

***living anatome:***  
**On-the-Wards Review: Back & Lower Extremity**

**I. INTRODUCTION**

**II. WARM-UP**

**III. BACK**

**Inspection:**

- Vertebral Column
  - Segments of the column:
    - 7 Cervical
    - 12 Thoracic
    - 5 Lumbar
    - 5 Sacral
    - 4 Coccygeal
  - Curvatures
    - Primary: thoracic and sacral (concave, think “fetal position”)
    - Secondary: cervical and lumbar (convex, lifting the head, then walking)

**Palpation (in partners):**

Palpate spinous processes, paravertebral muscles (erector spinae), iliac crest, PSIS & ASIS, sacroiliac (SI) joint.

*Clinical correlate:* Tenderness to palpation at spinous processes can suggest fracture or dislocation, especially if preceded by trauma, infection, or arthritis. Tenderness to percussion can arise from osteoporosis, infection, or malignancy.

*Clinical correlate:* Ankylosing spondylitis and sacroiliitis can produce SI tenderness.

**Range of Motion:**

There are four major movements of the back: forward flexion, lateral flexion, extension, rotation.

*Clinical correlate:* Pain with these movements, which radiates into the leg, can indicate radiculopathy. Forward flexion combined with rotation is movement combo most likely to predispose toward IV disc herniation.

**Exercises:**1. *Pilates push-up*

- *Emphasizing articulation through segments of the spine*

*Clinical correlate:* Kyphosis (excessive thoracic curvature), Lordosis (excessive lumbar curvature), Scoliosis (lateral deviation of the spine)

*Clinical correlate:* Winged scapula with loss of innervation to the serratus anterior via damage to the long thoracic nerve.

2. *Hundreds, Half Roll Back, Half Roll Back with Rotation (Pilates)*

- Muscles: Rectus abdominus, internal/external obliques, transversospinales
- Function: Flexion: Rectus abdominus, internal/external obliques; Rotation: Transversospinalis, internal/external obliques

3. *Triangle Pose (yoga)*

- Muscles: Internal/external obliques, quadratus lumborum
- Function: Lateral flexion of the spine

**IV. HIP****Inspection:**

The hip joint is where the head of the femur articulates with the acetabulum, forming a multi-axial ball-and-socket joint. It has less range of motion than the shoulder, but greater stability. Although the joint itself is not directly observed, much can be gleaned by observing a patient's gait. Note that what most individuals consider "hip pain," is actually musculoskeletal pain over their greater trochanters (e.g. from bursitis, hip flexor strain, etc).

**Palpation:**

Palpate the ASIS, the iliac crest, the greater trochanter, ischial tuberosity.

*Clinical correlate:* Tenderness over either the trochanter or the ischial tuberosity can imply bursitis.

**Range of Motion:**

The movements of the hip are: flexion, extension, abduction, adduction, internal rotation, and external rotation.

**Exercises:**1. *Shoulder Bridge (Pilates)*

- *Featured muscle:* Gluteus maximus, hamstrings (all except short head of biceps femoris), iliopsoas, pectineus

- Function: Extension of hip: Gluteus maximus and hamstrings; Flexion of hip: Iliopsoas and pectineus
- *Innervation*: Maximus: inferior gluteal n. (L5-S2); Hamstrings: tibial n. (L4-S3); Pectineus: Femoral n. (L2-4); Psoas: Ventral rami (L2-3)

2. *Side-lying leg series: Abduction (Pilates)*

- *Featured muscle*: Tensor fasciae latae, gluteus medius, gluteus minimus
- *Function*: Abduction of femur
- *Innervation*: Superior gluteal n. (L4-S1)

*Clinical correlate*: Trendelenburg Gait: Weakness of the abductor muscles results in this gait, where, during the stance phase, the patient's pelvis shifts away from the affected side, and the trunk lurches toward the weakened side to compensate.

4. *Side-lying leg series: Staggered legs (Pilates)*

- *Featured muscle*: Medial compartment: gracilis, pectineus, adductor longus, adductor brevis, adductor magnus
- *Function*: Adduction of femur
- *Innervation*: All innervated by obturator n. (L2-4), EXCEPT for adductor magnus, which is innervated by obturator n. and a branch of tibial n., and pectineus, which is innervated by femoral n.

5. *Clam-shell (Pilates)*

- *Featured muscle*: Lateral rotators (piriformis, gemelli superior, obturator internus, gemelli inferior, quadratus femoris, obturator externus)
- *Function*: Lateral rotation of hip
- *Innervation*: Piriformis: branches of sacral plexus (S1-2); Gemelli superior and obturator internus: n. to O.I. (L5-S1); Gemelli inferior and quadratus femoris: n. to Q.F (L5-S1); Obturator externus: obturator n. (L2-4)

*Clinical correlate*: The sciatic nerve runs deep (and sometimes through) the piriformis muscle. If the muscle is hypertrophied or in spasm, the nerve can be impinged, producing Piriformis Syndrome, with symptoms that mimic sciatica.

