

Pennsylvania Academy of Family Physicians Foundation

## Pittsburgh CME Conference

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### **Knee and Shoulder Exam Workshop**

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#### **Disclosures:**

Speakers have no disclosures and there are no conflicts of interest.

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The speakers indicated that the content of their presentation will not include discussion of unapproved or investigational uses of products or devices.

# Musculoskeletal Exam Techniques: The Shoulder

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## Disclosure

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Head Team Physician Drexel University  
Head Team Physician Philadelphia University  
Team Physician Saint Joseph's University  
Team Physician US Women's U19 National  
Lacrosse Team

AMERICAN ACADEMY OF  
FAMILY PHYSICIANS  
STRONG MEDICINE FOR AMERICA

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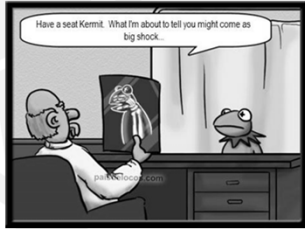
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- The shoulder can be a source of pain and dysfunction

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## Objectives

- To describe a clinically useful and efficient approach to the shoulder examination
- To discuss the evaluation and management of several clinical scenarios involving the shoulder: rotator cuff tendonopathy/ bursitis, dislocation/ subluxation, labral tear, and adhesive capsulitis
- To review indications and selection for imaging and consultation

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## Not Talking About

- Fractures: humeral, clavicle, glenoid, scapula
- Clavicular osteolysis
- Acromioclavicular and sternoclavicular separation/ dislocation
- Acromioclavicular degenerative joint disease
- Glenohumeral degenerative joint disease
- Thoracic outlet syndrome
- Peripheral neuropathies: suprascapular, Parsonage Turner Syndrome
- Scapular dyskinesia

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## Incidence and Prevalence of Shoulder Pain

- 3<sup>rd</sup> most common musculoskeletal complaint
- 5% of all musculoskeletal reasons seen in primary care office
- 6.6 to 25 cases per 1000 patients; peak incidence in 4<sup>th</sup> through 6<sup>th</sup> decades
- 8-13% of all athletic injuries; 3.9 % of new ER visits
- Second only to knee pain for referrals to sports medicine or orthopedics

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## History

- *The history is key to an accurate diagnosis*
- Age
- Gender
- Hand dominance
- Past medical and surgical history
- Work, sports, exercise, hobbies, home
- Prior problems with the affected side
  - Prior injury e.g. shoulder dislocation or separation
- Onset
  - Acute vs. insidious or chronic
  - Traumatic or atraumatic
- Radiation
  - Parasthesias
  - Weakness
- Night pain
- Fevers, chills, night sweats, unintended weight loss

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## History

- Aggravating factors:
  - Reaching overhead, e.g. for cupboards, tennis serve (AB,ER)
  - Washing hair (AB,ER)
  - Washing back (IR, EX)
  - Hooking bra behind back (IR, EX)
  - Putting on a coat or shirt/blouse (IR/ ER, EX)
  - Sleeping on affected side (IR, compression)
- AB=abduction; IR=internal rotation; ER=external rotation; FL=flexion; EX=extension
- Inciting factors (no trauma history):
- New activity
  - Sport, hobby, housework (painting, cleaning)
  - Travel (lifting luggage into overhead bins)
- Any change in activity
  - Intensity, duration, frequency
- Relieving factors:
  - Over-the-counter medications
  - Ice
  - Heat
  - Rest or activity modification
  - Sleeping on unaffected side

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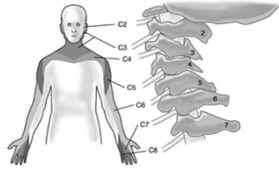
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## Physical Exam

- *Screen the neck!*
- Range of motion
  - Flexion, extension, rotation, lateral bending
- Palpation of cervical spine
- Spurling's maneuver
- Bilateral upper extremity evaluation
  - Strengthen, sensation, deep tendon reflexes, pulses, Hoffman's, Tinel's




