Live Orthopedic Demonstration
930–11:30am

Live Demonstration Orthopedic Exam: See It, Do It

SPEAKER
C. Christopher Smith, MD, FACP

Presenter Disclosure Information

The following relationships exist related to this presentation:
► Christopher Smith, MD, has no financial relationships to disclose.

Off-Label/Investigational Discussion
► In accordance with pmICME policy, faculty have been asked to disclose discussion of unlabeled or unapproved use(s) of drugs or devices during the course of their presentations.

Learning Objective

Through live demonstration of orthopedic maneuvers, you will improve your ability to diagnose common musculoskeletal complaints of the upper body, low back, hip, and knee

Introduction

• MSK-related complaints are the most common reason for primary care and emergency department visits
  – 10% to 28% of all visits
  – 70% of new MSK complaints treated by primary care physicians
• Most primary care physicians report insufficient training in musculoskeletal medicine
• Focus on office-based MSK complaints
• Demonstrate common maneuvers to assess common conditions


The Painful Shoulder

Shoulder and Neck Pain

• Anatomy
• History
• Differential based on patient’s age and location of pain
• Physical exam maneuvers
Case 1: 45-year-old man with new shoulder pain

The pain is in his anterior and lateral shoulder and has gradually worsened over the last three weeks. It is dull and constant and keeps him up at night.

He also notices marked discomfort when he combs his hair and cannot get sweaters from the top of his closet due to pain and weakness.

He denies any trauma but believes the pain began after throwing batting practice to his son’s little league team.

He works as an investment banker.

Causes of Shoulder Pain

- Acromioclavicular Osteoarthritis
- Adhesive Capsulitis
- Biceps Tendonitis
- Brachial Plexus Neuritis
- Cervical Radiculopathy
- Glenohumeral Arthritis
- Instability
- Impingement Syndrome
- Systemic Inflammatory Disorders
- Referred Pain
  - Diaphragmatic
  - Subdiaphragmatic
  - Intrathoracic Causes

Causes of Shoulder Pain in the Primary Care Setting

- Impingement Syndrome >70%
- Adhesive Capsulitis 12%
- Bicipital Tendonitis 4%
- A/C Joint OA 7%
- Other 7%

What Is Impingement Syndrome?

- Any age, but risk increases with age
- Anterior or lateral shoulder pain
  - Should not radiate below elbow
- Pain exacerbated by abduction and forward flexion
- Night pain common
Age and Shoulder Pain

- Young (< 30 y.o.)
  - Dislocations/instability of glenohumeral joint
  - Separation of AC joint
  - Overuse injury

- Less Young (30-60 y.o.)
  - Impingement syndrome
  - Adhesive capsulitis (esp. In diabetics)
  - Separation/overuse as above

- Older (>60 y.o.)
  - Impingement syndrome (non-traumatic tears)
  - Adhesive capsulitis
  - Systemic conditions (if bilateral, PMR, RA)

Physical Examination

- Inspection
- Palpation

Physical Examination

- Inspection
- Palpation
- Range of Motion
  - Passive and Active
    - Pain with active >> passive ROM indicates soft tissue disorder
    - Pain with active = passive ROM likely indicates intra-articular process
- Strength and Sensation
- Specific Maneuvers to Confirm Diagnosis

Cervical Radiculopathy

- Dysfunction of cervical spine nerve root
  - C7 cervical nerve root affected in majority of cases, followed by C6
- Inflammatory process initiated by nerve root compression which results in nerve root swelling
- Compression may be from a disc herniation, degenerative changes about the neural foramen, or both
Foraminal Compression Test (Spurling Test)

- To confirm cervical radiculopathy:
  - Position patient with the neck extended and head rotated
  - Apply downward pressure on head
- Test is + if pain radiates into the limb ipsilateral to the side to which the head is rotated
- Specificity 93%, sensitivity 30% in diagnosing acute radiculopathy


Case 1: 45-year-old man with new shoulder pain

The pain is in his anterior and lateral shoulder and has gradually worsened over the last three weeks. It is dull and constant and keeps him up at night. He also notices marked discomfort when he combs his hair and cannot get sweaters from the top of his closet due to pain and weakness. He denies any trauma but believes the pain began after throwing batting practice to his son’s little league team. He works as an investment banker.

