The success of any consultation depends on how well the patient and the practitioner communicate with each other. There is evidence to link the quality of this communication to clinical outcomes. (Gask and Usherwood 2002) “Taking a patient history is like playing detective, searching for clues, collecting information without bias, yet staying on track to solve the puzzle’ (Kaufman 2008). An accurate history can provide 80% or more of the information required for diagnoses (Epstein et al 2008), therefore history taking is essential to the consultation process. Active listening, which is described as the most fundamental communication skill (Kaufman 2008), is central to obtaining a comprehensive history.

The Patient-Centered Interview

- Build rapport with the patient
  - Greet the patient by name
  - Introduce yourself and your role
  - Use non-verbal communications skills and gestures
    - Smiling
    - Eye contact
    - Handshake
  - Use active listening skills; encompasses both verbal and non-verbal elements
    - Sit square on to the patient with an open position

- Lean slightly forward
- Establish eye contact
- Maintain a relaxed posture
- Use open questioning
- Summarize the patient history by recalling it back to patient
- To avoid getting side tracked or omit important questions use a history taking framework which gathers information in an orderly way, this is just an example:

  o **WHO**
    - Age
    - Gender
    - Occupation
    - Sport

  o **WHAT**
    - Pain
      - Nature of symptoms
      - Clicking, Popping, Locking
      - Painful or Painless
    - Limitation of Motion
    - Swelling
    - Neurological

  o **WHEN**
    - With/Without Activity
      - Sports
      - Occupation
    - 24 hour pattern
    - Positive Cough, Sneeze or Strain (CSS)

  o **WHERE**
    - Medial
    - Lateral
    - Anterior
    - Posterior

  o **WHY**
    - Macro trauma
    - Micro trauma
    - Non Trauma
1. **Pain Location**
   a. Local Pain - specific sites of local pain indicate involved structures
   b. Referral Pain (Somatic) - hamstrings strain may cause pain down entire back of leg, osteochondral fracture can cause aching in entire femur, chondromalacia refers pain to retro patellar area and medial joint line, slipped capital femoral epiphysis refers pain to knee
   c. Radicular Pain (Nerve Root) - L4, L5 to lower leg dermatomes, S1 to posterior thigh, L3, L4 to anterior thigh

2. **Pain Onset**
   a. Immediate - usually indicates a more severe injury
   b. Delayed onset: usually less severe problem

3. **Pain Quality**
   a. Sharp - skin, superficial muscle, muscle tendon, superficial ligament, subcutaneous bursa, periosteum
   b. Dull, Aching - bone, subchondral bone, tendon sheath, deep muscle, deep ligament, bursa, fibrous capsule, joint
   c. Tingling - peripheral nerve, nerve root problem, circulation problem
   d. Twinges with Movement - superficial ligaments or muscles

4. **Swelling Location**
   a. Local: usually local bursa or extra-articular injuries
   b. Diffuse

5. **Swelling Onset**
   a. Immediate: usually indicates a hemorrhage (ACL tear, patellar subluxation, chondral or osteochondral fracture, peripheral tear of meniscus, PCL tear)
   b. Delayed: usually synovial in origin (meniscal tear, osteochondritis dissecans, capsular sprain, patellar subluxation)

6. **Quality of the Symptoms**
   1. Clicking: meniscus tears, patella
   2. Locking: meniscal tear, loose body, isolated tear of anterior cruciate ligament, peripheral hemorrhage, posterior hemorrhage; (an effusion can block full extension & simulate locking)
   3. Giving Away: Pain followed by giving way: meniscus tear, loose body, osteochondritis dissecans, patellar subluxation, chondromalacia; Giving way followed by pain or painless: Ligamentous instability, weak quadriceps, large joint effusion
   4. Snapping: synovial plica, discoid lateral meniscus, osteochondral fracture, iliotibial band
   5. Grating: chondromalacia, osteochondritis, osteoarthritis, synovial chondromatosis
   6. Tearing: muscle or ligament
   7. Catching: meniscal tear, patellar subluxations, plica
   8. Tingling: neural or circulatory origin
   9. Hyperesthesia: peripheral or nerve root problem
   10. Warmth: local inflammation, infection, gout
   11. Pop: ACL rupture/tear, subluxed patella, meniscal tear, muscle rupture/tear