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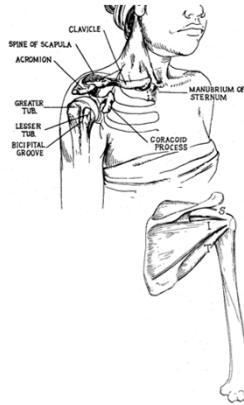
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## Shoulder Exam

- Relevant anatomy
  - Joints: acromioclavicular, glenohumeral, sternoclavicular joints; scapulothoracic articulation
  - Rotator cuff musculotendons: supraspinatus, infraspinatus, teres minor, subscapularis; biceps tendon
  - Ligaments: acromioclavicular, coracoclavicular, glenohumerals
  - Labrum
  - Bony: humerus (greater tuberosity, lesser tuberosity), scapula (acromion, glenoid, coracoid process), clavicle




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### Inspection

- Appearance
- Atrophy
- Asymmetry
- Deformity

### • Palpation

- AC joint
- SC joint
- Proximal humerus
- Scapulothoracic

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- Range of motion
  - Active: abduction, flexion, internal rotation, external rotation
  - Presence or absence of pain
  - Passive if unable to do full range actively
  - Drop arm test
- Strength testing
  - Empty can test for supraspinatus (AB) (84% sensitivity, 58% specificity)
  - Lift off test for subscapularis (IR) (62% sensitivity, 100% specificity)
  - Infraspinatus and teres minor testing (ER)
- (Video of empty can test)
- (Video of lift off test)

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- ### Special Tests
- Hawkins
    - Rotator cuff tendonopathy/ Impingement
  - Neer's
    - AC arthropathy
  - Speed's
    - Bicep's tendonopathy
  - Apprehension sign
    - Anterior glenohumeral instability
    - Jobe relocation sign
  - O'Briens active compression test
    - Superior labral injury

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- ### Hawkin's and Neer's
- Description
  - Positive findings
  - Internally rotate while the examiner brings the arm into the forward plane to bring out positive finding
  - Sensitivity 87-89%
  - Specificity 60%
  - (Video of Hawkin's test)
  - (Video of Neer's test)

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- Acromioclavicular pathology (eg sprain, DJD)
- Positive findings: pain over the AC joint with maneuver compressing the joint

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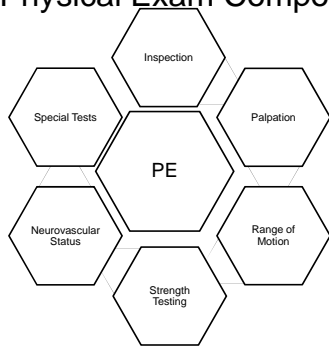
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### MSK Physical Exam Components



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### Clinical Management: Overview of the Knee Exam

Matthew Silvis, MD  
Departments of Family and Community Medicine & Orthopedics  
and Rehabilitation  
Penn State Hershey  
November 8<sup>th</sup>, 2014

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## Learning Objectives

- Outline the process of completing a standard MSK exam of an injured knee.
- Perform basic knee examination techniques.
- Recognize the limitations of these various clinical examination techniques.

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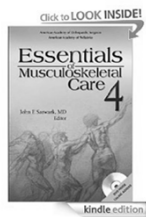
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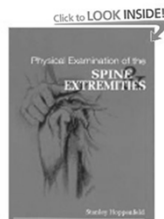
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## References

**Essentials of  
Musculoskeletal Care**



**Physical Examination of the  
Spine & Extremities**



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## Why is this topic important?

- **MSK complaints and injuries:**
  - 15-30% primary care visits in the United States and Canada
    - *J Bone Joint Surg Am* 2001; 83: 1317-1320.
  - 20% ER visits in the United States
    - *Ann Emerg Med* 1990; 19: 746-757.
  - 20% non-routine pediatric visits in Europe
    - *Arch Dis Child* 2004; 89: 431-434.
- ~50% of adults will experience knee pain in their lifetime.
  - 4 million office visits/year
  - 10<sup>th</sup> most common reason for outpatient visits

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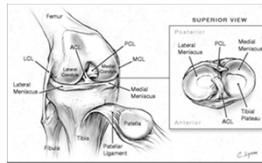
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## Knee Exam

- Inspection
  - Erythema, bruising, discoloration
  - Effusion
    - 74-91% patients with traumatic injuries and effusion have internal derangement
  - Deformity
  - Genu varum / valgum
  - Musculature (atrophy)
- Compare to asymptomatic knee!



