COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF INDUSTRIAL ACCIDENTS

KNEE INJURY TREATMENT GUIDELINE

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A. GENERAL GUIDELINE PRINCIPLES

This clinical guideline has been created to improve health care services for injured workers by outlining the appropriate evaluation and treatment processes for the management of work-related knee injuries. The guideline should be used as a tool to guide health care providers of different professional disciplines to provide quality care to injured workers. The guideline is not intended to be a substitute for appropriate medical judgment and is written to be broad enough to allow for a wide range of diagnostic and treatment modalities, and to purposely allow for philosophical and practice differences among professional disciplines of health care practitioners who provide care to injured workers. It is expected that approximately 10% of cases may fall outside of this guideline and may be reviewed and approved on a case-by-case basis. If objective clinical improvement is delayed or slower than expected, the treating provider must justify the necessity of continued care with a valid clinical rationale and supporting, objective clinical findings.

Medical care required as a result of work-related injury should be focused not only on returning to work but improving/restoring functional ability. The provider should evaluate the effectiveness of treatment by weeks 2-3 of the initial visit and then at least every 3-4 weeks thereafter. If expected progress is not seen in 4-6 weeks after treatment has begun, re-evaluation should be done to confirm the diagnosis and if not already accomplished, a consultation with a specialist should be considered. Repeat diagnostic procedures/imaging may be appropriate if the initial study was inadequate to confidently make a diagnosis. Repeat imaging may also be indicated to monitor the clinical course. Repeat imaging requires a clearly articulated clinical rationale.

Communication with the employee, human relations and their supervisory staff is essential to expedite a return to work in restricted capacities while providing a safe environment and optimizing recovery. It should be the goal of the provider to return the employee to work, in any capacity, and then advance duties/responsibilities as the recovery allows. A safe and healthy work environment including a positive work organization and organizational programs and policies designed to aid return to appropriate work are the responsibility of the employer. These measures can result in reduced injuries, better recovery from an injury, and improved long-term health status. An employer's specific attention to providing a safe and supportive work environment assists in reducing risk of injury and promoting a more rapid recovery when a work injury occurs.

Assessment should include potential facilitators and barriers to recovery, such as work organization and physical workplace exposures, organizational programs and policies, psychosocial, and individual risk factors (e.g., substance use, psychological factors). Job dissatisfaction is a predictor of poor outcomes and may be due to factors beyond the worker's control, i.e., factors related to the work structure or environment that may require addressing at the employer level. If such facilitators and barriers to recovery are identified, the treating provider should provide or facilitate access to appropriate additional resources, usually via referral. Such resources may include consulting with those with expertise in delayed recovery, which may include mental health providers. The treating provider may also need to discuss organizational programs and policies, and work organization and physical workplace exposures, with the employer. It may be valuable to have an assessment performed by a health care practitioner who has training and experience in diagnosing and treating pain disorders in injured workers. Assessment can include brief, standardized screening instruments that address the facilitators and barriers to achieving effective pain management and return to work, as well as focused treatment recommendations that can be integrated into the patient's overall care.

B. INTRODUCTION TO KNEE INJURY

B.1 History Taking and Physical Examination

Medical records should document History of Present Illness, Mechanism of Injury, Past History (including any pattern of joint pain, any prior imaging or procedures to knee, and pre-injury function of knee joint), and Physical Examination. History should include contributory workplace and non-workplace factors/hazards; and incorporate red flags or possible indicators of serious knee pathology (e.g., fever) and yellow flags or psychological factors associated with higher risk of delayed recovery (e.g., fear avoidance behavior, catastrophizing or belief that knee pain is harmful or severely disabling, prior trauma and delayed recovery/prolonged disability, tendency towards depression, major stressors). History should include past treatment for similar problems and the outcome of that treatment - whether there were any persistent/chronic symptoms and how these symptoms or the outcome affected the patient's function, including his/her occupation and quality of life.

B.2 Diagnostic Imaging

Indications for imaging may include:

- Inability to weight bear at the time of the initial visit.
- History of significant trauma, especially blunt trauma or fall from a height.
- Unexplained or persistent pain over two weeks. (Occult fractures, especially stress fractures, may not be visible on initial x-ray. A follow-up radiograph and/or bone scan may be required to make the diagnosis).
- History or exam suggestive of infection.
- Pain with swelling, tenderness to palpation and/or range of motion (ROM) limitation.
- History of prior knee injury, surgery, or fracture.
- Non-responsive to conservative treatment.

Plain Radiograph (X-Ray) Indications:

Typically used as a starting point due to low cost and low radiation exposure.

Computerized tomography (CT) indications:

May be used if MRI is contra-indicated/inaccessible; Suspected occult fracture; further delineation of fracture seen on plain radiographs.

Magnetic Resonance Imaging (MRI) indications:

- Knee trauma and/or instability, swelling, or significant weakness without improvement 72 hours post injury; and to assess for early surgical intervention for a meniscal injury in patients 35 years of age or younger.
- Inability to fully evaluate on clinical exam.
- Instability during any diagnostic maneuver during physical examination.
- Palpable and reproducible click during PE maneuver.
- Joint locking (intermittent or sustained).
- Presence of joint effusion, pain with hyperflexion or hyperextension, and joint line tenderness.
- Acute trauma or fracture resulting in immediate effusion.