**Special Maneuvers:**

*Straight Leg Raise*: To test for radicular pain, place the patient in a supine position with legs extended and passively raise one of the patient's legs and dorsiflex the foot. Sharp pain radiating down the leg indicates nerve root compression (e.g. from lumbar disk herniation).

**V. KNEE**

(While in Sitting Forward Fold (*yoga*))

**Inspection:**

The knee joint is the largest joint in the body, composed of the femur, the tibia, the fibula and the patella. It depends on ligaments for its stability, although it is highly vulnerable to injury. Cruciate ligaments (anterior and posterior) stabilize the knee joint and prevent anterior and posterior displacement of tibia, respectively. Collateral ligaments stabilize the knee joint medially and laterally. The two menisci (medial and lateral) deepen the surfaces of the proximal tibia and serve as shock absorbers. Superior contour of the knee joint is provided by the quadriceps muscles. Observe the medial and lateral indents; lack of hollow space can indicate swelling.

**Palpation:**

Palpate the patella and the patellar tendon, medial/lateral condyles, medial/lateral collateral ligaments, suprapatellar pouch, prepatellar pouch, pes anserine bursa, and popliteal space.

**Signs:**

Bulge, Balloon, Balloting.

**Range of Motion:**

The movements of the knee include flexion and extension.

**Exercises:**

(move thru modified Sun Salutation series B for extra movement (*yoga*))

1. *Warrior I*

- *Featured muscle:* iliopsoas, and the quadriceps femoris (rectus femoris, vastus medialis, vastus intermedius, vastus lateralis)
- *Function:* Thigh flexion (iliopsoas and rectus femoris); knee extension (rectus and vasti)
- *Innervation:* Femoral n. (L2-4)

2. *Warrior II*

- *Featured muscle:* Hamstring muscles: semitendinosus, semimembranosus, biceps femoris (long head) and gluteus maximus
- *Function:* Hip extension (all listed above) and knee flexion (semitendinosus, semimembranosus, biceps femoris (both heads))
- *Innervation:* Tibial n. (L4-S3)

**Special Maneuvers:**

Abduction stress test (MCL): Patient should lie supine with the knees slightly flexed. Lift one leg, stabilizing the lateral aspect of the knee with one hand and medial side of the ankle with the other hand. Push medially against the knee and laterally against the ankle to place a valgus stress (knock-knees) on the knee.

Adduction stress test (LCL): Patient should lie supine with the knees slightly flexed. Lift one leg, stabilizing the medial aspect of the knee with one hand and

lateral side of the ankle with the other hand. Push laterally against the knee and medially against the ankle to place a varus stress (bow-legged) on the knee.

Anterior Drawer sign (ACL): Patient should lie supine with knees flexed and feet flat on the table. Place your thumbs in the joint and cup your hands around the posterior aspect of the leg. Pull forward.

*Clinical correlate:* Unhappy triad: ACL, medial meniscus, and medial collateral ligament; often when a patient is injured from a lateral blow to the knee, this can result in injury to all three structures because they are connected.

Posterior Drawer Sign (PCL): Patient should lie supine with knees flexed and feet flat on the table. Place your thumbs in the joint and cup your hands around the posterior aspect of the leg. Push back.

## **VI. ANKLE & FOOT**

### **Inspection:**

The ankle joint is where the tibia and fibula meet the talus, forming a hinge joint. Inspect the normal contours of the ankle and foot for any swelling or deformity. On the medial aspect of the ankle there is the deltoid ligament; on the lateral aspect are the anterior and posterior talofibular ligaments and the calcaneofibular ligament. The anterior talofibular ligament is the one most likely to be sprained.

### **Palpation:**

Palpate the lateral and medial malleoli, the Achilles tendon, the heel, the metatarsophalangeal joints (MTP's), and the head of the metatarsal bones.

### **Range of Motion:**

The ankle can dorsiflex, plantar flex, invert, and evert.

### **Exercises:**

1. *Downward Dog (lowering and lifting heels to emphasize plantar flexion and stretching of posterior compartment of leg in dorsiflexion)*

- Muscles: Tibialis anterior, soleus, gastrocnemius
- Function: Dorsiflexion: Ant. Tibialis; Plantar flexion: Soleus, Gastrocnemius, tibialis posterior
- Innervation: Deep Peroneal n. (L4-S1): Tibialis anterior; Tibial n. (L4-S3): Soleus, gastrocnemius, tibialis posterior

2. *Bound Ankle Pose (yoga)*

- Muscles: Tibialis anterior and posterior

- Function: Foot inversion
- Innervation: Deep Peroneal n. (L4-S1): Tibialis anterior;Tibial n. (L4-S3): Tibialis posterior

## **VII. SAVASANA**

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