II. **THE CLINICAL EXAMINATION**

“Orthopedic medicine relies for its diagnosis on assessment of function. With soft tissues this is relatively easy: a joint moves with certain known limits, certain muscles are responsible for certain...
movements. It is merely necessary to devise a system based on applied anatomy to detect abnormalities and relate any defect to a specific tissue. Clinical examination is the key.” (James Cyriax MD)

Your clinical examination should also be systematic. I have always followed a Cyriax based clinical examination (Inspection, Active Movements, Passive Movements, Resisted Movements, Tissue Differentiation Tests and Palpation). The examination is used to confirm our working hypotheses developed during our patient centered interview. Some clinicians may pick and choose which examination techniques to use based on their working hypotheses, however, if one does this you may fall into the trap of approaching the clinical examination with blinders on and fail to include examination techniques which may direct you to the proper clinical assessment. Therefore, I always follow the same systematic clinical examination each time I assess a particular joint system, and I always compare the uninvolved side to the involved side. This format does two things: 1) it eliminates therapist bias, and 2) it allows me to become more proficient in the performance of various examination techniques as they are performed on multiple patients over the years. Of course one may argue that your time is limited and there is no way you could even consider this, however, with practice the flow of your exam will become more and more efficient. I also only include a few tissue differentiation tests for each tissue type, which are considered sensitive and specific (these tests may change as the literature supports newer tests) . . “the least amount of testing for the most information” (IAOM-US).

The Clinical Examination (always compare the involved side to the uninvolved side) (Brismee 2010, Coninck 2003)

1. Inspection
   a. Tissue
   b. Posture/Alignment
   c. Swelling
   d. Color
   e. Palpation
      i. Swelling
      ii. Temperature
2. PROM (Quality, Quantity & Provocation of Symptoms)
   a. Examine inert tissues: joint capsule, ligaments, bursa, fascia
   i. Quantity? How far do they go?
   ii. Quality? Characterize end-feel
      1. Bone to bone
      2. Springy block
   iii. Provocation? Does the test provoke the patient’s symptoms?
      1. Where is their pain?
   iv. Capsular lesions: if the capsule is inflamed, all or most movements of the joint will be painful and limited; lesions of the entire capsule result in a limitation in a “capsular pattern.” These patterns vary from joint to joint (e.g. knee: flexion more limited than extension)

3. Active Tests:
   a. Quantity? How far do they go?
   b. Quality?
      i. Willingness to move?
      ii. Observed substitutions?
   c. Provocation? Does the test provoke the patient’s symptoms?
      i. Where is their pain?

4. Resisted Tests:
   a. Examines contractile structures: muscles, tendons and attachments to bone
   b. Quantity? Weak or Strong
   c. Provocation? Does the test provoke the patient’s symptoms?
      i. Where is their pain?
         1. Contractile Structure
            a. Tendopathy
            b. Myopathy
         2. Nerve Entrapment
   d. Findings on resisted movements:
      i. Strong and painless: normal response
      ii. Strong and painful: minor lesion of the muscle, tendon or its attachment
iii. Weak and painless: complete rupture of muscle or tendon, or neuropathic in origin
iv. Weak and painful: possibly apprehension/guarding secondary to serious problem or pain, e.g. fracture
v. Painful with all movements: could be a gross involvement of the joint, e.g., arthritis or arthrosis

5. Tissue Differentiation Tests:
These will be specific to the joint system you are evaluating. For the knee you may consider the following (Brismee 2010):

Stability Tests

1. Valgus Stress Test
   a. In full extension - (straight medial instability) injury to tibial collateral ligament and PCL
   b. In 30° flexion - (anteromedial rotary instability) injury to tibial collateral, posteromedial capsular sprain, posterior oblique ligament, ACL

2. Varus Stress Test
   a. In full extension - (straight lateral instability) injury to lateral capsular & fibula collateral ligament, and PCL, biceps tendon, arcuate complex
   b. In 30° flexion - injury to lateral capsular, fibula collateral ligament, iliotibial band, posterior oblique ligament, arcuate-popliteus complex, ACL

