ After removal of immobilizing device (eg, cast, splint), have patient start isotonic exercises and continue with isometric exercises.
- ★ Assess the home for any fall hazards when patient ambulates.
- ★ Obtain PT/OT consultation for assistance with ADLs, transferring technique, gait strengthening, and conditioning after lengthy immobilization, as needed.
- ★ Assess orthostatic BP when patient begins to ambulate to prevent falls.

Patient Education and Health Maintenance

- ☎ Explain basis for fracture treatment and need for patient participation in therapeutic.
- ☎ Promote adjustment of usual lifestyle and responsibilities to accommodate limitations imposed by fracture.
- ☎ Instruct patient on exercises to strengthen upper extremity muscles if crutch walking is planned.
- ☎ Instruct patient in methods of safe ambulation—walker, crutches, cane.
- ☎ Emphasize instructions concerning amount of weight bearing that will be permitted on fractured extremity.
- ☎ Discuss prevention of recurrent fractures—safety considerations, avoidance of fatigue, proper footwear.
- ☎ Encourage follow-up medical supervision to monitor for union problems.
- ☎ Teach symptoms needing attention, such as numbness, decreased function, increased pain, elevated temperature.
- ☎ Encourage adequate balanced diet to promote bone and soft tissue healing.

Evaluation: Expected Outcomes

- 📖 Vital signs within normal parameters; urine output at least 30 mL/hour
- 📖 Respirations unlabored; alert and oriented
- 📖 No signs of neurovascular compromise (ie, circulation, motor, sensory intact)
- 📖 No calf pain reported
- 📖 Reports decreased pain with elevation, ice, and analgesic
- 📖 Afebrile; no wound drainage
- 📖 Performing hygiene and dressing practices with minimal assistance
- 📖 Performing active ROM correctly
- 📖 Using affected extremity for light activity as allowed
- 📖 Denies acute symptoms of stress; reports working through feelings about trauma