JAMA 2001; 286 (13): 1610-1620.

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## Knee Exam

- Palpation (bony and soft structures)
  - Pain, warmth, effusion
  - Neurovascular Exam
  - Point tenderness?
    - **Ottawa Knee Rules** for obtaining radiographs
      - Age > 55, TTP tibular head, isolated tenderness of patella, inability to flex to 90 degrees, inability to bear weight both immediately and in ER (4 steps)
      - Decreases radiography by 28-35%
      - 98.5-100% SN; 49% SP
      - *Ann Intern Med* 2004; 140: 121-4; *Injury* 2006; 37: 1157-1165.
- Symptomatic patellar crepitus?
  - 210 adults – always asymptomatic knees
  - Quite common – 94% women and 45% men
  - Only 4.5% women's knees and 21% of men's knees with no "positive" physical findings
    - *Arthroscopy* 1998; 14 (4): 347-359

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## The Importance of Palpation: Bursitis

- Bursae
  - Sacs that lie between skin and bony prominences or between tendons, ligaments, and bone
  - Lined by synovial tissue
    - Decreases friction
    - Chronic pressure/friction (overuse) causes thickening and excessive fluid formation which leads to pain and swelling
- Prepatellar bursitis
  - Anterior knee between skin and patella
  - Inflamed (trauma/ chronic irritation) or infected (direct penetration; *staph aureas, strep*)
- Pes anserine bursitis
  - Lies under insertion of sartorius, gracilis, and semitendinosus muscles on the medial tibia just below the plateau
  - Overuse or early arthritis

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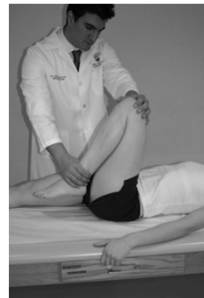
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## Knee Range of Motion: Extension Left (0°), Flexion Right (135-145°)




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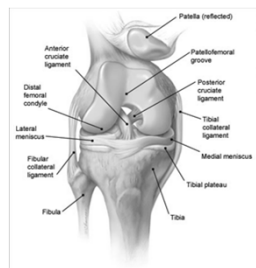
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## Knee Exam

- Specific Testing
  - Patellofemoral Assessment
  - Cruciate Ligaments
    - ACL
    - PCL
  - Collateral Ligaments
    - MCL
    - LCL
  - Menisci
    - Medial meniscus
    - Lateral meniscus



*Am Fam Phys* 2010; 82 (8): 917-922.

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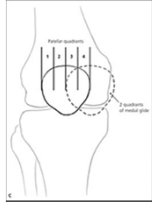
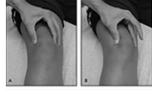
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## Patella Mobility Testing

- Medial glide of the patella
- Patella grasped in resting position
- Translated medially
  - < 1 quadrant
  - Tight lateral structures
  - > 3 quadrants
  - Hypermobile



*Am Fam Phys* 2007; 75: 194-204.

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## Patellar Tilt and Grind

- **Tilt test**
  - Compress medial patella
    - Medial patella should compress posteriorly while lateral patella should elevate
  - + if lateral does not rise to at least 0°
- **Grind or inhibition test**
  - Patient supine with knee extended
  - Displace patella distally into trochlear groove
  - Contract quadriceps with slight resistance to superior patella movement
  - + if pain



*Am Fam Phys* 2007; 75: 194-204.

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## Q-Angle Assessment

- Greater angles increase laterally directed forces on the patella through the pull of the patellar tendon
  - Normal = 10° males
  - Normal = 15° females
- Make sure patella in trochlear groove... flexion helps with this.
  - Falsely low angle if laterally subluxed patella
- Check supine and seated!