45-year-old man with new shoulder pain, cont’d

On inspection, his left humerus is riding slightly higher than his right.

There is pain with palpation of the lateral subacromial space.

ROM reveals pain with abduction and forward flexion; it is worse with active than passive movement.

Positive empty can and Neer tests.

68-year-old woman with severe shoulder pain

- You evaluate her for left shoulder pain and weakness that seemingly began a week ago as she lifted a gallon of milk out of the refrigerator. She reports having intermittent shoulder pain for many years, but this is the most severe.
- On examination she has tenderness in the lateral shoulder with pain and weakness on external rotation and abduction.
- You passively abduct her arm to 160 degrees and ask the patient to slowly lower her arm. At approximately 90 degrees, she is unable to continue to lower her arm due to weakness and she drops it to her side.

Supraspinatus Tendon Tear

- Positive “Drop-Arm” Test
- Supraspinatous weakness
- External rotation weakness
- Impingement signs
- Greater than 60 years old


Diagnosing Rotator Cuff Tear

<table>
<thead>
<tr>
<th># Positive signs*</th>
<th>Age</th>
<th>Probability of rotator cuff tear</th>
</tr>
</thead>
<tbody>
<tr>
<td>All 3</td>
<td>Any</td>
<td>98%</td>
</tr>
<tr>
<td>Any 2</td>
<td>&gt;60</td>
<td>98%</td>
</tr>
<tr>
<td>Any 2</td>
<td>&lt;60</td>
<td>64%</td>
</tr>
<tr>
<td>Any 1</td>
<td>&gt;70</td>
<td>76%</td>
</tr>
<tr>
<td>Any 1</td>
<td>&lt;40</td>
<td>12%</td>
</tr>
<tr>
<td>None</td>
<td>Any</td>
<td>5%</td>
</tr>
</tbody>
</table>

46-year-old male with shoulder pain after moving furniture

- 46-year-old male who moves furniture on the weekends and works as a handyman during the week presents with right anterior shoulder pain. The pain began after a particularly heavy move, where he moved over a hundred boxes. No fever, chills, night sweats; no weakness or numbness. No prior injuries.
- He points to his anterior shoulder with one finger. He has a normal ROM and good strength. Pain is more pronounced with active forward flexion than with passive. With elbow extended and hand supinated, palpation of the anterior shoulder while the patient forward flexes the shoulder 30 degrees against resistance reproduces pain, as do tests for impingement.

Clinical Tests for Rotator Cuff Disease and Tears

<table>
<thead>
<tr>
<th>Test</th>
<th>+ LR</th>
<th>- LR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Painful Arch (RCD)</td>
<td>3.7</td>
<td>0.36</td>
</tr>
<tr>
<td>Drop Arm (RCD)</td>
<td>3.3</td>
<td>0.82</td>
</tr>
<tr>
<td>External Resistance (RCD)</td>
<td>2.6</td>
<td>0.49</td>
</tr>
<tr>
<td>External Lag (Full Tear)</td>
<td>7.2</td>
<td>0.57</td>
</tr>
<tr>
<td>Internal Lag (Full Tear)</td>
<td>5.6</td>
<td>0.04</td>
</tr>
</tbody>
</table>

RCD=Rotator Cuff Disease


Bicipital Tendonitis

- Inflammation of long head of the biceps tendon – 95% associated with impingement syndrome


Yergason Test

Evaluate biceps tendon by palpating bicipital groove while patient flexes elbow to 90 degrees and supinates against resistance


Speed’s Test

With elbow extended and hand supinated, palpate bicipital groove while patient attempts to forward flex shoulder 30 degrees against resistance

### Adhesive Capsulitis or Frozen Shoulder

- Thickening and contraction of the capsule surrounding the glenohumeral joint
- Risk Factors:
  - Diabetes
  - Hypothyroidism
  - AVN of glenohumeral head
  - Reflex Sympathetic Dystrophy (RSD)
  - Immobility!!