3. Drawer sign or test:
   a. Noted instability in the sagittal plane, however not tissue specific need to perform further; more sensitive and specific testing of the ACL and PCL
   i. Lachman (ACL): Examiner stands on the side to be tested and places the flexed knee on the treatment table and then supports the patients’ upper thigh across the examiners knee so that the patients’ knee rests in about 20 degrees of flexion. The examiner stabilizes the distal femur with the proximal hand and uses the distal hand to apply an anterior translation of the tibia in relation to the fixed femur and assess end feel.
   ii. Lateral-anterior drawer test in 80 degrees knee flexion (PCL): Position the patients’ leg in 80 degrees flexion. With the examiners proximal hand stabilize the distal lateral aspect of the femur just above the knee. With the distal hand grasp the posterior medial aspect of the tibia just below the joint line and apply a force in the direction of Gordy’s tubercle (lateral and slightly anterior); assess end feel.
   b. If there is noted laxity in the sagittal plane (positive Lachman or Anterolateral Drawer) you may need to perform other laxity tests to confirm and rule in/out rotatory instability.
      i. Marten’s Test: Patient supine while examiner holds patients ankle between examiner’s trunk and arm with hands around tibia. Examiner holds patient’s leg just distal to knee joint with one hand and pushes femur posteriorly with other hand. Valgus stress is applied while knee is flexed until tibia reduces which indicates a positive test (Anterior Lateral Rotatory Instability “ALRI”)
      ii. External Rotation in 30 degrees (the dial test): The examiner stands on the same side of the testing limb with the therapists flexed knee on the table and the patients leg resting on that knee so that the patients knee is resting in 30 degrees of flexion. With the examiners proximal hand stabilize the distal femur against the examiners thigh. The proximal hand then grasps the medial border of the foot using it as a lever to passively externally rotate the tibia. Increased laxity as compared to the opposite side and as compared to passive external rotation when tested in 80 degrees of flexion indicates a lesion of the
Master Clinician Tackles the Knee

Take Home Message

a. Modified anterior drawer test for rotatory instability:
   1. Anterior drawer test in 80 degrees flexion and maximal external rotation: tibia positioned in external rotation, anterior displacement of medial tibia indicates anteromedial rotary instability (MCL, posterior oblique, ACL, medial capsular sprain)
   2. Anterior drawer test in 80 degrees flexion and maximal internal rotation: tibia positioned in internal rotation, anterior displacement of lateral tibia indicates anterolateral rotary instability (lateral capsular, arcuate complex, ACL, LCL sprain)
   3. Posterior drawer test in 80 degrees flexion and maximal external rotation: tibia positioned in external rotation, posterior displacement of lateral tibia indicates posterolateral rotary instability (arcuate complex, lateral capsular sprain, biceps femoris, ACL)

Patella Femoral Tests
   a. Sustained Flexion
   b. Provocation Test in Standing: Patellar compression during double leg or single leg squat
   c. Zohlen's Test: Patient lies supine with knee extended. Examiner pulls patella distally and holds it in that position, then the patient is asked to contract the quadriceps. Pain is positive for chondromalacia, although it is quite commonly positive in normal population.
   d. "McConnell Test" or Chondromalacia: high sitting, resist quad isometrically at 0°, 30°, 60°, 90° to determine if pain is elicited, if painful repeat with patella pushed medially to see if symptoms decrease with improved patellar alignment.

Menisci Tests
   a. Modified McMurray's Test - palpate joint lines while taking knee into full flexion and extension with it internally rotated and externally rotated
      (1) flexion and external rotation with valgus force - draws medial meniscus anteriorly and lateral meniscus posteriorly
      (2) flexion and internal rotation with varus force - draws lateral meniscus anteriorly and medial meniscus posteriorly
      (3) extension and internal rotation with varus force - compresses lateral meniscus
      (4) extension and external rotation with valgus force - compresses medial meniscus
   b. Bounce Home Test - Pt. is supine while examiner cups heel of involved extremity and flexes knee and allows passive extension. Lack of full extension suggests torn meniscus, loose body, or significant intracapsular swelling. If knee does not fully extend or has a rubbery or springy end feel such as a springy block, it indicates mechanical blocking of full extension, which is most likely, a torn meniscus. Springy block as the end feel suggests a torn meniscus caught between bone ends (displaced bucket handle tear)
   c. Steinman's Tenderness Displacement Test - Point tenderness and pain on the joint line that appears to move anteriorly when knee is extended and moves posteriorly when knee is flexed indicates a possible meniscus tear. Medial pain is elicited on external rotation & lateral pain on internal rotation.

