

Chronic Knee Pain
EVIDENCE TABLE

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
1. Murphy LB, Moss S, Do BT, et al. Annual Incidence of Knee Symptoms and Four Knee Osteoarthritis Outcomes in the Johnston County Osteoarthritis Project. <i>Arthritis Care Res (Hoboken)</i> . 2016;68(1):55-65.	Review/Other-Dx	1,518 patients	To estimate annual incidence rates (IR) of knee symptoms and four knee osteoarthritis (OA) outcomes (radiographic, symptomatic, severe radiographic and severe symptomatic) overall and stratified by socio-demographic characteristics and knee OA risk factors.	The median follow-up time was 5.5 years. Average annual incidence rates [IR] were: symptoms=6%, radiographic OA=3%, symptomatic OA=2%, severe radiographic OA=2%, and severe symptomatic OA=0.8%. Across outcomes, IRs were highest among those with the following baseline characteristics: age = 75 years; obese; a history of knee injury; or an annual household income = \$15,000.	4
2. George E, Tsipas S, Wozniak G, et al. MRI of the knee and shoulder performed before radiography. <i>J Am Coll Radiol</i> . 2014;11(11):1053-1058.	Review/Other-Dx	84,704 Knee MRI; 53,936 Shoulder MRI	To estimate the percentage of magnetic resonance imaging (MRI) examinations for knee and shoulder pain or tendonitis performed without prior radiography, which thus may fall outside the American College of Radiology (ACR) Appropriateness Criteria for the Medicare and commercially insured populations.	Approximately 28% of all knee MRIs, and 35%-37% of all shoulder MRIs were performed without recent prior radiographs. The extrapolated expense of these potentially unwarranted MRIs in the entire fee-for-service Medicare population was between \$20 and \$35 million. Between 20% and 23% of patients undergoing knee MRI, and 27%-32% undergoing shoulder MRI, did not have radiographic examination at any point before the MRI in the same calendar year.	4
3. American College of Radiology. ACR Appropriateness Criteria®: Osteonecrosis of the Hip. Available at: https://acsearch.acr.org/docs/69420/Narrative/ .	Review/Other-Dx	N/A	Evidence-based guidelines to assist referring physicians and other providers in making the most appropriate imaging or treatment decision for osteonecrosis of the hip.	N/A	4
4. American College of Radiology. ACR Appropriateness Criteria®: Acute Trauma to the Knee. Available at: https://acsearch.acr.org/docs/69419/Narrative/ .	Review/Other-Dx	N/A	Evidence-based guidelines to assist referring physicians and other providers in making the most appropriate imaging or treatment decision for acute trauma to the knee.	N/A	4
5. Hochman MG, Melenevsky YV, Metter DF, et al. ACR Appropriateness Criteria(R) Imaging After Total Knee Arthroplasty. <i>J Am Coll Radiol</i> . 2017;14(11S):S421-S448.	Review/Other-Dx	N/A	Evidence-based guidelines to assist referring physicians and other providers in making the most appropriate imaging or treatment decision for imaging after total knee arthroplasty.	No results stated in abstract.	4