- Insidious onset of pain
- Pain in most planes of movement
- Pain in deltoid, but no tenderness to palpation
- Pain and limited active and passive ROM
  - Need AP X-ray of glenohumeral joint to rule out glenohumeral arthritis
- Night pain

### Bicipital Tendon Tear

- Proximal aspect of long head of biceps tendon
- After especially vigorous lifting
- Often in setting of chronically inflamed tendon
- Loss of elbow flexion/supination
- “Popeye Sign”—bulge just proximal to antecubital fossa

### Summary Shoulder and Neck Pain

- Impingement syndrome most common cause of shoulder pain in the primary care setting
- Systematic approach to physical exam
- Range of Motion: pain with abduction, forward flexion; active > passive
- Empty Can, Neer’s, Hawkins tests to confirm
- Drop Arm indicates a complete tear — esp. in pts >60 years old

### Summary

- Cervical Radiculitis
  - Pain radiates below elbow or in trapezius
  - Spurling maneuver to confirm
- Adhesive Capsulitis
  - DM or immobile shoulder
  - Limited ROM in most planes
  - Pain with both active passive ROM
- Biceps Tendonitis
  - Associated with impingement syndrome
  - Reproduced with Yergason and Speed’s tests
  - “Popeye” sign for bicep tendon tear

### Elbow and Wrist Pain
31-year-old man with elbow pain

- He presents with left lateral elbow pain that has worsened over the last 2-3 weeks. It occasionally radiates to his forearm and up to his shoulder.
- He is a cook for the local country club, flipping burgers on the grill. On his time off he utilizes the tennis and golf facilities.
- On exam, there is tenderness to palpation of the origin of the extensor tendon mass of his left elbow.

Lateral Epicondylitis

- A common overuse syndromes in primary care
  - Annual incidence ~ 1-3%
- Caused by overuse of the extensor tendons of forearm from repetitive wrist dorsiflexion with supination and pronation.
- Results in microtears, collagen degeneration, and angiofibroblastic proliferation.

Lateral Epicondylitis

- At risk occupations:
  - Painters, plumbers, carpenters, auto workers, cooks, butchers
- Repetitive movements and weight lifting required in these occupations leads to injury.
- If untreated, may persist for an average of 6-24 months.

New mother with wrist pain

- 26-year-old woman presents to your office with her 3-month-old infant.
- She reports right thumb and wrist pain on the radial aspect for the last 6 weeks, making it hard to hold her baby.
- She also describes numbness on the back of her thumb and index finger.
- Denies any trauma.

Finkelstein Test

Patient flexes thumb across the palm and the clinician applies ulnar deviation to the wrist, reproducing the pain.


de Quervain’s Tenosynovitis

- Inflammation of tendons in first dorsal compartment (abductor pollicis longus and extensor pollicis brevis)
- Caused by activities requiring forceful grasping with ulnar deviation or repetitive use of thumb
- Common in new mothers grasping infant or daycare workers; exacerbated as infant gets heavier


Other Causes of Wrist Pain

- Cervical disc disease with radiation, particularly C5-6 nerve root
- Carpal tunnel syndrome
- Dorsal ganglion at the wrist
- OA at the first CMC joint or radioscaphoid joint
- Osteonecrosis of the lunate
- Cheiralgia paresthetica – neuropathy of the radial sensory nerve (i.e., the superficial radial nerve) at the wrist
- Scaphoid fracture (tenderness at floor of anatomical snuffbox)
- Synovitis of other wrist tendons