- Delayed recovery, i.e., not meeting expectations by 4 weeks.

- Repeat MRI is not routinely recommended and should be reserved for a significant change in symptoms and/or findings suggestive of significant pathology.
- MRI is often helpful in the assessment of the degree of arthritis. Plain films may show a maintained joint space, but an additional MRI may show focal full thickness chondral defects, complex meniscal tears, and insufficiency fractures of the subchondral bone.

Diagnostic Arthroscopy Indications:
Generally not recommended for diagnostic purposes. Provider justification required.
Persistent symptoms and/or findings in the absence of availability of other diagnostic modalities or strongly suspected false negative diagnostic results.

Ultrasound Indications:
If an MRI is contraindicated or if ultrasound is considered to be diagnostically equivalent or superior. Technicians specifically trained to diagnose musculoskeletal pathologies must be used. Can be used to diagnose bursitis, ligament, and meniscus injury.

B.3 Laboratory Testing
Laboratory tests are rarely indicated at the time of initial evaluation, unless history and/or physical exam creates suspicion of infection, neoplasia, connective tissue disorder, or underlying rheumatologic disorder.

B.4 Diagnostic Testing and Procedures
Electromyography (EMG) and Nerve Conduction Velocity Studies (NCV) Indications:
Electrodiagnostic studies are indicated only for concern of local or spinal nerve injury.

Somatosensory Evoked Potentials (SSEP): Not Recommended

Doppler Ultrasonography/Plethysmography Indications:
Useful in establishing the diagnosis of arterial and venous disease in the lower extremity and should be considered prior to the more invasive venogram or arteriogram study. Doppler is less sensitive in detecting deep-vein thrombosis in the calf muscle area. If the test is initially negative, an ultrasound should be repeated 7 days post initial symptoms to rule out popliteal thrombosis.
For the diagnosis of popliteal mass.

Venogram/Arteriogram Indications:
Venogram/Arteriogram is useful for investigation of vascular injuries or disease, including deep-venous thrombosis. Potential complications may include pain, allergic reaction, and deep-vein thrombosis.

B.5 Other Procedures
Joint Aspiration Indications:
Not all knee effusions require aspirations. Joint aspirations may be considered when there is concern for a septic joint, large joint effusion or bursitis (even at the initial evaluation). Aspiration should not be performed through an infected area.

Aspiration of a large knee effusion can help to decrease pain and speed functional recovery. Persistent or unexplained effusions may be examined for evidence of infection, rheumatologic, or inflammatory processes. The presence of blood and fat globules in the effusion strongly suggests occult fracture. A large hemorrhagic effusion should prompt suspicion that a fracture or ligament tear may be present.

C. KNEE INJURY DIAGNOSIS, TESTING, AND TREATMENT RECOMMENDATIONS

C.1 Chondral Defects (Cartilage or Cartilage and Bone Defects)

Chondral defects consist of a cartilage or cartilage and bone defect at the articular or meniscal surface of a joint. On physical exam, there may be a knee effusion with concurrent joint pain. Management of chondral defects depends on character and location of lesion(s). MRI and/or operative findings are utilized to grade chondral defect(s) which determines management.

Imaging and Classification of Chondral Injury:
MRI is the diagnostic imaging of choice but may be preceded by radiographs or CT based on ruling out other differential diagnoses. The Modified Outerbridge Classification for Cartilage Damage by FS PD (Fat-Saturated Proton Density) per MRI is defined below and will be referenced in the next few sections of this guideline:

I FS PD MRI: focal areas of hyperintensity with normal contour
Arthroscopy: Articular cartilage softening
II FS PD MRI: blister-like fraying of articular cartilage extending to surface
Arthroscopy: Chondral fissures or fibrillation < 1.25 cm in diameter
III FS PD MRI: partial-thickness cartilage loss with focal ulceration
Arthroscopy: Chondral fibrillation > 1.25 cm in diameter (“crabmeat changes”)
IV FS PD MRI: full-thickness cartilage loss with underlying bone reactive changes
Arthroscopy: Exposed subchondral bone

Non-Operative Treatment:
The cornerstone of conservative therapy is activity modification - specifically avoiding movements which may cause further injury while maintaining lymphatic flow inducing movements including self-massage (distal to proximal), muscle activation (knee flexion/extension) as tolerated, off-loading with crutches, braces, or cane for 3 days to 2 weeks, elevation, and intermittent compression. Physical medicine is recommended. For pain management ice application, NSAIDs and intra-articular injections may be considered.

Surgical Indications:
Surgery may be indicated after the failure of conservative management. Mild and moderate injuries are expected to resolve without surgical intervention. A trial of conservative management as above is recommended for 4 -12 weeks depending on clinical improvement.

