University of Kerbala / College of Nursing
Adult Nursing Department
Health Assessment

Musculoskeletal Assessment

ANATOMY AND PHYSIOLOGY

The musculoskeletal system provides both support and mobility for the body and protection for internal organs. This system also produces blood cells and stores minerals such as calcium and phosphorus.

SKELETON: Functions of bones include support for soft tissues and organs, protection of organs such as the brain and spinal cord, body movement, and hematopoiesis. Bones are continually remodeling and changing the collagen and mineral composition to accommodate stress placed on them. The function of each bone dictates its shape and surface features. For example, long bones act as levers; they have a flat surface for the attachment of muscles, with grooves at the end for passage of tendons or nerves. Examples of long bones are the humerus, femur, fibula, and phalanges. Short bones such as carpal and tarsal bones are cube shaped. Flat bones make up the cranium, ribs, and scapula. The vertebrae are irregularly shaped bones.

The human skeleton has two major divisions: the **axial** and **appendicular** skeletons. The **axial** skeleton includes the facial bones, auditory ossicles, vertebrae, ribs, sternum, and hyoid bone; the **appendicular** skeleton includes the scapula, clavicle, bones of the shoulders and arms, and bones of the pelvis and legs. The subsequent discussion of bones is organized by these divisions.

SKELETAL MUSCLES: Skeletal muscles are composed of muscle fibers that attach to bones to facilitate movement. Although some skeletal muscles move by reflex, all are controlled voluntarily. Skeletal muscle fibers are arranged parallel to the long axis of bones to which they attach, or they are attached obliquely. Muscles attach to a bone, ligament, tendon, or fascia.

JOINTS: Joints are articulations where two or more bones come together. They help hold the bones firmly while allowing movement between them. Joints are classified in two ways: by the type of material between them (fibrous, cartilaginous, or synovial) and by their degree of movement. Immovable joints are **synarthrodial** (e.g., the suture of the skull); slightly movable joints are **amphiarthrodial** (e.g., the symphysis pubis); and freely movable joints are

diarthrodial (e.g., the knee and the distal interphalangeal [DIP] joint of the distal fingers).

Diarthrodial joints are further classified by their type of movement. Only the diarthrodial joints have one or more ranges of motion. "See (Table 1) for types of movement of each diarthrodial joint". [(1)]**Hinge** joints (e.g., the knee, elbow, and fingers) permit extension and flexion. Some hinge joints allow hyperextension; however, there is variability among individuals, not all hinge joints are able to hyperextend. [(2)]**Pivot** joints permit movement of one bone articulating with a ring or notch of another bone such as the head of the radius, which articulates with the radial notch of the ulna. The ends of saddle shaped bones articulate with one another: the base of the thumb is the only example. [(3)]**Condyloid or ellipsoidal** joints consist of the condyle of one bone that fits into the elliptically shaped portion of its articulating bone (e.g., the distal end of the radius articulates with three wrist bones). [(4)]**Balland**- socket joints are made of a ball-shaped bone that fits into a concave area of its articulating bone (e.g., the head of the femur fits into the acetabulum within the pelvis). [(5)]**Gliding** joints permit movement along various axes through relatively flat articulating surfaces such as joints between two vertebrae.

Diarthrodial joints are synovial joints because they are lined with synovial fluid (Fig. 1). Synovial fluid lubricates the joint to facilitate its movement in various directions.

LIGAMENTS AND TENDONS: The difference between ligaments and tendons is more functional than structural. Ligaments are strong, dense, flexible bands of connective tissue that hold bones to bones (Fig. 2). They can provide support in several ways: by encircling the joint, gripping it obliquely, or lying parallel to the bone ends across the joint. They can simultaneously allow some movements while restricting others.