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Carpal Tunnel Syndrome (CTS)

- Compressive neuropathy of median nerve at wrist
- Classic CTS associated with symptoms affecting ≥ 2 of the first through third digits; 4th and 5th digits, wrist pain, radiation of pain proximal to the wrist may also occur
  - Unlikely if no symptoms present in any of first 3 digits
- Physical: + Phalen’s, Tinel and Durkin tests, weakness of resisted thumb abduction


Scaphoid Fracture

- Most common carpal fracture
- Fall on out-stretched hand
- Tenderness in anatomic snuff box

Carpometacarpal Joint Osteoarthritis

- Pain at base of thumb
- Most common location in hand
- Worsened by pinching or grasping or forceful use
- Assess with “grind test”
Wrist Summary

- de Quervain’s tenosynovitis
- Pain along thumb abductor and extensor tendons
- Finkelstein test
- Carpal Tunnel Syndrome
- Pain in first three digits
- Phalen, Tinel, Durkin tests
- CMC arthritis
  - Pain at base of thumb/top of “snuff box”
  - Grind test

Back Pain

Goals of Evaluation

To identify those needing urgent attention
- Look for symptoms suggesting an underlying condition that may be more serious
- Determine who may need urgent surgical evaluation

Low Back Pain: Differential Diagnosis

<table>
<thead>
<tr>
<th>Causes</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nonspecific LBP (ie, no specific disease or spinal abnormality identified)</td>
<td>&gt;85</td>
</tr>
<tr>
<td>Lumbar strain/sprain, ie, “idiopathic” or mechanical LBP</td>
<td>70</td>
</tr>
<tr>
<td>Degenerative disk, facets (usually age-related)</td>
<td>10</td>
</tr>
<tr>
<td>herniated disk</td>
<td>4</td>
</tr>
<tr>
<td>Osteoporotic compression fracture</td>
<td>4</td>
</tr>
<tr>
<td>Spinal stenosis</td>
<td>3</td>
</tr>
<tr>
<td>Spondylolisthesis</td>
<td>2</td>
</tr>
<tr>
<td>Visceral disease (pelvic, renal disease, aortic aneurysm)</td>
<td>2</td>
</tr>
<tr>
<td>Neoplasia (e.g., multiple myeloma, spinal cord tumors)</td>
<td>1</td>
</tr>
<tr>
<td>Congenital disease (e.g., kyphosis, scoliosis)</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Traumatic fracture</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Inflammatory arthritis (e.g., ankylosing spondylitis)</td>
<td>0.3</td>
</tr>
</tbody>
</table>


"Red Flags" for Potentially Serious Cause of Low Back Pain

<table>
<thead>
<tr>
<th>Finding</th>
<th>Possible etiology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recent significant trauma, or milder trauma age &gt;50</td>
<td>fracture</td>
</tr>
<tr>
<td>Unexplained weight loss</td>
<td>cancer</td>
</tr>
<tr>
<td>Unexplained fever or recent UTI</td>
<td>infection</td>
</tr>
<tr>
<td>Immunocompromise</td>
<td>cancer</td>
</tr>
<tr>
<td>Intravenous (IV) drug use</td>
<td>infection</td>
</tr>
<tr>
<td>Osteoporosis</td>
<td>fracture</td>
</tr>
<tr>
<td>Prolonged use of glucocorticoids</td>
<td>fracture, infection</td>
</tr>
<tr>
<td>Age &gt;70</td>
<td>fracture, cancer</td>
</tr>
<tr>
<td>Progressive motor or sensory deficit</td>
<td>CES or cancer</td>
</tr>
<tr>
<td>Duration greater than 6 weeks</td>
<td>cancer, infection</td>
</tr>
<tr>
<td>History of cancer</td>
<td>cancer</td>
</tr>
<tr>
<td>Saddle anesthesia, bilateral sciatica/weakness; urination, defecation difficulties</td>
<td>CES, cauda equina syndrome</td>
</tr>
</tbody>
</table>