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6. Kransdorf MJ, Murphey MD, Wessell DE, et al. ACR Appropriateness Criteria® Soft-Tissue Masses. J Am Coll Radiol 2018;15:S189-S97.	Review/Other-Dx	N/A	Evidence-based guidelines to assist referring physicians and other providers in making the most appropriate imaging or treatment decision for soft-tissue masses.	No results stated in abstract	4
7. American College of Radiology. ACR Appropriateness Criteria®: Primary Bone Tumors. Available at: https://acsearch.acr.org/docs/69421/Narrative/ .	Review/Other-Dx	N/A	Evidence-based guidelines to assist referring physicians and other providers in making the most appropriate imaging or treatment decision for primary bone tumors.	N/A	4
8. Jacobson JA, Roberts CC, Bencardino JT, et al. ACR Appropriateness Criteria(R) Chronic Extremity Joint Pain-Suspected Inflammatory Arthritis. J Am Coll Radiol. 2017;14(5S):S81-S89.	Review/Other-Dx	N/A	Evidence-based guidelines to assist referring physicians and other providers in making the most appropriate imaging or treatment decision for chronic extremity joint pain.	No results stated in abstract.	4
9. Illingworth KD, El Bitar Y, Siewert K, Scaife SL, El-Amin S, Saleh KJ. Correlation of WOMAC and KOOS scores to tibiofemoral cartilage loss on plain radiography and 3 Tesla MRI: data from the osteoarthritis initiative. Knee Surg Sports Traumatol Arthrosc. 2014;22(7):1649-1658.	Observational-Dx	4,796 patients	To determine the correlation between the Western Ontario and McMasters Universities Osteoarthritis Index (WOMAC) and Knee Injury Osteoarthritis Outcomes scores (KOOS) and the degree of tibiofemoral cartilage loss on plain radiography and 3 Tesla (3T) magnetic resonance imaging (MRI).	There was a statistically significant correlation between medial and lateral compartment cartilage thickness on MRI and medial and lateral joint space width on plain radiography ($r = 0.86$, $r = 0.80$) ($p < 0.001$). KOOS knee pain score was significantly correlated to increasing per cent full thickness cartilage loss in the medial femoral compartment ($r = 0.34$) ($p < 0.001$). KOOS symptom score was significantly correlated to decreasing joint space width in the medial ($r = 0.16$) and lateral ($r = 0.15$) compartment and increasing per cent full thickness cartilage loss in the medial femoral compartment ($r = 0.36$) ($p < 0.001$). No WOMAC score was correlated to degree of joint space width, cartilage thickness or per cent full thickness cartilage loss (n.s).	3

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10. Wick MC, Kastlunger M, Weiss RJ. Clinical imaging assessments of knee osteoarthritis in the elderly: a mini-review. <i>Gerontology</i> . 2014;60(5):386-394.	Review/Other-Dx	N/A	To provide an insight into the most important radiological features of knee osteoarthritis (OA) and their systematic visualization with different imaging approaches that can be used in clinical routine.	No results stated in abstract.	4
11. Hayashi D, Roemer FW, Guermazi A. Imaging for osteoarthritis. <i>Ann Phys Rehabil Med</i> . 2016;59(3):161-169.	Review/Other-Dx	N/A	To review the roles and limitations of radiography and magnetic resonance imaging (MRI) with particular attention to knee osteoarthritis (OA).	No results stated in abstract.	4
12. Kinds MB, Marijnissen AC, Bijlsma JW, Boers M, Lafeber FP, Welsing PM. Quantitative radiographic features of early knee osteoarthritis: development over 5 years and relationship with symptoms in the CHECK cohort. <i>J Rheumatol</i> . 2013;40(1):58-65.	Observational-Dx	1002 patients.	To evaluate whether computer-assisted, interactive digital analysis of knee radiographs enables identification of different quantitative features of joint damage, and to evaluate the relationship of such features with each other and with clinical characteristics during 5-year followup in early osteoarthritis (OA).	The identified radiographic features were joint space width (JSW: minimum, medial, lateral), varus angle, osteophyte area, eminence height, and bone density. The features progressed in severity at different times during followup: early (medial JSW, osteophyte area), late (minimum and lateral JSW, eminence height), and both early and late (varus angle, bone density). Correlations between different radiographic features varied between timepoints. The JSW features were most strongly related to each other (largest $r = 0.82$), but also, e.g., osteophytes and bone density were correlated (largest $r = 0.33$). The relationships with clinical outcome varied over time, but were most commonly found for osteophyte area and JSW.	2