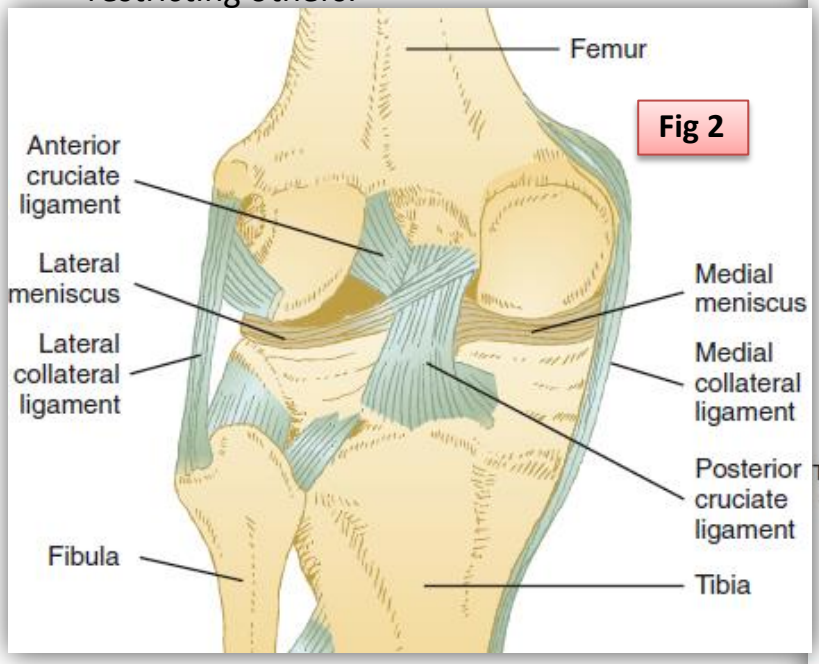
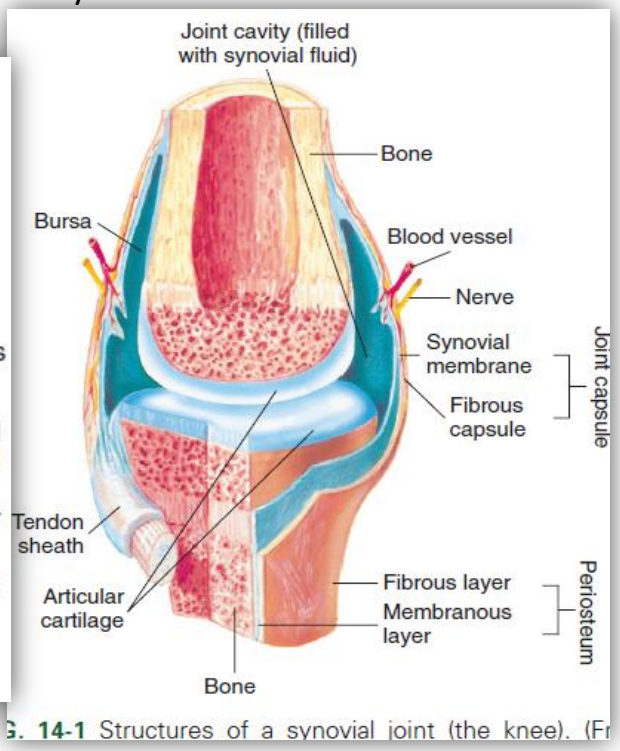


Fig 2



G. 14-1 Structures of a synovial joint (the knee). (Fr

Conversely, tendons are strong, non-elastic cords of collagen located at the ends of muscles to attach them to bones (see Fig. 1). Tendons support bone movement in response to skeletal muscle contractions, transmitting remarkable force at times from the contracting muscles to the bone without sustaining injury themselves.

CARTILAGE AND BURSAE: Cartilage is a semi smooth, gel like supporting tissue that is strong and able to support weight. The upper seven pairs of ribs are connected directly to the sternum by costal cartilage. The flexibility of the cartilage allows the thorax to move when the lungs expand and contract. Cartilage also reinforces respiratory passages such as the nose, larynx, trachea, and bronchi. It forms a cap over the ends of long bones, providing a smooth surface for articulation (see Fig. 1). Because it contains no blood vessels, it receives nutrition from the synovial fluid forced into it during movement and weight-bearing activities. For this reason, weight-bearing activity and joint movement are essential to maintaining cartilage health. **Bursae** are small sacs in the connective tissues adjacent to selected joints such as the shoulders (the glenohumeral joint) and knees. Each bursa is lined with synovial membrane containing synovial fluid, which acts as a lubricant to reduce friction when a muscle or tendon rubs against another muscle, tendon, or bone (see Fig. 1).

GENERAL HEALTH HISTORY

1- **Present Health Status**:
2- **Past Health History:** (medical & surgical)
3- **Family History:**
4- **Personal and Psychosocial History**:

Physical examination (Abdominal)

Begin examination as patient enters rooms, observing gait and posture. During examination, note ease of movement when patient walks, sits, rises, takes off garments, and responds to directions.