Iliotibial Band Test
   a. IT Band Friction Test (Renne's Test): iliotibial band compression over the lateral femoral condyle during a double or single leg squat.
Plica Tests

a. Mediotibial Plica (Kim 2007): the patient lies supine while examiner applies manual pressure with the thumb over the inferomedial patellofemoral joint. If tenderness is noted then the knee is brought into passive flexion while maintaining the force. The test is positive if pain is diminished at 90 degrees of flexion (This test has been validated with arthroscopic examination)

b. Martin’s Plica Test: the examiner uses the thumb to compress the mediotibial plica while passively moving the knee from extension to 60 degrees of flexion; pain is typically reproduced around 30 degrees flexion.

Functional Tests

a. Step tests - step up & down steps to determine function, strength, alignment

b. Full squat - pain at end of full squat can indicate:
   • patellar tendon strain
   • quadriceps strain or hematoma
   • infrapatellar bursitis
   • suprapatellar bursitis
   • prepatellar bursitis
   • slight joint effusion
   • patellar misalignment or chondromalacia may be painful during descent

c. Return from squat: pain or difficulty returning from squat can indicate:
   • quadriceps weakness or inhibition
   • chondromalacia
   • joint effusion
   • any problems associated with full squatting

d. Jump: observe for quad eccentric weakness or increased femoral adduction and/or internal rotation due to gluteus medius weakness. Pain or inability to jump indicates:
   • extensor mechanism problems
   • patellofemoral problems

6. Inspection

a. Swelling
b. Color

c. Color

7. Palpation

a. Swelling
b. Temperature
c. Trigger points*
d. Scar Mobility
e. Provocation of pain*

*Palpation at the end of the clinical examination should be used to confirm what we already know. Some clinicians may use palpation at the beginning of the examination to assist in guiding their exam. However, I would propose that palpation at the beginning of the examination should only include palpation for temperature or effusion. Palpation for pain provocation at the beginning of the clinical examination may only bias the examiner. Examiner bias may occur because there is a lot of convergence associated with pain referral patterns the more proximal the structure is located on the appendage, therefore palpation will be less reliable.

III. THE GOALS OF THE CLINICAL EXAMINATION

1. Determine if there is a limitation of movement within the joint. “Is there a limit?”

   a. If yes, does the limitation reflect a capsular or non-capsular pattern? (e.g., capsular pattern of the knee flexion more limited than extension)
      i. A capsular pattern reflects evidence of an active arthritis/synovitis or arthrosis affecting the joint.
      ii. A non capsular pattern is a limitation which is not capsular in nature
         1. Status post immobilization
         2. Scar tissue
         3. Muscle length
         4. Loose Body
            a. Unidirectional limitation
            b. Multidirectional limitation

2. Determine the pain generator. “What is/are the most painful test(s)?”

   a. Were you able to reproduce the patients’ primary complaints of pain or symptoms?
      i. If yes, is there a recognized association between the examination techniques performed...
which reproduced the patient’s primary complaints?
1. If yes, we increase the likelihood of a single primary pain generator.
2. If no, we may need to consider multiple pain generators or the presence of hyperalgesia (a state of abnormally increased sensitivity to pain or nociceptive stimuli) or allodynia (a condition in which pain arises from a stimulus that would not normally be experienced as painful), especially when evaluating patients with chronic pain or chronic conditions.

ii. If no, we may need to:
1. Consider potential for referred pain from a proximal location
2. Perform the examination again immediately following provocation of symptoms after the patient has reproduced the symptoms performing a functional activity. (e.g. run 3 miles, perform repeated squat, step down, step ups)

3. List observed impairment(s).
4. Link impairment(s) to causal factor(s).
5. Link observed impairment(s) to functional limitation(s).
6. Link pain generator(s), impairment(s) and functional limitation(s) to develop a physical therapy diagnoses and plan of care.

