GOAL

- Learn a standardized history and physical examination of patients with knee injuries
KNEE INJURY

- Components of the assessment include
  - Focused history
  - Attentive physical examination
  - Thoughtfully ordered tests/studies
FOCUSED HISTORY
FOCUSED HISTORY QUESTIONS

▸ **Onset of Pain**
  ▸ Date of injury or when symptoms started

▸ **Location of pain***
  ▸ *Anterior*
  ▸ *Medial*
  ▸ *Lateral*
  ▸ *Posterior*
FOCUSED HISTORY QUESTIONS

- **Mechanism of Injury** - helps predict injured structure

- **Contact or noncontact injury?**
  - If contact, what part of the knee was contacted?
    - Anterior blow?
    - Valgus force?
    - Varus force?

- **Was foot of affected knee planted on the ground?**

Valgus alignment = distal segment deviates lateral with respect to proximal segment.

Patellas Touch

http://moon.ouhsc.edu/dthompso/namics/varus.gif
FOCUSED HISTORY QUESTIONS

▸ Associated Events/Mechanics
  ▸ **Pop** heard or felt?
  ▸ **Swelling** after injury (immediate vs delayed)
  ▸ **Catching / Locking**
  ▸ **Buckling / Instability** ("giving way")
INSTABILITY - EXAMPLE

Patellar dislocation

http://www.carletonsportsmed.com/Libraria_medicus/PF_patella_dislocation.JPG
Degree of Immediate Dysfunction

Unable to Ambulate → Antalgic Gait* → Continued to Participate
FOCUSED HISTORY QUESTIONS

▸ Aggravating Factors
  ▸ Activities, changing positions, stairs, kneeling

▸ Relieving Factors/treatments tried
  ▸ Ice, medications, crutches

▸ History of previous knee injury or surgery
## HISTORICAL CLUES TO KNEE INJURY DIAGNOSES

<table>
<thead>
<tr>
<th>Noncontact injury with “pop”</th>
<th>ACL tear</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact injury with “pop”</td>
<td>MCL or LCL tear, meniscus tear, fracture</td>
</tr>
<tr>
<td>Acute swelling</td>
<td>ACL tear, PCL tear, fracture, knee dislocation, patellar dislocation</td>
</tr>
<tr>
<td>Lateral blow to the knee</td>
<td>MCL tear</td>
</tr>
<tr>
<td>Medial blow to the knee</td>
<td>LCL tear</td>
</tr>
<tr>
<td>Knee “gave out” or “buckled”</td>
<td>ACL tear, patellar dislocation</td>
</tr>
<tr>
<td>Fall onto a flexed knee</td>
<td>PCL tear</td>
</tr>
</tbody>
</table>
PHYSICAL EXAM
Develop a standard routine
Alleviate the patient's fears

GENERAL STEPS
- Inspection
- Palpation
- Range of motion
- Strength testing
- Special tests
› Adequate exposure - groin to toes bilaterally
› Examine in supine position
› Compare knees
OBSERVE – STATIC ALIGNMENT

- Patient stands facing examiner with feet shoulder width apart
  - Ankles, subtalar joints – pronation, supination
  - Feet – pes planus, pes cavus

[Images of foot anatomy showing pronation, supination, pes planus, and pes cavus]
Patient then brings medial aspects of knees and ankles in contact

- Knees – genu valgum (I), genu varum (II)

OBSERVE – STATIC ALIGNMENT

[Image: http://www.orthoseek.com/articles/img/bowl1.gif]
OBSERVE – DYNAMIC ALIGNMENT

- Pronation/Supination may be enhanced with ambulation

- Antalgic gait indicates significant problem  
  (anti = against, algic = pain)
INSPECT KNEE

- Evidence of local trauma
  - Abrasions
  - Contusions
  - Lacerations
- Patella position
- Muscle atrophy
- Warmth
- Erythema
- Effusion
INSPECT KNEE-RELATED MUSCLES

- Quadriceps atrophy
  - Long-standing problem
- Vastus medialis atrophy
  - After surgery

http://www.neuro.wustl.edu/neuromuscular/pics/people/patients/Hands/ibmquadatrmsm.jpg
ANATOMY - ANTERIOR, EXTENDED

- Patella
- Hollow
- Indented
KNEE – ANTERIOR, FLEXED
Patella:
Lateral and Medial Patellar Facets

Superior And Inferior Patellar Facets

Lateral Fat Pad

Patellar Tendon**

Medial Fat Pat
PALPATION - MEDIAL

Medial Collateral Ligament (MCL)*

Pes anserine bursa**

Medial joint line
PALPATION – LATERAL*

Lateral Collateral Ligament (LCL)**

Lateral joint line
PALPATION - POSTERIOR

- Popliteal fossa

- Abnormal bulges
  - Popliteal artery aneurysm
  - Popliteal thrombophlebitis
  - Baker’s cyst
RANGE OF MOTION TESTING

- Extension: 0° → Flexion: 135°

- Describe loss of degrees of extension
  - Example: “lacks 5 degrees of extension”

- Locking = patient unable to fully extend or flex knee due to a mechanical blockage in the knee (i.e., loose body, bucket-handle meniscus tear)
STRENGTH TESTING

- Test knee extensors (quadriceps) and knee flexors (hamstrings)
  - Can test both with patient in seated position, knees bent over edge of table
  - Ask patient to extend/straighten knee against your resistance
  - Then ask patient to flex/bend knee against your resistance
- Compare to unaffected knee
SPECIAL TESTS – ANTERIOR KNEE PAIN