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13. Hayashi D, Xu L, Roemer FW, et al. Detection of osteophytes and subchondral cysts in the knee with use of tomosynthesis. <i>Radiology</i> . 2012;263(1):206-215.	Observational-Dx	40 patients	To evaluate the diagnostic performance of tomosynthesis in depicting osteophytes and subchondral cysts, with use of magnetic resonance (MR) imaging as the reference, and to test whether the lesions detected at radiography and tomosynthesis are associated with pain.	MR imaging depicted 171 osteophytes and 51 subchondral cysts. Tomosynthesis had a higher sensitivity for osteophyte detection in left and right lateral femur (0.96 vs 0.75, P = .025, and 1.00 vs 0.71, P = .008, respectively), right medial femur (0.94 vs 0.72, P = .046), and right lateral tibia (1.00 vs 0.83, P = .046). For subchondral cyst detection, the sensitivity of tomosynthesis was 0.14–1.00 and that of radiography was 0.00–0.56. Both modalities had similar specificity for both lesions. Subjects with tomosynthesis-depicted osteophytes (odds ratio, 4.2–6.4; P = .001–.011) and medially located subchondral cysts (odds ratio, 6.7–17.8; P = .004–.03) were more likely to feel pain than those without. However, radiography-depicted osteophytes were more strongly associated with pain than were tomosynthesis-depicted osteophytes.	3
14. Haviv B, Bronak S, Thein R. The complexity of pain around the knee in patients with osteoarthritis. <i>Isr Med Assoc J</i> . 2013;15(4):178-181.	Review/Other-Dx	N/A	To understand the clinical assessment of the sore osteoarthritic knee with better imaging technique such as magnetic resonance.	No results stated in abstract.	4
15. Grando H, Chang EY, Chen KC, Chung CB. MR imaging of extrasynovial inflammation and impingement about the knee. <i>Magn Reson Imaging Clin N Am</i> . 2014;22(4):725-741.	Review/Other-Dx	N/A	To review the magnetic resonance (MR) imaging of extrasynovial inflammation and impingement about the knee.	No results stated in abstract.	4
16. Kalke RJ, Di Primio GA, Schweitzer ME. MR and CT arthrography of the knee. <i>Semin Musculoskelet Radiol</i> . 2012;16(1):57-68.	Review/Other-Dx	N/A	To review the Magnetic Resonance (MR) and Computed Tomography (CT) arthrography of the knee.	No results stated in abstract.	4

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17. Krasnokutsky S, Belitskaya-Levy I, Bencardino J, et al. Quantitative magnetic resonance imaging evidence of synovial proliferation is associated with radiographic severity of knee osteoarthritis. <i>Arthritis Rheum.</i> 2011;63(10):2983-2991.	Observational-Dx	180 patients	To evaluate the relationships of quantitative and semi-quantitative (SQ) assessments of synovium with knee osteoarthritis (OA) severity by radiographic and 3 tesla (3T) Magnetic Resonance Imaging (MRI) findings.	Kellgren-Lawrence (KL) grade, diseased compartment joint space width (dcJSW) and diseased compartment joint space narrowing (dcJSN) were significantly associated with synovial proliferation, measured as contrast-enhanced (CE) quantify synovial volume (qSV) ($\beta = 0.78$, $p = 0.0001$; $\beta = -0.22$, $p = 0.0003$; $\beta = 0.53$, $p = 0.0001$, respectively). Furthermore, qSV strongly correlated with total subchondral bone marrow lesions (BML) volume ($\beta = 0.22$, $p = 0.0003$). KL grade, dcJSW, and dcJSN were significantly associated with Boston-Leeds osteoarthritis knee score (BLOKS) SQ infrapatellar synovitis (OR [95%CI]: 9.05, [1.94,42.3]; 0.75 [0.54,1.03]; 2.22 [1.15,4.31], respectively) and effusion (OR [95%CI]: 5.75, [1.23,26.8]; 0.70, [0.50,0.98]; 1.96, [1.02,3.74], respectively). CE SQ synovitis also significantly associated with KL and dcJSN ($\beta = 0.036$, $p = 0.0040$; $\beta = 0.015$, $p = 0.0266$, respectively), and BLOKS synovitis.	2
18. Guermazi A, Roemer FW, Haugen IK, Crema MD, Hayashi D. MRI-based semiquantitative scoring of joint pathology in osteoarthritis. <i>Nat Rev Rheumatol.</i> 2013;9(4):236-251.	Review/Other-Dx	N/A	To review the magnetic resonance imaging (MRI)-based semiquantitative scoring of joint pathology in osteoarthritis.	No results stated in abstract.	4