1. Chondroplasty may be appropriate IF
Clinical Findings support the diagnosis:
- Subjective: Joint pain AND Swelling
- Objective: Effusion OR Crepitus
- Imaging: Grade 2 or higher injury documented on MRI

2. Subchondral drilling or Micro-fracture surgery may be appropriate IF:
Clinical Findings support the diagnosis:

- Subjective: Joint pain AND Swelling
- Objective: Small full thickness chondral defect (typically less than 2 cm) on the weight bearing portion of the trochlea, medial or lateral condyle
  AND
  Knee is stable with intact, full functional menisci and ligaments
  AND
  Normal joint space
- Imaging: Chondral defect on weight bearing portion of the medial or lateral femoral condyle or trochlea on MRI or diagnostic arthroscopy

3. Osteochondral Autograft (Mosaicplasty) may be appropriate IF:
Clinical Findings support the diagnosis:

- Subjective: Joint pain AND Swelling
- Objective: Large full thickness chondral defect that measure less than 3 cm in diameter and 1 cm in bone depth on the weight bearing portion of the medial or lateral femoral condyle; or failure of previous subchondral drilling or microfracture.
  AND
  Knee is stable with intact, full functional menisci and ligaments
  AND
  Normal joint space
- Imaging: Chondral defect on weight bearing portion of the medial or lateral femoral condyle on MRI or diagnostic arthroscopy

Autologous Chondrocyte Implantation (ACI)
ACI may be appropriate if clinical rationale is provided and a 4-12 week trial of conservative care has been unsuccessful including physical medicine.

The likelihood of ACI success would be negatively affected by any of the following circumstances:

- Lesion that involves bone or is due to osteochondritis dissecans.
- A “kissing lesion” or Modified Outerbridge Grade II, III, or IV exists on the opposite tibial surface.
- Mild to severe localized or diffuse arthritic condition that appears on standing x-ray as joint space narrowing, osteophytes, or changes in the underlying bone.
- Unhealthy cartilage border; the synovial membrane in the joint may be used as a substitute border for up to ¼ of the total circumference.
- Prior total meniscectomy of either compartment in the affected knee. Must have at least 1/3 of the posterior meniscal rim.
- History of anaphylaxis to gentamicin or sensitivity to materials of bovine origin.
- Chondrocalcinosis is diagnosed during the cell culture process.
- Mechanical misalignment on radiographs.

Optimal candidate for ACI has these characteristics:

- Patient is willing and able to follow the rehabilitation protocol
- Patient has failed traditional surgical interventions (see above)

- Patient has a single, clinically significant, lesion that measures between 2.5 to 10 sq. cm in area that affects a weight-bearing surface of the medial femoral condyle or the lateral femoral condyle
- Full-thickness lesion (Modified Outerbridge Grade III-IV) that involves only cartilage
- Knee is stable with intact, full functional menisci and ligaments
- Normal joint space
- Normal knee alignment
- Patient is less than 60 years old
- Body mass index of less than 35
- Patient's chondral defect is on weight bearing portion of the medial or lateral condyle on MRI or diagnostic arthroscopy.

Post-Operative Therapy:
May include restricted weight-bearing, bracing, active and/or passive therapy. Continuous passive movement is suggested after microfracture.

C.2 Osteoarthritis

Osteoarthritis (OA) can be exacerbated by an injury, whether traumatic or overuse, while performing the duties of one's employment. It can be classified as mild, moderate or severe based on the impact of the disease on the employee's quality of life. Acute exacerbation of OA often presents with swelling and/or pain. To rule out alternative diagnoses based on the employee's clinical presentation, clinicians can consider serologic testing for rheumatologic disorders (e.g., rheumatoid factor, antinuclear antibodies, anti-Sm, anti-Ro, anti-La, etc.)

Imaging:
Plain films for the assessment of arthritis should include weight bearing AP and PA (Rosenberg) views.
CT is seldom indicated, but may be considered if reconstructive surgical intervention is being considered or if periprosthetic osteolysis is suspected post total knee arthroplasty.
MRI is not recommended for routine evaluation of OA.

Non-Operative Treatment:
Activity modification (avoiding movements that may cause further injury), aerobic exercise as tolerated, stretching and strengthening exercises are generally recommended.

Physical medicine, mobilization and or manipulation, is recommended and can include aquatic therapy. The patient should be reassessed every 8 visits to demonstrate clinically meaningful functional and/or symptomatic benefit.
Pain management with medications may include NSAIDs and acetaminophen. Alternative pain therapies may include cryotherapies/heat therapy, off-loader braces, acupuncture, percutaneous electric therapy as part of a rehabilitation program, corticosteroids, and viscosupplementation.

Surgical Indications:
Total knee arthroplasty or unicompartmental arthroplasty is recommended if all of the following are met; moderate to severe OA has been clinically confirmed, the individual has symptoms or functional limitations that severely restrict their activities of daily living or occupational tasks (including limited range of motion or nighttime joint pain), and the symptoms have not been managed after a trial of

non-operative treatment modalities. Ideally, the patient should be over 50 years of age, be a non-smoker and have a body mass index of less than 35. If a patient does not meet the ideal conditions insurers should consider offering weight loss treatment and or smoking cessation treatment.
Total knee arthroplasty is preferred due to revision statistics.

Post-Operative Treatment:
Post-operative patients should follow their surgeons recommended treatment plan which may include immediate (0-10 days) restricted activity and off-loading, short term (0-10 days) modified physical activity and a 3 month physical medicine program showing demonstrated improvement in treatment. Additional weeks may be allowed with clinical rationale.

C.3 Collateral Ligament (MCL and LCL) Injury

Collateral ligament injuries include strain, sprain, tear, or rupture of the medial or lateral collateral ligament (MCL/LCL). Injuries typically occur after valgus or varus force. Physical exam findings may include laxity or pain when valgus/varus stress is applied. Concurrent meniscus and or anterior or posterior cruciate ligament injury is common and should be evaluated.