Low Back Pain: Physical Exam

- Observe patient walking into room
- Check vital signs
  - Do pulse and BP correlate with the amount of pain patient is reporting?
- Inspect the back
- Palpate/percuss
- Evaluate muscle bulk
- Test for manual strength
- Reflex testing
- Rectal exam if bowel/bladder complaints

Spine: Evaluate Range of Motion

Main movements: bend forward (flex), bend backward (extend), side-bend (side-flex), and rotate

Normal ROM
- Lumbar flexion ~ 40°
- Lumbar extension ~ 15°
- Lateral bending ~ 30° (hand should reach close to knee)
- Rotation ~ 45°

Physical Exam Findings: Clues to Causes of Low Back Pain

- More pain with extension
  - Suggestive of spinal stenosis
- Pain with forward flexion
  - Suggestive of disc disorders
- Localized paralumbar pain with extension
  - Suggestive of facet syndrome
- Pain in buttck or leg
  - Often disc or facet, but must rule out hip pathology
    - Perform hip ROM testing
    - Patrick’s test

Straight Leg and Crossed Straight Leg

Positive SLR: pain in back and down posterior or lateral leg at ≤70° of hip flexion

Testing for Lumbar Nerve Root Compromise

<table>
<thead>
<tr>
<th>Nerve Root</th>
<th>Pain</th>
<th>Numbness</th>
<th>Motor Weakness</th>
<th>Screening Examination</th>
<th>Reflexes</th>
</tr>
</thead>
<tbody>
<tr>
<td>L4</td>
<td></td>
<td>Extension of quadriceps</td>
<td>Squat and rise</td>
<td>Knee jerk diminished</td>
<td></td>
</tr>
<tr>
<td>L5</td>
<td></td>
<td>Dorsiflexion of great toe and foot</td>
<td>Heel walking</td>
<td>None reliable</td>
<td></td>
</tr>
<tr>
<td>S1</td>
<td></td>
<td>Plantar flexion of great toe and foot</td>
<td>Walking on toes</td>
<td>Ankle jerk diminished</td>
<td></td>
</tr>
</tbody>
</table>


Piriformis Syndrome

- Condition in which the piriformis muscle irritates the traversing sciatic nerve causing pain, tingling, and numbness in the buttck and leg; can mimic sciatica
- Stretching can reduce pain

Patrick’s Test for Hip or SI Pain

AKA “Sign of Four” and “FABERE sign” from the acronym of the maneuvers involved:
- Flexion, abduction, external rotation, and extension

Press down on thigh.
Test is + if pain in anterior hip (flexors) is elicited
This may also provoke pain in SI joint
Waddell Signs ("Yellow Flags")

<table>
<thead>
<tr>
<th>Sign</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Superficial or nonanatomic tenderness</td>
<td>Pain with light superficial skin palpation or widespread nonlocalized</td>
</tr>
<tr>
<td>Pain on axial loading or simulated rotation</td>
<td>Pain with vertical pressure applied to the standing patient's head, or back pain when the shoulders and pelvis are rotated together</td>
</tr>
<tr>
<td>Nonreproducibility of pain when patient is distracted</td>
<td>A positive physical finding is found on routine formal assessment, but is not present when patient distracted and it is checked again (e.g., sitting SLR)</td>
</tr>
<tr>
<td>Regional weakness or sensory change</td>
<td>Regional sensory change (e.g., stocking sensory loss) or regional weakness (e.g., jerky such as cogwheeling); organic weakness can be overpowered smoothly</td>
</tr>
<tr>
<td>Overreaction</td>
<td>Exaggerated painful response to a stimulus that is not reproducible, or exaggerated response to a stimulus that should not cause back pain (e.g., gently pinching skin)</td>
</tr>
</tbody>
</table>

Adapted from Waddell G. Spine. 1980;5(2):117-125.