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19. Javaid MK, Kiran A, Guermazi A, et al. Individual magnetic resonance imaging and radiographic features of knee osteoarthritis in subjects with unilateral knee pain: the health, aging, and body composition study. <i>Arthritis Rheum.</i> 2012;64(10):3246-3255.	Observational-Dx	3075 patients.	To compare radiographic and magnetic resonance imaging (MRI) features of knee osteoarthritis (OA) and assess their ability to discriminate between painful and nonpainful knees in persons with unilateral symptoms.	In conditional logistic analyses, knee pain was significantly associated with both radiographic features (any joint space narrowing grade ≥ 1) (odds ratio 3.20 [95% confidence interval 1.79-5.71]) and MRI features (any cartilage defect scored ≥ 2) (odds ratio 3.67 [95% confidence interval 1.49-9.04]). However, in most subjects, MRI revealed osteophytes and cartilage and bone marrow lesions in both knees, and using Receiver operating characteristic (ROC) analysis, no individual structural feature discriminated well between painful and nonpainful knees. The best-performing MRI feature (synovitis/effusion) was not significantly more informative than Kellgren Lawrence (K/L) grade ≥ 2 ($P = 0.42$).	2
20. Baum T, Joseph GB, Arulanandan A, et al. Association of magnetic resonance imaging-based knee cartilage T2 measurements and focal knee lesions with knee pain: data from the Osteoarthritis Initiative. <i>Arthritis Care Res (Hoboken).</i> 2012;64(2):248-255.	Review/Other-Dx	126 patients.	To evaluate the association of magnetic resonance imaging (MRI)-based knee cartilage T2 measurements and focal knee lesions with knee pain in knees without radiographic osteoarthritis (OA) among subjects with OA risk factors.	Prevalences of meniscal, bone marrow, and ligamentous lesions and joint effusion were not significantly different between the groups ($P > 0.05$), while cartilage lesions were more frequent in subjects with right knee pain only compared to subjects without knee pain ($P < 0.05$). T2 values averaged over all of the compartments were similar in subjects with right knee pain only (mean \pm SD 34.4 \pm 1.8 msec) and in subjects with bilateral knee pain (mean \pm SD 34.7 \pm 4.7 msec), but were significantly higher compared to subjects without knee pain (mean \pm SD 32.4 \pm 1.8 msec; $P < 0.05$).	4

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21. Englund M, Guermazi A, Gale D, et al. Incidental meniscal findings on knee MRI in middle-aged and elderly persons. N Engl J Med. 2008; 359(11):1108-1115.	Review/Other-Dx	991 subjects	To evaluate the prevalence of meniscal tears in the middle aged and elderly and association with knee pain and knee OA.	The prevalence of a meniscal tear or of meniscal destruction in the right knee as detected on MRI ranged from 19% (95% CI, 15-24) among women 50 to 59 years of age to 56% (95% CI, 46-66) among men 70 to 90 years of age. Among persons with radiographic evidence of OA (Kellgren-Lawrence grade 2 or higher, on a scale of 0 to 4, with higher numbers indicating more definite signs of OA), the prevalence of a meniscal tear was 63% among those with knee pain, aching, or stiffness on most days and 60% among those without these symptoms. The corresponding prevalence's among persons without radiographic evidence of OA were 32% and 23%. Meniscal tears are common in the general population, and increase with increasing age. A majority of the elderly (>70 years old) have a meniscal tear, and a majority of these individuals are asymptomatic.	4