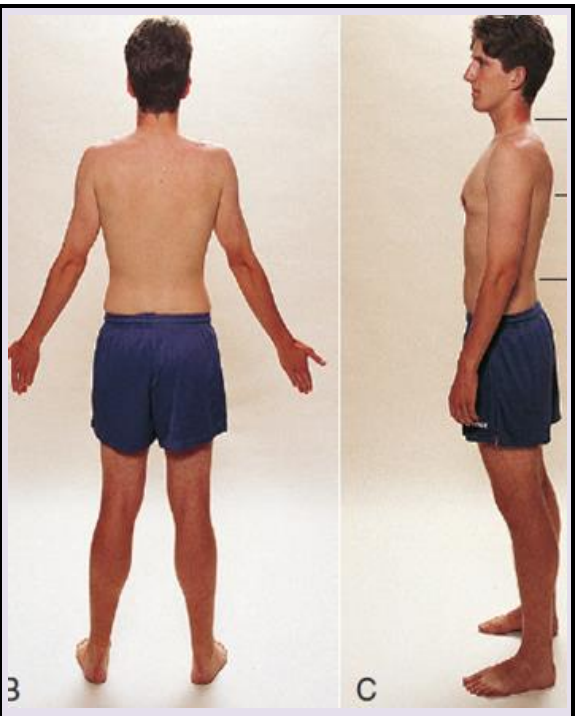
Physical Exam	Normal finding	Abnormal finding
INSPECT **A-Posture and General Guidelines**: Inspect skeleton and extremities, comparing sides Inspect anterior, posterior, lateral aspects of posture; ability to stand erect; body parts; extremities.	A-1-Bilateral symmetry of length, circumference, alignment, position and number of skinfolds; symmetric body parts; and aligned extremities. C-1- Approximately symmetric bilateral muscle size.	A-1-Gross deformity, lordosis, kyphosis, scoliosis, bony enlargement. B- Discoloration, swelling, or masses. C-1- Gross hypertrophy or atrophy, fasciculations, or spasms.

1-*Size, alignment, contour, symmetry:* Measure extremities when lack of symmetry is noted in length or circumference.

B-Inspect skin and subcutaneous tissues over muscles, cartilage, bones, joints

C- Inspect muscles and compare sides

1- *Size and symmetry*:



A- Palpate: all bones, joints, surrounding muscles (palpate inflamed joints last)

1-*Muscle tone*.

2-*Characteristics*.

B-Test each major joint and related muscle groups for **active** and **passive** range of motion, and compare sides. **Ask** patient to move each joint through range of motion (see instructions for specific joints and muscles in individual sections that follow), then ask patient to relax as you passively move same joints until end of range is felt. Goniometer.

C-Test major muscle groups for **strength**, and compare contralateral sides For each muscle group, **Ask** patient to contract a muscle by flexing or extending a joint and to resist as you apply opposing force. Compare bilaterally.

A-1-Firm

B- Passive range of motion often exceeds active range of motion by 5 degrees. Range of motion with passive and active maneuvers should be equal between contralateral joints.

C- Bilaterally symmetric strength with full resistance to opposition.

D-1- Palmar and phalangeal creases, palmar surfaces with central depression with prominent, rounded mound on thumb side (thenar eminence) and less prominent hypothenar eminence on little-finger side.

A-1- Hard or doughy, spasticity.

A-2- Heat, tenderness, swelling, fluctuation of a joint, synovial thickening, crepitus, resistance to pressure, or discomfort to pressure on bones and joints.

B- Pain, limitation of motion, spastic movement, joint instability, deformity, contracture, discrepancies greater than 5 degrees between active and passive range of motion. When increase or limitation in range of motion is found, measure angles of greatest flexion and extension with goniometer, as shown in figure below, and compare with values as described for specific joints in individual extremities.

C- Inability to produce full resistance. Grade muscular strength according to the (Table2).

D-2- Deviation of fingers to ulnar side or inability to fully extend fingers; swan neck or boutonnière deformities.

D-3- Spindle-shaped fingers, bony overgrowths at phalangeal joints.

E- Nodules, swelling, bogginess,

D- Hands and Wrists: Inspect dorsum and palm of each hand

1-*Characteristics and contour*.

2-*Position*:

3-*Shape*:

E- Palpate each joint in hand and wrist Palpate interphalangeal joints with thumb and index finger, as shown in this figure. Metacarpophalangeal joints with both thumbs, as shown in this figure. and wrist and radiocarpal groove with thumbs on dorsal surface and fingers on palmar aspect of wrist, as shown in this figure.

D-2- Fingers able to fully extend and align with forearm when in close approximation to each other.

D-3- Lateral finger surfaces gradually tapered from proximal to distal aspects.

E- Joint surfaces smooth.

tenderness, or ganglion.