Imaging: MRI is imaging of choice. X-ray may be considered first to rule out fracture.

Collateral Ligament Severity Scale:
Grade 1: ligament has been stretched but maintains joint stabilization
Grade 2: ligament remains at least partially intact but there is joint laxity (partial tear)
Grade 3: ligament has been completely severed (complete tear)

Non-Operative Treatment:
Bed rest and immobilization are not recommended. Specifically, prolonged/unnecessary use of knee immobilizer should be avoided.

Grade 1 injuries do not require surgery but may need work limitations, pain management (NSAIDS, acetaminophen), hinged brace may be considered, home program for quadricep muscle tone/stretching or formal PT as indicated.
Grade 2 injuries typically do not require surgery and have high recovery rates with non-operative treatment; hinged brace if tolerated, home program for quadricep muscle tone/stretching or formal PT as indicated; follow-up to assure progress, improved function.

Surgical Indications:
Grade 3 LCL tear confirmed by MRI. Some may benefit from surgery, while others can be treated non-operatively.
Many isolated Grade 3 MCL tears do not require surgical repair with excellent documented recovery of function. Surgery is only recommended for persistent instability, in rare cases of failure with non-operative treatment procedures.

C.4 Anterior Cruciate Ligament (ACL) Injury

Partial or complete tear/rupture of the ACL typically occurs after traumatic twisting or hyperextension forces. Provocative physical exam tests may include Lachman's test, Pivot Shift test and the Anterior Drawer test.

Imaging:
MRI is the imaging of choice but is not always needed with experienced clinical suspicion. Radiography can be used to rule out accompanying fracture. Arthroscopy can be used if other imaging is inconclusive.

Non-Operative Treatment:
Non-operative treatment has been demonstrated as successful in some patients with lower demand and even complete tears, and includes NSAIDS for pain, splints, cryotherapy/heat therapy, functional bracing and rehabilitation. Rehabilitation is the mainstay of treatment and is strongly recommended with non-operative or operative treatment. Rehabilitation can include 2-3 sessions per week for 1-6 weeks with a decreasing number of sessions up to 12 weeks to achieve strengthening and muscle coordination goals. Temporary work limitations and activity modification with short term off-loading may be indicated.

Surgical Indications:
Surgical reconstruction is typically indicated in most patients. Additionally, if clinical expertise deems surgical treatment is necessary for recovery, complete tears do not require any attempts at conservative therapy. Workers with higher demand jobs such as construction or delivery jobs typically benefit from reconstruction.

ACL surgical treatment may be appropriate if the following clinical, objective and imaging requirements are met:

Clinical Findings:
- Subjective: Knee instability OR Significant effusion at the time of injury OR Mechanism of action indicates rotary twisting or hyperextension incident
- Objective: Positive Lachman's sign OR Positive pivot shift OR Positive anterior drawer

Imaging:
(Not required but beneficial if hemarthrosis and instability obviously present)
ACL disruption on MRI, OR arthroscopy

Post-Operative Therapy:
Recommend 3 months of post-surgical physical medicine both at home and at a rehabilitation facility.

C.5 Posterior Cruciate Ligament (PCL) Injury

Partial or complete tear/rupture of the posterior cruciate ligament is typically due to a traumatic anterior to posterior force on a flexed knee and is uncommon. Provocative physical exam testing can include reverse pivot shift test, and posterior drawer test.

Imaging:
MRI is the imaging modality of choice but is not always needed with experienced clinical suspicion. Radiography can be used to rule out an accompanying fracture. Arthroscopy can be used if other imaging is inconclusive.

Non-Operative Treatment:
Non-operative treatment can be successful in even complete tears. Rehabilitation is the mainstay of treatment and is strongly recommended whether surgical intervention occurs or not. Bracing and temporary activity modification with short term off-loading may be indicated. Strengthening and muscle coordination are the focus of rehabilitation therapy.

Surgical Indications:
Surgical treatment for isolated PCL tears is not always required, but usually is indicated after an injury that causes multiligament damage.

Autograft or allograft reconstruction.
Recommended in select patients as clinically indicated.
Indications: Complaints of instability or pain. Carefully consider the patients' normal daily activity level before initiation of surgical intervention. Most commonly done when the PCL rupture is accompanied by multiligament injury.

Post-Operative Therapy:
Recommend 3 months of post-surgical physical medicine either at home or at a rehabilitation facility with a minimum of 3-5 supervised visits.

C.6 Meniscus Injury

Acute meniscal injuries are typically caused by twisting or flexion trauma that leads to disruption or tearing of the medial or lateral meniscus tissue. Surgery may be appropriate for the patients who continue to have significant functional deficits of activities of daily living or work duties after 6 weeks of therapy. Patients often complain of a "catching" sensation, with pain on high knee extension or knee flexion. Physical exam findings may show difficulty in forced knee flexion or extension, joint line tenderness, effusion or positive provocative physical exam testing such as McMurray, Apley or Thessaly tests. Patients with mechanical block may have loss of extension.

Degenerative meniscal tears, especially horizontal tears, commonly occur absent significant trauma. There is strong evidence that partial meniscectomy provides no clear benefit over initial exercise therapy for patients with an isolated degenerative meniscal tear. Therefore, it is not recommended.