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22. Foong YC, Khan HI, Blizzard L, et al. The clinical significance, natural history and predictors of bone marrow lesion change over eight years. <i>Arthritis Res Ther.</i> 2014;16(4):R149.	Observational-Dx	198 patients.	To describe the natural history of knee bone marrow lesions (BMLs), their association with knee pain and examine predictors of BML change over eight years.	At the two year visit, 64% of participants (n = 127) had 229 BMLs (34% patella, 26% femoral and 40% tibial). Over eight years, 24% (55/229) increased in size, 55% (125/229) remained stable and 21% (49/229) decreased in size or resolved completely. Of the participants without BMLs at baseline, 52% (37/71) developed incident BMLs. After adjusting for confounders, eight year change in total BML size was associated with change in knee pain in offspring ($\beta = 2.50$, 95% confidence interval (CI) 0.96 to 4.05) but not controls. This association was stronger in males. Incident BMLs were associated with increase in pain ($\beta = 3.60$, 95% CI 1.14 to 6.05). Body mass index (BMI) and strenuous activity (but not radiographic osteoarthritis or smoking) were associated with an increase in BML size.	2

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23. Driban JB, Price L, Lo GH, et al. Evaluation of bone marrow lesion volume as a knee osteoarthritis biomarker--longitudinal relationships with pain and structural changes: data from the Osteoarthritis Initiative. <i>Arthritis Res Ther.</i> 2013;15(5):R112.	Observational-Dx	404 patients	To evaluate the cross-sectional and longitudinal associations between bone marrow lesions (BMLs) volume and knee pain as well as joint space narrowing (JSN), with an emphasis on exploring decreases in BML size.	This sample was 49% female with a mean age of 63 (9.2 standard deviation (SD)) years, and 71% had radiographic osteoarthritis in the study knee. Larger baseline BMLs were associated with greater baseline knee pain (P = 0.01), the presence of JSN at baseline (odds ratio (OR) = 1.50, 95% confidence interval (CI) = 1.23 to 1.83), and JSN progression (OR = 1.27, 95%CI = 1.11 to 1.46). Changes in total knee BML volume had a positive association with changes in knee pain severity (P = 0.004) and this association may be driven by knees that were progressing from no or small baseline BMLs to larger BMLs. In contrast, we found no linear positive relationship between BML volume change and JSN progression. Instead, regression of medial tibiofemoral BML volume was associated with JSN progression compared to knees with no or minimal changes in BML volume (OR = 3.36, 95%CI = 1.55 to 7.28). However, follow-up analyses indicated that the association between JSN progression and BML volume change may primarily be influenced by baseline BML volume.	2

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24. Baert IA, Staes F, Truijen S, et al. Weak associations between structural changes on MRI and symptoms, function and muscle strength in relation to knee osteoarthritis. <i>Knee Surg Sports Traumatol Arthrosc.</i> 2014;22(9):2013-2025.	Observational-Dx	87 women	To explore associations between magnetic resonance imaging (MRI)-defined structural abnormalities and clinical features related to knee osteoarthritis (OA).	Limited significant associations between structural and clinical features were found. An increased meniscal signal was associated with more pain/symptoms ($P < 0.027$). An anterior cruciate ligament tear was associated with poorer stair climbing test performance ($P = 0.045$). In a stepwise linear regression model, patellofemoral cartilage integrity and pain explained 28 % of the isometric quadriceps strength variability. The amount of cartilage lesions, loose bodies and pain explained 38 % of the isokinetic quadriceps strength variability. Synovitis/effusion and patellofemoral cartilage integrity combined with pain explained 34 % of the isometric hamstring strength variability.	2
25. Yusuf E, Kortekaas MC, Watt I, Huizinga TW, Kloppenburg M. Do knee abnormalities visualised on MRI explain knee pain in knee osteoarthritis? A systematic review. <i>Ann Rheum Dis.</i> 2011;70(1):60-67.	Review/Other-Dx	22 studies	To systematically evaluate the association between magnetic resonance imaging (MRI) findings (cartilage defects, bone marrow lesions (BML), osteophytes, meniscal lesion, effusion/synovitis, ligamentous abnormalities, subchondral cysts and bone attrition) and pain in patients with knee osteoarthritis (OA) in order to establish the relevance of such findings when assessing an individual patient.	A total of 22 papers were included; 5 had longitudinal and 17 cross-sectional data. In all, 13 reported a single MRI finding and 9 multiple MRI findings. Moderate levels of evidence were found for BML and effusion/synovitis. The OR for BML ranged from 2.0 (no CI was given) to 5.0 (2.4 to 10.5). The OR of having pain when effusion/synovitis was present ranged between 3.2 (1.04 to 5.3) and 10.0 (1.1 to 149). The level of evidences between other MRI findings and pain were limited or conflicting.	4