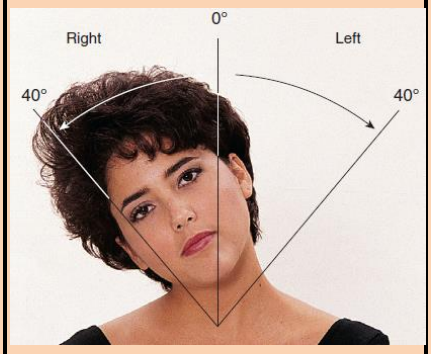
Assess integrity of median nerve:

1- Tinel sign: Strike median nerve where it passes through carpal tunnel with index or middle finger.

2- Thumb abduction test: Apply downward pressure on thumb as patient holds thumb perpendicular to hand, palm side up.

3-Phalen test: Have patient hold both wrists in fully palmar-flexed position with dorsal surfaces pressed together for 1 minute.

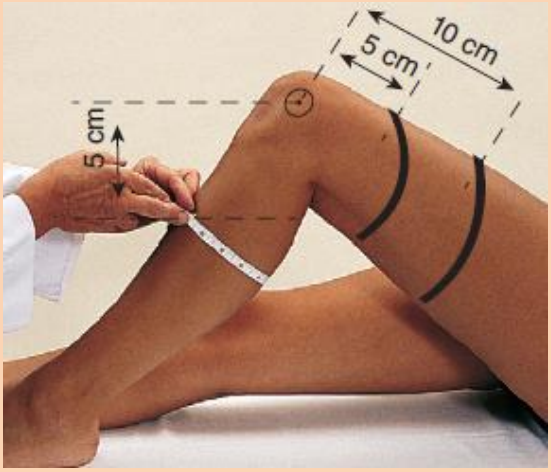
2- Full resistance to pressure.



1- Tingling sensation radiating from wrist to hand along pathway of median nerve.

2-Inability to produce full resistance.

3- Numbness, paresthesia in distribution of median nerve.



Test range of motion: Ask patient to perform the movements (Table1)

Test muscle strength: Ask patient to maintain

flexion and extension, while you apply opposing force see (Table 2). And to assess the grade of muscle strength function see (Table3).

Table 1 **RANGE OF MOTION FOR DIARTHRODIAL JOINTS**

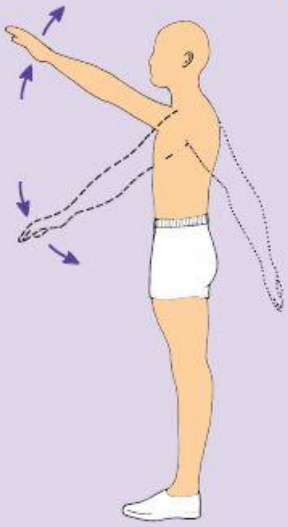
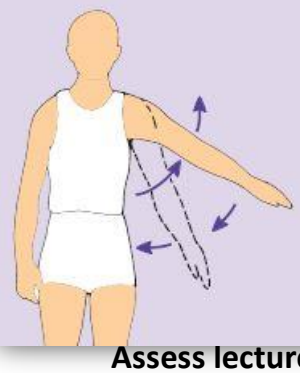
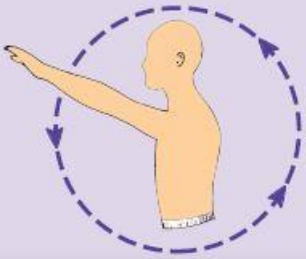
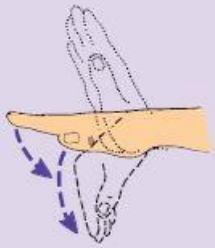
BODY PART	TYPE OF JOINT	TYPE OF MOVEMENT
Neck and Cervical Spine	Pivotal	Flexion: Bring chin to rest on chest. Extension: Return head to erect position. Hyperextension: Bend head back as far as possible.
		
		Lateral flexion: Tilt head as far as possible toward each shoulder.
		Rotation: Turn head as far as possible to right and left.
Shoulder	Ball and socket	Flexion: Raise arm from side position forward to position above head. Extension: Return arm to position at side of the body. Hyperextension: Move arm behind body, keeping elbow straight.
		
		Abduction: Raise arm to side to position above head with palm away from head. Adduction: Lower arm sideways and across body as far as possible.
		Internal rotation: With elbow flexed, rotate shoulder by moving arm until thumb is turned inward and toward back. External rotation: With elbow flexed, move arm until thumb is upward and lateral to head.
		Circumduction: Move arm in full circle. Circumduction is combination of all movements of ball-and-socket joint.
Elbow	Hinge	Flexion: Bend elbow so lower arm moves toward its shoulder joint and hand is level with shoulder. Extension: Straighten elbow by lowering hand. Hyperextension: Bend lower arm back as far as possible. Not all elbows hyperextend.
		