Back Summary

- Assess for "red flags"
- Range of Motion testing
  - More pain with extension
    - Suggestive of spinal stenosis
  - Pain with forward flexion
    - Suggestive of disc disorders
- Straight Leg = Sensitive for disc disease
- Crossed Straight Leg = Specific for disc disease
- 98% of clinically significant disc hemiations occur at L5 or S1 nerve roots

Knee Pain

- Anatomy
- History
- Essentials of the knee exam
- Specific physical exam maneuvers

36-year-old man with knee pain

- A patient with no prior orthopedic injuries presents to your clinic one day after injuring his right knee during a game of basketball at the White House. The injury occurred when another player fell onto the lateral aspect of his right knee. He did not continue playing, and now walks with a slight limp. He did not notice a "pop," or immediate swelling. There is no laxity or "catching." The pain is on the medial aspect of his right knee, just above the joint line.
- Exam reveals slight medial swelling, with a small amount of ecchymosis. There is tenderness to palpation just superior to the medial joint line and pain reproduced with valgus stress, but a solid end point and no laxity.

Causes of Knee Pain

<table>
<thead>
<tr>
<th>Acute Knee Pain</th>
<th>Chronic Knee Pain</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCL/LCL injury</td>
<td>Meniscal Injury</td>
</tr>
<tr>
<td>ACL/PCL injury</td>
<td>Osteoarthritis</td>
</tr>
<tr>
<td>Fracture</td>
<td>Patellofemoral Pain</td>
</tr>
<tr>
<td>Bursitis</td>
<td>Rheumatoid Arthritis</td>
</tr>
<tr>
<td>Infection</td>
<td>Tumor</td>
</tr>
</tbody>
</table>

- Meniscal Injury
- Osteoarthritis
- ACL
### History
- Prior Injury
- Location of Pain
- Exacerbating/Alleviating Factors
- Mechanism of Injury

### History
- “Pop”
- Immediate swelling?
- “Giving way” or “Laxity”
- “Locking” or “Catching”
- Able to return to activity?
- Bear weight?

### Physical Examination
- Inspect
  - Gait
  - Alignment
  - Quad Atrophy
  - Bruising
  - Deformity

### Physical Examination
- Palpation
  - Tibial Tuberosity → Patella
  - Bursae
  - Joint lines
  - Popliteal fossa
  - Intra/Extra Articular Swelling
    - Ballotment
    - Milking

### Physical Examination
- Range of Motion
  - Passive and Active
    - Flexion (130 - 150 degrees)
    - Extension (0 - minus 10 degrees)
      - Pain with active >> passive ROM indicates soft tissue disorder
      - Pain with active = passive ROM likely indicates intra-articular process
  - Patella Tracking
  - Valgus and Varus Stress

### 36-year-old man with knee pain, cont’d
- A patient with no prior orthopedic injuries presents to your clinic one day after injuring his right knee during a game of basketball at the White House. The injury occurred when another player fell onto the lateral aspect of his right knee. He did not continue playing, and now walks with a slight limp. He did not notice a “pop,” or immediate swelling. There is no laxity or “catching.” The pain is on the medial aspect of his right knee, just above the joint line.
- Exam reveals slight medial swelling, with a small amount of ecchymosis. There is tenderness to palpation just superior to the medial joint line and pain reproduced with valgus stress, but a solid end point and no laxity.
Medial Collateral Ligament Sprain

- “Sprained” Knee
- Direct trauma to the side opposite the location of pain (valgus stress)
- If mild, can continue with activity
- Most commonly involves proximal MCL
- Pain with valgus stress
- Most common cause of acute knee “injury” in primary care setting (50%)

Valgus Stress and MCL Strain

- First Degree Sprain
  - Tenderness along MCL
  - <5mm laxity but solid end point
- Second Degree Sprain
  - Laxity at 30 degree flexion, not in full extension
  - Solid end point
- Third Degree Sprain
  - Significant laxity at 30 degrees; laxity in full extension
  - No solid end point

41-year-old woman with knee pain

A patient presents to your office in a wheelchair pushed by her 16-year-old son.
This morning while playing “tag” with her son, she stopped suddenly and planted her left knee to turn; her knee gave out and she fell to the ground.
She noted a “pop” and immediate pain deep in her knee and rapid swelling in her knee.
She reports knee feels “wobbly” when she stands on it.