IV. TRANSVERSE FRICITION MASSAGE (TFM)

James Cyriax described TFM in the 1940’s. He claimed TFM had two therapeutic effects in chronic inflammatory conditions: production of a traumatic hyperemia, and mobilization and softening of fibrous adhesions (Cyriax 1982).

TFM has been purported to have benefit during all three phases of tissue repair. During the early inflammatory phase gentle transverse friction can assist in stimulation of micro lymphatic’s to promote phagocytosis and also assist with management of pain (Clayton 2009). During the granulation stage TFM can be used to stimulate ‘an increase in local blood flow, decrease pain and limit adhesion

formation’ (Clayton 2009). Finally during maturation TFM assists in ‘remodeling immature and weak scar tissue in a longitudinal fashion’ (Clayton 2009).

TFM is the mechanical stimulation of the under lying connective tissue (fascia, skin, tendon, muscle) using the pad of your finger or the blunt end of a mobilization tool. To decrease strain to the applicator digit reinforce that digit with the one next to it (e.g. index finger reinforced by the 3rd digit).
Pressure is usually applied in one direction at a time to eliminate potential for tissue ischemia. The direction of force should be perpendicular or transverse to the target tissue. The amount of pressure is dependent on the stage of healing and the tolerance of the patient; less pressure applied during the inflammatory phase and pressure increased during the proliferation and maturation phases. The amount of time is also dependent of the phase of tissue healing with less time 3-5 minutes during the inflammatory phase and up to 15 minutes during the maturation phase. The technique is usually followed with low load stretching along the lines of stress for the tissue and periodically between sessions of TFM.

V. EXPERTISE IN CLINICAL PRACTICE

According to Resnik et al (2003), expertise is clinical practice is not related to years of experience but to the use of a “patient-centered approach to care”. Patient-centered approach to care includes: “collaborative problem solving, patient empowerment through education, and cultivation of the patient-practitioner relationship”. Jensen et al (2000) found four main subgroups to be associated with characteristics of expert practice in physical therapy:

1) “knowledge,” life long learners who utilize clinical mentors for knowledge and facilitation of learning, actively engaged with the patient as an important source of knowledge, and the use of self-reflection to enhance the learning process;
2) “clinical reasoning,” a collaborative process including a collegial and patient centered process and utilization of an ongoing reflective process;
3) “movement,” use of hands-on skills and touch for assessment of movement, communication and therapeutic intervention with emphasis on return of function; and
4) “virtues,” setting individual high standards, being intrigued by the challenges of clinical practice, and committed to what is best for the patient (Jensen 2000).

In studying differences between novice and experience clinicians regarding clinical reasoning strategies Wainwright et al (2010) found experienced clinicians to utilize self assessment and “reflection-in-action” more frequently than novice clinicians. This process included not only assessment of the patient’s performance but also assessment of the therapists thought process and actions. Reflection-in-action is described as the “ongoing meta-cognition about what is occurring during patient-therapist interaction and often informs the process of experimentation”. Wainwright proposed that “expert physical therapists use more of their treatment time to engage in direct patient treatment, handle environmental interruptions without disrupting treatment, use social interaction as a means of eliciting information from the patient as well as providing information, and provide more frequent and integrated cues and encouragement.”

Jensen et al concluded that in order to develop expertise in clinical practice “physical therapists need time with their patients, time with their colleagues, time for reflection, and time to return to the literature if they are to develop the knowledge-in-practice that results in becoming better and wiser clinicians”. So the challenge is to not only to find the time but also demand the time. I can say that I recognized the benefit of time early in my career. I have always sought positions of employment in clinical practice, which respect and provide time. I know that my patients have not only received the care they deserve but I am a better clinician because of the gift and respect of time.