*Am J Sports Med* 2008; 36 (3): 577-594.

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## Patella Apprehension Sign

- Patella often reduces spontaneously
- Apprehension sign
  - Patella translated laterally
  - Patient demonstrates fear/anxiety



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## Patella Alta



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## Lateral Patella Tilt



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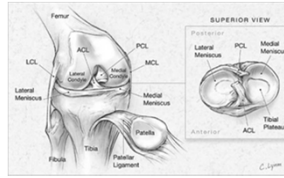
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## Knee Ligaments & Menisci

- Acute swelling that can accompany injuries may make initial exam difficult
  - Repeat exams
- For knee ligaments, laxity is critical to assess
  - Compared to normal knee
- **Grade**
  - I = 1-5 mm
  - II = 6-10 mm
  - III = > 10 mm
- **Endpoint**
  - Firm
  - Soft
  - Absent



JAMA 2001; 286: 1610-1620.

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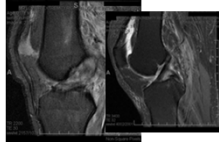
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## Anterior Cruciate Ligament (ACL)



- ACL – prevents anterior translation; tight in flexion
- Sudden pain and giving way
- Twisting or hyperextension injury
- Effusion (hemarthrosis)
  - Develops quickly
  - ACL injury in > 70% of acute hemarthroses in young athletes
- **Lachman Test**
  - Injured knee at 30°
  - Stabilize distal femur with one hand and proximal tibia with other
  - Attempt to sublax tibia
  - Difficult to perform if after 2 hours post-injury
  - SN and SP = 95%




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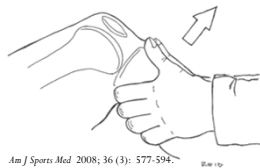
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## Anterior Drawer Testing

- Place injured knee at 90°
  - Fix patient's foot in slight ER (sitting)
  - Need relaxed hamstrings
  - Place thumbs at tibial tubercle and fingers posterior calf
  - Pull anteriorly
- **Limitations (SN = 22-95%):**
  - Posterior meniscal horns, bony contour of joint interferes with isolating ACL
  - Also, practically difficult to place knee in 90° flexion when swollen, painful knee
  - Be wary of false + result
    - Femoral condyles should be one cm posterior to anteromedial tibial plateau



Am J Sports Med 2008; 36 (3): 577-594.




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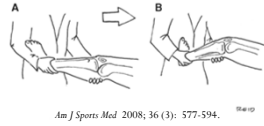
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## Pivot Shift Test

- Patient supine and relaxed
  - *Difficult exam to perform in clinic; easier in operating room with sedated patient*
- Examiner holds leg in extension and internal rotation
- Knee is flexed while valgus force applied
- In the ACL deficient knee, the lateral tibial plateau will be anteriorly subluxated at the beginning of the test and will reduce at 30-40° flexion – palpable and sometimes audible...
- SN = 84-98.4%
- SP = 35% alert; 98.4% anesthesia




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## ACL Assessment

	+ Likelihood Ratio	- Likelihood Ratio	Probability of injury if +	Probability of injury if -
Pivot Shift Test	20.3	0.4	69%	4%
Lachman	12.4	0.14	58%	2%
Anterior Drawer Test	3.7	0.6	29%	6%

Based on overall likelihood of 10% for injury.

MRI sensitivity = 83-91%  
 MRI specificity = 88-94%

*Ann Intern Med* 2003; 19: 575-588.  
*Am Fam Phys* 2012; 85 (3): 247-52.