Anterior Cruciate Ligament Injury

- History of forced hyperextension (clipping), noncontact deceleration or “cutting” or twisting movement — esp. with planted foot and valgus stress
- “Pop”
- Unable to continue activity
- Reported instability
- Rapid effusion
- More common in women


Anterior Drawer Test

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### Lachman Maneuver

![Image of Lachman Maneuver](https://example.com/lachman-image.png)

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### Physical Exam of ACL

<table>
<thead>
<tr>
<th>Test</th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anterior Drawer</td>
<td>48-62%</td>
<td>67-87%</td>
</tr>
<tr>
<td>Lachman</td>
<td>84-87%</td>
<td>93-100%</td>
</tr>
<tr>
<td>Composite Exam</td>
<td>82%</td>
<td>94%</td>
</tr>
</tbody>
</table>

- Exam is less accurate if hemarthrosis present
  - 70% of acute knee hemarthrosis is due to ACL
- Limited data on historical features
- Assess for other injuries
  - Isolated ACL tear in <10%

### 42-year-old man with knee pain

A patient presents with four days of intermittent knee pain. It began when he “twisted” his knee when he stepped into a hole while cutting the grass. Since then he has been able to walk with only mild discomfort. The day after the injury he noted a small amount of swelling, which has not changed. His pain is exacerbated by twisting and turning. He denies “locking” or laxity.

Exam demonstrates a small effusion and tenderness at the medial joint line. McMurray’s maneuver reproduces some tenderness.

### Meniscal Injuries

- Common (35% of all patients) — esp. with osteoarthritis (up to 80% of patients with OA)
  - In OA less likely to have mechanical symptoms
- Either acute or chronic pain
- Twisting or cutting while weight bearing
- Often initially able to continue activity
- Clicking, catching, locking — esp. if tear extends anteriorly beyond the MCL (“bucket-handle tear”)
- Intermittent pain—usually with rotational movements
- Delayed effusion

### Physical Exam of Meniscal Tear

<table>
<thead>
<tr>
<th>Test</th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joint Line</td>
<td>76-79%</td>
<td>15-29%</td>
</tr>
<tr>
<td>McMurray</td>
<td>52-53%</td>
<td>59-97%</td>
</tr>
<tr>
<td>Composite</td>
<td>77%</td>
<td>91%</td>
</tr>
<tr>
<td>ACL/PCL/Meniscal</td>
<td>74-81%</td>
<td>92-96%</td>
</tr>
</tbody>
</table>

### Meniscal Injuries

- Joint line tenderness
- McMurray’s test
- Duck Walk
- Lachman—one third also have ACL injury

66-year-old woman with progressive knee pain

- A patient presents with progressively worsening pain in her knees over the last 3 years. The pain is brought on with ambulation but also bothers her after awakening in the morning, when she reports 15-20 minutes of stiffness.
- On physical examination her knees have no redness or warmth, but very slight effusion greater in the right knee. Active and passive range of motion elicit mild discomfort and crepitus. There is mild bony hypertrophy greatest in the medial aspect of the right knee and a mild varus deformity. She has swelling of the DIP and PIP joints.