▷ Patellar apprehension test*

![Starting position](http://www.sportsdoc.umn.edu/Clinical_Folder/Knee_Folder/Knee_Exam/lateral%20patellar%20apprehension.htm)

![Push patella laterally](http://www.sportsdoc.umn.edu/Clinical_Folder/Knee_Folder/Knee_Exam/lateral%20patellar%20apprehension.htm)

▷ Patellofemoral grind test**
Assess stability of 4 knee ligaments via applied stresses*
STRESS TESTING OF LIGAMENTS

- Use a standard exam routine
  - Direct, gentle pressure
  - No sudden forces

- Abnormal test
  1. Excessive motion = laxity
     What is NORMAL motion?*
  2. Soft/mushy end point**
Patient and Examiner Position*
VALGUS STRESS TEST FOR MCL*

Note Direction Of Forces
VALGUS STRESS TEST
VARUS STRESS TEST FOR LCL*

Note direction of forces
VARUS STRESS TEST
LACHMAN TEST

▶ Patient Position
▶ Physician hand placement
View from lateral aspect

Note direction of forces
LACHMAN TEST
ANTERIOR DRAWER TEST FOR ACL

- Physician Position & Movements*
- Patient Position

Note direction of forces
POSTERIOR DRAWER TESTING- PCL*

Note direction of forces
ASSESS MENISCUS – KNEE FLEXION

▸ Most sensitive test is full flexion*
  ▸ Examiner passively flexes the knee or has patient perform a full two-legged squat to test for meniscal injury

▸ Joint line tenderness**
  ▸ Flexion of the knee enhances palpation of the anterior half of each meniscus
TESTS THAT WE DO NOT RECOMMEND ROUTINELY

- Pivot-Shift* - for ACL tear
- Posterolateral corner injury
Table 3. Comparison of 3 Clinical Examination Techniques for Diagnosing Anterior Cruciate Ligament Tears*

<table>
<thead>
<tr>
<th>Study (Reference)</th>
<th>Lachman Test</th>
<th>Anterior Drawer Test</th>
<th>Pivot Test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sensitivity</td>
<td>Specificity</td>
<td>Sensitivity</td>
</tr>
<tr>
<td>Boeree and Ackroyd (14)</td>
<td>0.63</td>
<td>0.90</td>
<td>0.56</td>
</tr>
<tr>
<td>Hardaker et al. (40)</td>
<td>0.74</td>
<td>NA</td>
<td>0.18</td>
</tr>
<tr>
<td>Donaldson et al. (41)</td>
<td>0.99</td>
<td>NA</td>
<td>0.35</td>
</tr>
<tr>
<td>Jonsson et al. (42)</td>
<td>0.87</td>
<td>NA</td>
<td>0.33</td>
</tr>
<tr>
<td>Liu et al. (43)</td>
<td>0.95</td>
<td>NA</td>
<td>0.61</td>
</tr>
<tr>
<td>Braunstein (59)</td>
<td>0.91</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Torg et al. (71)</td>
<td>0.95</td>
<td>NA</td>
<td>0.61</td>
</tr>
<tr>
<td>Katz and Fingeroth (75)</td>
<td>0.89</td>
<td>NA</td>
<td>0.41</td>
</tr>
<tr>
<td>Noyes et al. (76)</td>
<td>0.56</td>
<td>NA</td>
<td>0.78</td>
</tr>
<tr>
<td>Lee et al. (79)</td>
<td>0.89</td>
<td>NA</td>
<td>0.58</td>
</tr>
<tr>
<td>Hughston et al. (81)</td>
<td>0.89</td>
<td>(0.89–0.96)</td>
<td>0.48</td>
</tr>
</tbody>
</table>

Summary statistic (95% CI): Sensitivity = 0.87 (0.76–0.98), Specificity = 0.93 (0.89–0.96)

*(Jackson JL, et al. 578 7 October 2003, Annals of Internal Medicine, Volume 139 • Number 7)*
## REVIEW OF EVIDENCE - MENISCUS

**Table 4. Comparison of 2 Common Physical Examination Tests for Meniscal Pathology**

<table>
<thead>
<tr>
<th>Study (Reference)</th>
<th>Joint Line Tenderness</th>
<th>McMurray Test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sensitivity</td>
<td>Specificity</td>
</tr>
<tr>
<td>Anderson and Lipscomb (38)</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Noble and Ebit (39)</td>
<td>0.67</td>
<td>0.13</td>
</tr>
<tr>
<td>Fowler and Lubliner (63)</td>
<td>0.85</td>
<td>0.29</td>
</tr>
<tr>
<td>Barry et al. (63)</td>
<td>0.75</td>
<td>0.43</td>
</tr>
<tr>
<td>Summary statistic (95% CI)</td>
<td>0.76 (0.65–0.87)</td>
<td>0.29 (0.10–0.46)</td>
</tr>
</tbody>
</table>

* NA = not assessed.

(Jackson JL, *et al.*)

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- **Joint Line Tenderness**  Sens 76%  Spec 29%
- **McMurray Test**         Sens 52%  Spec 97%
REFERENCES


Solomon DH, Simel DL, Bates DW, Katz JN. Does this patient have a torn meniscus or ligament of the knee? Value of the Physical Examination. *JAMA* 2001;286:1610-1620.
Thank you!

TOPIC 1