Forearm	Pivotal	Supination: Turn lower arm and hand so palm is up. Pronation: Turn lower arm so palm is down.
		
Wrist	Condyloid	Flexion: Move palm toward inner aspect of the forearm. Extension: Move fingers so fingers, hands, and forearm are in same plane. Hyperextension: Bring dorsal surface to hand back as far as possible.
		

Table 1 RANGE OF MOTION FOR DIARTHRODIAL JOINTS—cont'd

BODY PART	TYPE OF JOINT	TYPE OF MOVEMENT
		Hyperextension: Bring dorsal surface to hand back as far as possible. Radial flexion: Bend wrist medially toward thumb. Ulnar flexion: Bend wrist laterally toward fifth finger; referred to as radial/ulnar deviation.
Fingers	Condyloid hinge	Flexion: Make fist. Extension: Straighten fingers. Hyperextension: Bend fingers back as far as possible.
		Abduction: Spread fingers apart. Adduction: Bring fingers together.
Thumb	Saddle	Flexion: Move thumb across palmar surface of hand. Extension: Move thumb straight away from hand. Abduction: Extend thumb laterally (usually done when placing fingers in abduction and adduction).
		Adduction: Move thumb back toward hand. Opposition: Touch thumb to each finger of same hand.
Hip	Ball and socket	Flexion: Move leg forward and up. Extension: Move leg back beside other leg.

BODY PART	TYPE OF JOINT	TYPE OF MOVEMENT
		Hyperextension: Move leg behind body.
		Abduction: Move leg laterally away from body. Adduction: Move leg back toward medial position and beyond if possible.
		Internal rotation: Turn knee toward the inside. External rotation: Turn knee toward the outside.
		Circumduction: Move leg in circle.
Knee	Hinge	Flexion: Bring heel back toward back of thigh. Extension: Return heel to floor.

Table 1 RANGE OF MOTION FOR DIARTHRODIAL JOINTS—cont'd

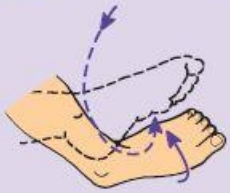
BODY PART	TYPE OF JOINT	TYPE OF MOVEMENT
Ankle 	Hinge	Dorsiflexion: Move foot so toes are pointed upward. Plantar flexion: Move foot so toes are pointed downward.
Foot 	Gliding	Inversion: Turn sole of foot medially. Eversion: Turn sole of foot laterally.
Toes 	Condyloid	Flexion: Curl toes downward. Extension: Straighten toes. Abduction: Spread toes apart. Adduction: Bring toes together.
		

Table 2 SCREENING TESTS FOR MUSCLE STRENGTH

MUSCLES TESTED	PATIENT ACTIVITY	NURSE ACTIVITY
Ocular musculature		
Lids	Close eyes tightly.	Attempt to resist closure.
Eye muscles	Track object in six cardinal positions.	
Facial musculature	Blow out cheeks.	Assess pressure in cheeks with fingertips.
	Place tongue in cheek.	Assess pressure in cheek with fingertips.
	Stick out tongue; move it to right and left.	Observe strength and coordination of thrust and extension.
Neck muscles	Extend head backward.	Push head forward.
	Flex head forward.	Push head backward.
	Rotate head from side to side.	Observe mobility and coordination.
	Touch shoulders with head.	Observe range of motion.
Deltoid	Hold arms upward.	Push down on arms.
Biceps	Flex arm.	Pull to extend arm.
Triceps	Extend arm.	Push to flex arm.
Wrist musculature	Extend elbow.	Push to flex.
	Flex elbow.	Push to extend.
Finger muscles	Extend fingers.	Push dorsal surface of fingers.
	Flex fingers.	Push ventral surface of fingers.
	Spread fingers.	Hold fingers together.
Hip musculature	In supine position raise extended leg.	Push down on leg above knee.
Hamstring, gluteal, abductor, and adductor muscles of leg	Sit and perform alternate leg crossing.	Push in opposite direction of crossing limb.
Quadriceps	Extend leg.	Push to flex leg.
Hamstring	Bend knees to flex leg.	Push to extend leg.
Ankle and foot muscles	Bend foot up (dorsiflexion).	Push to plantar flexion.
	Bend foot down (plantar flexion).	Push to dorsiflexion.
Antigravity muscles	Walk on toes.	
	Walk on heels.	

Table 3

Muscle Function Level	Grade
No evidence of contractility	0
Slight contractility, no movement	1
Full range of motion, gravity eliminated*	2
Full range of motion against gravity	3
Full range of motion against gravity, some resistance	4
Full range of motion against gravity, full resistance	5