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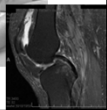
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## Posterior Cruciate Ligament (PCL)

- PCL – prevents posterior translation
- Less common injury
  - Dashboard injury
  - Fall onto flexed knee
  - Pure hyperflexion
  - Hyperextension
    - ACL torn followed by PCL
- Posterior drawer
  - Patient supine, knee flexed to 90°
  - Anterior tibial plateau is normally 10 mm anterior to femoral condyles
  - Slide tibia posteriorly
  - SN = 90%; SP = 99%
- Sag test (SP = 100%)




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## Dial Test

- Posterolateral instability
- Mechanisms:
  - Blow to anteromedial knee
  - Varus blow to flexed knee
  - Hyperextension knee injuries
  - Knee dislocation
- Anatomy
  - LCL; popliteus tendon; popliteofibular, arcuate, and fabellofibular ligaments; lateral capsule
  - Biceps femoris, popliteus, iliotibial tract, lateral head gastroc
- External rotation force applied at 30° and 90°
  - Isolated at 30°
  - >10° external rotation difference between sides is positive



*Am J Sports Med* 2008; 36 (3): 577-594.

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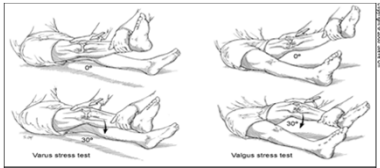
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## Collateral Ligaments



- Varus Stress Test (LCL)
  - Place one hand over medial aspect of knee and the other hand over lateral distal fibula; varus force applied at 0° and 30°
- Valgus Stress Test (MCL)
  - Patient's leg slightly abducted; place one hand over lateral knee and the other hand over medial distal tibia; valgus force applied at 0° and 30°

*No systematic review has addressed diagnostic accuracy of physical examination findings in patients with collateral ligament injuries.*

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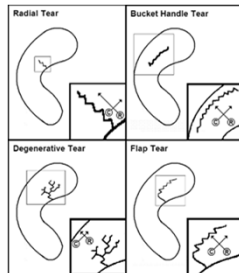
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## Meniscal Tears

- Menisci
- Traumatic
  - Twisting
- Degenerative
  - Minimal or no trauma
- Acute
  - Knee swelling and stiffness over 2-3 days
  - Mechanical symptoms
    - Catching, locking, popping
- Most common finding is TTP of the joint line
  - Posterior half more specific
  - SN = 75%; SP = 29%



*Am J Sports Med* 2007; 35 (1): 103-112.

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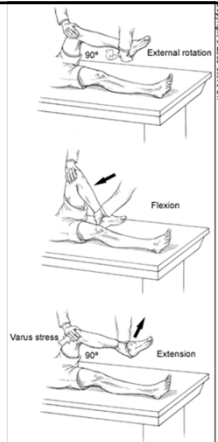
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## Meniscal Tears

- McMurray Test
- SN = 52%; SP = 97%
- Starting position
  - Grasp patient's heel with one hand and knee with other – thumb lateral joint line and fingers medial; flex knee maximally
- Lateral Meniscus
  - Tibia rotated internally and knee extended with valgus stress
- Medial Meniscus
  - Tibia rotated externally and knee extended with varus stress




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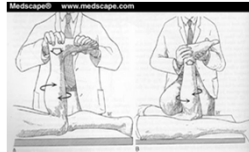
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## Meniscal Tears

- Apley Compression Test
  - Patient prone with knee at 90°
  - Compress and rotate tibia
- Thessaly Test



*Am Fam Phys* 2012; 85 (3): 247-252.

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## Meniscal Assessment

	+ Likelihood Ratio	- Likelihood Ratio	Probability of injury if +	Probability of injury if -
Thessaly Test	39.3	0.09	81%	1%
McMurray Test	17.3	0.5	66%	5%
Age > 40, continuation of activity not possible, weightbearing during trauma, pain with passive flexion	5.8	0.9	39%	9%
Joint line tenderness	1.1	0.8	11%	8%

Based on overall likelihood of 10% for injury.

*Ann Intern Med* 2003; 19: 575-588.

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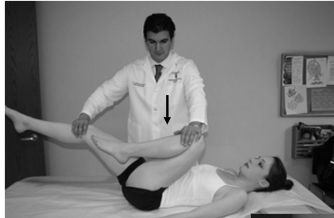
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Hip Extension:  
The Thomas Test

First maximally flex the opposite hip to lock the pelvis and eliminate all lumbar lordosis (above)



Then extend hip being examined (right)

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