Imaging:
MRI is the gold standard and can identify other ligamentous injuries that often accompany meniscal injuries. Radiographs may help rule out fracture if the injury was traumatic as well as arthritis that can present with some of the same exam findings. Clinical correlation is important due to frequent incidental MRI findings in asymptomatic patients.

Non-Operative Treatment:
Many meniscal injuries can be managed with conservative therapies such as heat therapy, cryotherapy, NSAIDS, knee sleeves, injections, and rehabilitative exercises. An initial physical medicine plan for 4 weeks at 2-3x/wk. We consider failure of conservative treatment after 6 to 12 weeks of rehabilitative therapy without adequate improvement.

Surgical Indications/Considerations:
1) Locked or blocked knee precluding active therapy.
2) Isolated acute meniscus tear with appropriate physical exam findings.
3) Isolated degenerative meniscal tear is not an indication for surgery without locking or other major functional symptoms.
4) Failed conservative care wherein patient has not regained preinjury knee function in the presence of imaging evidence of internal joint damage that may be amenable to arthroscopic intervention.

Debridement of the meniscus is not recommended in patients with severe arthritis as it is unlikely to alleviate symptoms. Complete excision of meniscus should only be performed when clearly indicated due to the long-term risk of arthritis in these patients.
Early MRI and early surgical intervention may be indicated for injured workers under age 35 who may have sustained a peripheral meniscus tear to optimize the outcome of repair. Early surgery is supported for patients with true locking (blocked extension).

The benefit of meniscectomy for degenerative tears in middle age patients and especially with osteoarthritis is unclear.

Post-Operative Therapy:
Recommend 4-6 weeks of rehabilitative exercises.

C.7 Patellar Subluxation

Patellar subluxation or “dislocated kneecap” is non-anatomical movement of the patella from the trochlear groove of the femur. The injury can be a full dislocation or a partial subluxation. Chronic subluxation can predispose to dislocation. The injury is typically caused by traumatic medial/lateral force to the knee. Patients often have a sensation of buckling with flexion. Common physical exam findings may include retinacular tenderness, patellar tracking abnormalities, patellar apprehension, and patella alta.

Imaging:
Radiographs are usually sufficient.
Patellar dislocation/ subluxation: consider an MRI to assess for chondral injury.

Non-Operative Treatment:
First line treatment for most non-fracture subluxation/dislocations with no intra-articular loose body is implementation of a rehabilitation plan for 3 months. Bed rest and immobilization are not recommended.

Surgical Indications:
In the presence of a fracture, open reduction internal fixation is recommended.
May also consider tibial tubercle osteotomy, lateral retinacular release, quadriceps reefing, or medial patellofemoral ligament reconstruction in recurrent subluxation cases or if symptoms persist after a trial of conservative therapy.

Post-Operative Therapy:
Procedure dependent duration but all should focus on strength and neuromuscular coordination of the muscles that cross the knee joint.

C.8 Retropatellar Pain Syndrome (Chondromalacia Patella)

Retropatellar pain syndrome is due to damage of the hyaline cartilage covering the posterior patella. It is commonly caused by an overuse injury but may be exacerbated/precipitated by trauma. This syndrome is colloquially known as “runner’s knee”. Mechanism of injury is through repeated compressive forces on the patella (flexion of the quadriceps). The Q-angle (angle created roughly between the femur and the tibia) may be exaggerated causing increased stress on the lateral aspect of the internal/posterior patella. Physical exam findings may include pain with patellar compression, crepitus with range of motion, and quadriceps atrophy. Physical exam tests can include positive findings on the patellar glide test or the patellar apprehension test.

Imaging:
Radiographs can rule out alternative pathology, but the mainstay of diagnosis is clinical.
MRI may reveal additional diagnostic value in select patients where alternate pathology is suspected.

Non-Operative Treatment:
Conservative treatment with physical medicine is recommended. Therapy should include quadriceps strengthening for recovery. Recommended assessment of the hips and ankle for other causative misalignment pathology may also be beneficial.

Surgical Indications:
Should only be considered after an exhaustive failed rehabilitation attempt (at least 1 year). There is limited evidence for surgical intervention.

Patellar realignment surgery may be appropriate IF:

Clinical Findings support the diagnosis:

- Subjective: Knee pain with sitting OR Pain with patellar/femoral movement OR Recurrent dislocations
- Objective: Lateral tracking of the patella OR Recurrent effusion OR Patellar apprehension OR Synovitis with or without crepitus OR Increased Q angle > 15 degrees

Imaging:
Abnormal patellar tilt on X-ray or MRI, or trochlear dysplasia

Post-Operative Therapy:
Similar plan as non-operative treatment focusing on quadriceps strengthening.

C.9 Patellar Tendinitis/Tenosynovitis

Patellar tendinitis is due to inflammation of the patellar tendon sheath or tendon and occurs commonly at the muscle/bone junction at the inferior pole of the patella. Injuries are often due to repetitive overuse but can be elicited by trauma. As compared to bursitis, knee pain is typically more inferior. Physical exam findings include tenderness at the inferior pole of the patella.

Imaging:

Used to rule out other pathologies. Radiograph to rule out fracture or arthritis if indicated.