VI. Plica Syndrome

“In the early stages of embryological development, the knee synovial cavity forms as a result of the union of three separate synovial covered chambers. Select individuals demonstrate residual ‘shelves’ that are remnants of the walls that separated the original separate cavities. This structure, or “plica,” becomes visible as a fold in the synovial membrane in the suprapatellar, mediopatellar, infrapatellar, or lateropatellar region. (Brismee 2010)”

The mediopatellar plica is credited with the most problems. It has been reported in “20-30% of non-arthritic painful knees and 70% in osteoarthritic knees” (Brismee 2010). Pain is generated when the plica becomes hypertrophied, and inflamed as result of pathological changes in the knee (chondromalacia, osteochondritis dissecans, over-use, or trauma) and then becomes impinged between the medial femoral condyle and the patella resulting in anteromedial knee pain during functional activities like biking, ascending/descending stairs, arising from a chair after sustained sitting and squatting. Other symptoms include reports of: dull, achy pain increased with activity, pain at night, giving way (rule out instability, loose body, chondromalacia), pain with sustained flexion (rule out chondromalacia), audible snapping, popping or pseudo-locking (rule out meniscal lesion, chondromalacia) with active flexion and extension of the knee and possible synovial effusion (Camacho 2010, Griffith 2007, Al-Hadithy 2011). Positive findings during the clinical exam may include (Camacho 2010, Griffith 2007, Al-Hadithy 2011): small non-capsular pattern of limitation in flexion or extension, painful arc of motion (30-90 degrees), pain with passive tibial external rotation, pain with palpation of the medial femoral condyle and the under side of the medial patella, palpation of a painful thickened mediopatellar plica, positive Marten’s plica test and/or mediopatellar plica test (Kim 2007). Treatment includes (Brismee 2010, Camacho 2010, Griffith 2007, Al-Hadithy 2011):

1) modify activities,
2) ultrasound or ioneptohoresis,
3) transverse friction massage,
4) addressing any mechanical issues (dynamic valgus) with strengthening and stretching,
5) corticosteroid injection, and
6) surgical excision.

VII. Dynamic Knee Valgus

Many researchers during the last decade have examined the contributions of proximal causes associated with knee injury. They have observed a relationship between increased incert of anterior knee pain with observed decrease hip-muscle strength, and increase hip internal rotation during running, hopping, squatting (double and single legged) and performing a step down. Souza et al
found that “women with patella femoral pain performed 49% less hip extension repetitions and 40% less pelvic drop repetitions compared with the control group” (2009, 2010). They observed a direct correlation between weakness of the gluteus maximus and gluteus medius with increased hip internal rotation during running. Isotonic hip extension endurance was reported as the strongest predictor. Bolgla (2008) found diminished isometric hip external rotator and abductor strength in females with a history of patellofemoral joint pain. Decreased muscle endurance could contribute to increased tissue stress and micro trauma secondary to failure to control lower extremity mechanics during long bouts of exercise.

“As a single joint muscle, the gluteus maximus is best suited to provide 3-dimensional stability of the hip, as this muscle resists the motions of hip flexion, adduction, and internal rotation (Powers 2010).” The gluteus medius is a strong stabilizer within the frontal plane and should not be ignored during rehabilitation but remember it provides poor control of transverse plane motion. “Apart from being a strong hip extensor, the gluteus maximus is the most powerful external rotator of the hip. Its external rotation capacity is supplemented by the actions of the deep hip rotators and the posterior fibers of the gluteus medius. Furthermore, the upper portion of the gluteus maximus has the ability to abduct the hip and demonstrates an activation pattern similar to the gluteus medius” (Powers 2010). Therefore, it is important for us to remember that when considering lower chain mechanics both during OKC and CKC we should link what we know about normal mechanics with those activities our patients report greatest discomfort or limitations. It is also important for us to consider not only what is going on locally at the knee but to examine the strength, endurance and motor control associated with the proximal hip, pelvis and trunk if we are to improve our clinical decision making and improve clinical outcomes when managing anterior knee pain.

Previously it had been reported that one cause of patellofemoral pain was secondary to abnormal tracking of the patella on the femur and therefore clinicians have utilized taping, strapping, and bracing in an effort to control these motions to relieve pain and restore function. However, these kinematic studies were based on non-weight bearing conditions or conditions where motion of the femur was constrained. Recent studies using dynamic magnetic resonance imaging have compared OKC to CKC motions in subjects with a history of lateral patellar subluxation and found that during OKC activity the patella tilted and displace laterally, where as during the CKC condition it was the femur which would rotate internally under a stable patella (Powers 2010). Therefore, when our patients report greater pain or limitations during CKC activities we need to consider ways in which we can control femoral rotation not patellar mobility.