Osteoarthritis

American College of Rheumatology Criteria:
- Age >50 years
- Morning stiffness <30 minutes
- Crepitus
- Bony tenderness
- Bony enlargement
- No palpable warmth

If 3 present, sensitivity 95% specificity 69%
If 4 present, sensitivity 84% specificity 89%


Osteoarthritis X-Ray Findings

- Osteophyte (correlates with pain)
- Sclerosis
- Joint space narrowing (no correlation with pain/outcome)
- Cystic subchondral bone
  Sensitivity: 77% Specificity: 83%

Combined with clinical criteria:
- Sensitivity: 91% (worse)
- Specificity: 86% (better)

Radiographic Features

- Joint space narrowing
- Marginal osteophytes
- Subchondral cysts
- Boney sclerosis
- Malalignment

OA Progression

Natural history of OA: Progressive cartilage loss, subchondral thickening, marginal osteophytes

ACR Criteria for Knee OA

<table>
<thead>
<tr>
<th>Clinical &amp; Lab</th>
<th>Clinical &amp; X-ray</th>
<th>Clinical</th>
</tr>
</thead>
<tbody>
<tr>
<td>At least 5 of 9</td>
<td>At least 1 of 3</td>
<td>At least 3 of 6</td>
</tr>
<tr>
<td>&gt;50 yo</td>
<td>&gt;50 yo</td>
<td>&gt;50 yo</td>
</tr>
<tr>
<td>Stiffness &lt;30 min</td>
<td>Stiffness &lt;30 min</td>
<td>Stiffness &lt;30 min</td>
</tr>
<tr>
<td>Crepitus</td>
<td>Crepitus</td>
<td>Crepitus</td>
</tr>
<tr>
<td>Bony Tenderness</td>
<td>+Osteophyte</td>
<td>Bony Tenderness</td>
</tr>
<tr>
<td>Bony enlargement</td>
<td>Bony enlargement</td>
<td></td>
</tr>
<tr>
<td>No warmth</td>
<td>No warmth</td>
<td></td>
</tr>
<tr>
<td>ESR&lt;40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RF &lt;1:40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SF OA</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
IT Band Tendonitis

- Runs from ilium to tibia just below the knee
- Ache or burning where crosses over lateral femoral condyle (3 cm proximal to joint line)
- Worse with activity—especially running, cycling, activities going up or down hills or stairs
- Noble test: Patient supine; thumb over lateral femoral condyle during repeated flex/extension
- Risk factors: varus alignment of knee, tight IT band, excess running (knee flexion), worn shoes, uneven terrain
- Treatment: RICE, PT for IT band stretching; attention to shoes, running surface, pull-on sleeve

Patellofemoral Syndrome

- One of the most common cause of knee pain, especially in younger patients
- More common in women
- Anterior knee pain
- Exacerbated by repetitive flexion or prolonged sitting
- Exam often unremarkable
- Can find retropatellar pain and crepitus when compressing patella against femoral groove during active extension

Pes Anserine Bursitis

- Inflammatory condition of medial knee below joint line, superficial to tibial insertion MCL
- Hallmark finding: pain over proximal medial tibia at insertion of conjoined tendons of pes anserinus
- Often coexists with other knee disorders (overuse, DJD)
- Treat with ice, NSAIDs, PT; injection may also help

Physical Examination of Knee Injuries

- Given prevalence in primary care setting, likelihood of ligamentous or meniscal tear is <1.5% if exam is negative
- If exam is positive, post test probability is 50%
- MRI is slightly more sensitive, but less specific

Knee Summary

- Look for clues in the history — pop, laxity, catching
- Systematic examination — inspection, palpation, ROM and specific maneuvers
- MCL “sprain” — valgus stress, tenderness along MCL
- ACL — sudden deceleration/hyperextension, pop, laxity, immediate effusion, Lachman
- Meniscus — plant/twist injury, delayed effusion, catching, joint line pain, McMurray
- Osteoarthritis — crepitus, tenderness, bony enlargement without warmth; morning stiffness

Conclusion

- Patients usually see their primary care provider when they have musculoskeletal complaints
- A careful history with specific orthopedic evaluations are very useful in determining the source of pain
- A careful orthopedic evaluation can accurately diagnose common orthopedic injuries