Non-Operative Treatment:
The cornerstone of treatment is activity and work modification by reducing force through repetitive flexion or direct pressure on the knee (e.g. carrying items up and down stairs, kneeling, squatting). For symptomatic treatment, NSAIDs may be indicated. Eccentric quadriceps exercises should be the focus of a rehabilitation plan as well as lower extremity strengthening and stretching exercises.

Surgical Indications:
Patellar tendon debridement and repair may be indicated in the presence of a complete or significant tear.

Post-Operative Therapy:
Gradual increase in quadriceps load over 3 months. Rest periods should be accompanied with continued low force movements.

C.10 Bursitis

Bursa inflammation, most commonly the prepatellar bursa but may also appear at the pes anserinus. Mechanism of injury is often kneeling on an object placing pointed force through bursa but can be from repetitive kneeling and/or an increase of quadriceps dominant movements. As compared to tendonitis, pain is typically more superior at the body of the patella for pre-patellar bursitis, or over the pes bursa at the anteromedial aspect of the proximal tibia. Physical exam may reveal an enlarged, palpable and tender bursa in addition to pain with resisted quadriceps extension and decreased flexion. It is important to consider aspiration of fluid and gram stain/culture if infection is suspected.

Imaging:
Radiographs and MRI are used only to rule out other pathologies (e.g., septic knee bursitis). Ultrasound may be considered to evaluate pes anserine bursitis or concern for a mass.

Non-Operative Treatment:
The key to conservative treatment is activity and work modification to limit both high force and high repetition activities while maintaining movement. Compressive forces such as kneeling should be avoided. Pain management may include wraps and padding around the bursa and may reduce incidental reinjury. May consider drainage and steroid injection.

Surgical Indications:
Surgical excision of the bursa is indicated in the presence of infection or after failure of conservative therapy of at least 3 months for an initial case with no incremental improvement.

Post-Operative Therapy:
Use of knee pads for several months and perhaps permanently is recommended. Increase activity as tolerated. Recommend 4-6 wks of physical medicine to regain ROM, quadriceps strength, and overall function.

D. THERAPEUTIC PROCEDURES

With any therapeutic procedure, the authorized treating provider, employer and insurer must be cognizant of the following principles of caring for the injured worker:

1. Treatment outcome should be assessed on a regular basis, i.e. every 8-12 visits/3-4 weeks and documented evidence of clinically meaningful functional and/or symptomatic benefit must be objectively documented before additional treatment can be clinically justified. Treatments should be reviewed and/or ceased when there is no longer objective improvement in the injured worker's condition. Alternative treatment interventions, further diagnostic studies or consultations should be pursued.
Examples of "clinically meaningful functional and/or symptomatic benefit" may include:
   - Reduction in the patient's use of prescription medications, and/or
   - Reduction in the need for ongoing supervised treatment, and/or
   - Reduction in the patient's work restrictions and limitations (i.e. – improved/change in work status).
2. The patient should be educated on the treatment rationale.
3. In situations where accessing treatment facilities is a significant barrier to care, home therapy may be necessary. Home therapy may include active and passive therapeutic treatment and is usually of short duration.
4. Durable Medical Equipment (DME) may assist with stability, improve function, and help reduce pain for certain conditions. The choice of DME is selected by the treating health care practitioner after a discussion with the injured worker regarding proper use and expected compliance. The injured worker may require medical visits for supervised training regarding proper use of the DME. Medical records should clearly document the clinical rationale for the prescribed DME.

D.1 Acupuncture:

Generally not recommended for acute knee injuries. Provider justification required (see Chronic Pain Guidelines).

D.2 Biofeedback:

Not generally recommended for knee. However, may be beneficial to help regain quadriceps motor control and function.

D.3 Therapeutic Injections:

Ideally, a therapeutic injection will: (a) reduce inflammation in a specific target area; (b) relieve secondary muscle spasm; (c) allow a break from pain; and (d) support therapy directed to functional recovery. Therapeutic injections should be used as an adjunct therapy to reduce pain with rehabilitation. General contraindications to knee injections include local or systemic infection, bleeding disorders, allergy to medications used and refusal.
Corticosteroid: May be performed as a therapeutic intervention for knee injuries from an anti-inflammatory and subsequently analgesic perspective. This should be reserved for cases with lack of substantial improvement with oral and topical medications as well as physical medicine. This should not be performed on knee injuries with ongoing infection, either confirmed or suspected. Corticosteroid injections into knee tendons is not recommended.

Specific contraindications may apply to individual injections. Injections are typically not done more than once at least two (2) months apart. Time to produce effect: Immediate with local anesthetic, or within three days with corticosteroids.
Optimum/maximum duration: Limited up to three injections annually to the same site with objective and subjective documented benefits.

Trigger Point Injections: Generally not recommended for knee injuries.

Prolotherapy (also known as sclerotherapy): Not recommended for knee injuries.

Platelet Rich Plasma (PRP): No recommendation. A determination as to the use of this treatment may be made on a case by case basis as science is evolving and there is limited evidence of efficacy.

Intracapsular Acid Salts – Viscosupplementation: Hyaluronic acid injections are an alternative to steroid injection for work related exacerbation of osteoarthritis. These injections may be considered in patients who have insufficient improvement with non-pharmacological and analgesic treatment, particularly if NSAID use is contraindicated or surgical intervention is not an appropriate treatment. There is limited evidence of efficacy for viscosupplementation in severe osteoarthritis and its efficacy beyond six months is not well known. This medication is to be given per manufacturer's directions, typically 6 to 8 months apart.

D4. Medications

Non-steroidal anti-inflammatory drugs (NSAIDs): For patients who can tolerate them, ibuprofen, naproxen, or other older generation NSAIDs are recommended as first-line medications.

Acetaminophen (or the analog paracetamol) may be a reasonable alternative or adjunct to NSAIDs for optimum analgesia. These medications are recommended for treatment of acute, subacute, or chronic knee pain. Patients with known cardiovascular and/or renal disease or multiple risk factors for cardiovascular and/or renal disease should have the risks and benefits of NSAID therapy for pain discussed. Acetaminophen may be a necessary alternative treatment modality in select patient groups. Simultaneous dosing of acetaminophen and NSAIDs has been shown to provide superior analgesia compared to either medication utilized alone.

Topical medications can be used as an adjunct treatment of pain associated with acute, subacute, or chronic knee pain. Treatments include topical creams, ointments, and lidocaine patches. A topical agent should be prescribed with strict instructions for application and maximum number of applications per day to obtain the desired benefit and avoid potential toxicity. Compounding pharmaceuticals are not generally recommended.

Opioids are not generally recommended as first-line management for acute, subacute, or chronic knee pain. They are appropriate for use (no more than seven days) for post-operative pain management as adjunctive therapy.

Muscle relaxants are only indicated for management of knee pain due to muscle spasm.

D.5 Orthotics and Bracing

When there is a need to normalize weight-bearing, facilitate better motion response, stabilize a joint with insufficient muscle or proprioceptive/reflex competencies, or to protect subacute conditions as needed during movement and correct biomechanical problems, use of orthotics and prosthetics may be indicated. Splints or adaptive equipment may be necessary for some patients.

D.6 Rehabilitation

Rehabilitation (supervised formal therapy) should be focused on restoring functional ability required to meet the patient's daily and work activities, facilitating their return to work. Ideally, rehabilitation aims to return the injured worker to pre-injury status.

Active therapy requires the patient to complete specific exercises or tasks. Passive therapy is dependent on manipulation and effort delivered by a licensed health care practitioner. Generally, passive interventions are viewed as a means to facilitate progress in an active therapy program with concomitant attainment of objective functional gains. Active interventions, which may include Blood Flow Restriction Training, should be emphasized over passive interventions. The patient should be instructed to continue both active and passive therapies at home as an extension of the treatment process in order to maintain improvement levels.
Assistive devices may be included as an adjunctive measure incorporated into the rehabilitation plan to facilitate functional gains.

Contrast Baths: Not recommended for knee injuries.

Functional Electrical Stimulation (Physician or Therapist Applied): This may be utilized as an adjunct treatment to reduce knee pain and augment supportive musculature force for two (2) to three (3) times per week up to two (2) months.

Gait Training: Recommended in patients with lower extremity injuries, particularly those who required surgical intervention. Gait training promotes a normal gait pattern with assistive devices, instructs the patient on safety and proper use of assistive devices, and guides progressive use of more independent devices (i.e., platform walker to walker to crutches to cane). This training reduces fall risk and helps protect a healing injury or surgery. Typically, two (2) to three (3) times per week with up to four (4) treatments is needed to produce effect and a maximum duration of two (2) weeks as clinically indicated.

Infrared Therapy: Not recommended for knee injuries.

Iontophoresis: Not recommended for knee injuries.

Massage (Manual or Mechanical): Not recommended for knee injuries.

Mobilization (Joint): May be clinically indicated to improve joint play, improve intracapsular mobility, and/or reduce pain associated with knee movement due to underlying causes. Typically, three (3) times per week with up to nine (9) treatments may be needed to produce effect and a maximum of ten (10) treatments as clinically indicated.

Mobilization/Manual Therapy (Soft Tissue): May be indicated to reduce muscle spasms, neural compression, trigger points, and adhesions around a joint. Two (2) to three (3) times per week for up to three (3) weeks may be needed to produce an effect.

Neuromuscular Re-education: Recommended for retropatellar and patellofemoral degenerative joint conditions. This may be utilized two (2) to three (3) times per week with up to four (4) treatments needed to produce effect. Also recommended to regain balance for injured employees whose jobs require standing and or walking on unlevel surfaces.

Physical Medicine: Physical medicine treatments may be provided by physicians, chiropractors, physical/occupational therapists and other duly qualified health care practitioners. Recommended to improve function, including range of motion and strength. Visits may be as few as two (2) to three (3) for patients with mild functional deficits or up to twelve (12) to fifteen (15) with more severe deficits with documentation of ongoing objective functional improvement. Ongoing functional deficits may require additional sessions, provided there is clear documentation of functional improvement towards specific objective functional goals (e.g., range of motion, advancing ability to perform work activities). A home exercise program should be developed and performed in conjunction with the therapy.

Superficial Cold Therapy: May be indicated for management of pain, edema and hemorrhage (cold specifically), muscle spasms and stiffness. Treatment may include portable cryotherapy units and application of heat. May be performed in conjunction with other active therapy or may be administered by the patient themselves. Typically, two (2) to five (5) times per week with immediate effect and a maximum duration of two (2) months is clinically appropriate.

Taping or Strapping: May be indicated for acute joint stability management post-injury, but not recommended for pain management. May also be indicated to promote correct patellofemoral alignment.

Therapeutic Exercise: May include isoinertial, isotonic, isometric and isokinetic types of exercises. Exercise aims to reduce edema, improve muscle strength, improve connective tissue strength and integrity, increase bone density, promote circulation to enhance soft tissue healing, improve muscle recruitment, increased range of motion, and promotion of normal movement patterns. Typically, three (3) to five (5) times per week with a maximum of eight (8) weeks may be clinically indicated.

Therapeutic Ultrasound: May be indicated to reduce scar tissue, adhesions, contractures and muscle spasm; may also accelerate soft tissue healing. Typically, three (3) times per week with up to fifteen (15) treatments is needed to produce effect with a maximum of two (2) months of treatment.

Vasopneumatic Devices: Not recommended for knee injuries.

Wheelchair Management and Propulsion: May be necessary in select patients who are not able to ambulate due to bilateral lower extremity injuries, those who are unable to use ambulatory assistive devices, and in cases of multiple traumas. Typically, two (2) to three (3) times per week with up to six (6) treatments may be needed to produce effect.

Whirlpool: May be indicated for analgesia, relaxing muscle spasm, reducing joint stiffness, enhancing mechanical debridement and facilitating and preparing for exercise.
Up to five (5) treatments per week may be indicated with two (2) to four (4) treatments needed to produce effect. A maximum of two (2) months may be clinically indicated if used as adjunct therapy.

D.7 Therapy: Ongoing Maintenance Care

If pain persists after the expected period of healing, refer to the MA Chronic Pain Treatment Guideline.

D.8 Therapeutic Procedures and Operative Management

All operative interventions must be based upon positive correlation of clinical findings, clinical course, and diagnostic tests as indicated. A specific diagnosis with positive identification of pathologic condition(s) must be made. Non-physiologic modifiers of pain and non-operative conditions mimicking radiculopathy or instability (E.g., peripheral neuropathy, piriformis syndrome, myofascial pain, sympathetically mediated pain syndromes, sacroiliac dysfunction, psychological conditions, etc.) must be ruled out prior to surgical intervention.

In addition, operative treatment is indicated when the natural history of surgically treated lesions is better than the natural history for non-operatively treated lesions. A comprehensive neuromusculoskeletal examination should be documented to identify injury components which may respond to non-surgical techniques or may be refractory to surgical intervention.
Post-operative management often includes rest/restricted activity, off-loading with crutches or cane, oral medications, followed by active therapy for protected weight-bearing and gait training.

Amputation: May be indicated, generally due to acute trauma with bony, soft tissue, neurologic, and/or vascular compromise of the lower extremity. Clear documentation of inability to salvage the amputated tissue should be present.

Bursectomy: Surgical excision of a bursa may be indicated if the inflamed bursa causes persistent pain and/or swelling despite multimodal conservative management. Typically, this is considered where a bursa adjacent to the knee presents functionality issues because of its inflamed size. Typically, non-operative management will be tried for a minimum of twelve (12) weeks before bursectomy is considered.

Contracture Release: Some patients may require surgical management of contracted tissue post-surgery. Examination findings should identify a shortened tendon or contracted joint capsule in the setting of a stiffened joint. Multimodal conservative management should be undertaken prior to operative management with clear documentation of need for surgical intervention. See MUA section. Physical Therapy should be initiated following the contracture release.

Hardware Removal: Removal of internal hardware may be indicated after recovery of a traumatic injury which required instrumentation fixation or reconstruction, including but not limited to infection, broken hardware, loosening hardware, pain.

Knee Arthroplasty: Knee arthroplasty may be indicated in some circumstances.
Severe osteoarthritis: All reasonable conservative measures have been exhausted. Other reasonable surgical options have been considered or implemented.

Clinical Findings support of diagnosis warranting arthroplasty:

- Subjective:
  Limited range of motion and/or
  Nocturnal joint pain and/or

Pain refractory to multimodal conservative management (i.e., oral medications, therapy, injections)

- Objective:
  Age > 50 years
  - ❖ If <50 consider for unicompartmental replacement if:
    - Little or no arthritis in the lateral compartment
    - No inflammatory disease and/or deformity
    - Body Mass Index (BMI) < 35
    - May be considered for lateral unicompartmental disease when the patient is not a candidate for osteotomy

  BMI > 35: Recommend weight loss program if the patient is unsuccessful losing weight on their own.
- Imaging findings: Standing weight bearing, AP, Lateral, and Tangential patellar view showing significant osteophytes, joint space narrowing, and/or subchondral sclerosis

Relative contraindications: Significant general disability due to other medical/psychiatric conditions.

Knee Fusion: Surgical fusion of femur to tibia at the knee joint. Typically, open reduction, grafting, and internal fixation are performed. Prior to this procedure, diagnostic imaging (i.e., radiographs, MRI) and appropriate lab/clinical findings to rule out active infection, are done. All reasonable conservative measures should have been exhausted and other reasonable surgical options have been seriously considered or implemented.

Manipulation Under Anesthesia (MUA):
May be clinically indicated to address adhesions within 3-6 months or less after the work injury or surgery.
Indications/Considerations: A minimum of 6 weeks of conservative care (e.g. physical medicine, bracing, injections), pain, continued joint stiffness in passive and active range of motion, no contraindications.
Post procedure, an individualized rehabilitation program.