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26. Zhang Y, Nevitt M, Niu J, et al. Fluctuation of knee pain and changes in bone marrow lesions, effusions, and synovitis on magnetic resonance imaging. <i>Arthritis Rheum.</i> 2011;63(3):691-699.	Observational-Dx	570 patients	To determine whether pain resolution is accompanied by diminution of lesions in patients with knee osteoarthritis (OA).	Included in the analysis were 570 subjects with knee OA (651 knees). When the bone marrow lesions (BMLs) score changed from 0 to 1, 2, 3, 4, 5-6, and 7-18 over 2 consecutive clinic visits, the odds ratios (ORs) for frequent knee pain were 1.2, 1.2, 1.5, 2.2, 2.4, and 2.5, respectively (P for trend = 0.006). The corresponding ORs were 1.5, 1.5, and 2.4 when the synovitis score changed from 0 to 1, 2, and 3-6, respectively (P for trend = 0.045). No significant association was found between the effusion score and frequent knee pain. Diminishing size of BMLs was associated with resolution of knee pain (P for trend = 0.007). Similar associations were also observed between these structural lesions and the severity of knee pain.	2
27. Plett SK, Hackney LA, Heilmeier U, et al. Femoral condyle insufficiency fractures: associated clinical and morphological findings and impact on outcome. <i>Skeletal Radiol.</i> 2015;44(12):1785-1794.	Observational-Dx	73 patients.	To determine the characteristics of femoral condyle insufficiency fracture (FCIF) lesions and their relative associations with the risk of clinical progression.	The majority of patients with FCIF were women (64.4%, 47/73), on average 10 years older than men (66.28 +/- 15.86 years vs. 56.54 +/- 10.39 years, p = 0.005). The most common location for FCIF was the central weight-bearing surface of the medial femoral condyle; overlying full thickness cartilage loss (75.7%, 53/70) and ipsilateral meniscal injury (94.1%, 64/68) were frequently associated. Clinical outcomes were variable, with 23.9% (11/46) requiring total knee arthroplasty (TKA). Cartilage WORMS score, adjacent cartilage loss, and contralateral meniscal injury, in addition to decreased knee range of motion at presentation, were significantly associated with progression to TKA (p < 0.05).	3

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28. Bencardino JT, Stone TJ, Roberts CC, et al. ACR Appropriateness Criteria(R) Stress (Fatigue/Insufficiency) Fracture, Including Sacrum, Excluding Other Vertebrae. J Am Coll Radiol. 2017;14(5S):S293-S306.	Review/Other-Dx	N/A	Evidence-based guidelines to assist referring physicians and other providers in making the most appropriate imaging or treatment decision for stress (fatigue/insufficiency) fracture, including sacrum, excluding other vertebrae.	N/A	4
29. Thuillier DU, Souza RB, Wu S, Luke A, Li X, Feeley BT. T1rho imaging demonstrates early changes in the lateral patella in patients with patellofemoral pain and maltracking. Am J Sports Med. 2013;41(8):1813-1818.	Observational-Dx	20 patients.	To study early changes in the articular surface of the patellofemoral joint in patients with anterior knee pain and patellar tilt but no radiographic changes of arthritis within the patellofemoral joint.	The mean T1rho values of the lateral facets were significantly elevated in patients with PFP compared with controls (46.33 +/- 4.92 ms vs. 42.32 +/- 3.67 ms, respectively; P = .031), while no significant difference was observed in the medial facets (42.20 +/- 5.55 ms vs. 41.42 +/- 4.09 ms, respectively; P = .69). Significantly higher mean T1rho values were noted in the lateral facets of the patients with PFP (46.33 ms) compared with the medial facets (42.20 ms) (P = .0001), while no significant differences in T1rho values were observed between the medial and lateral facets of the controls (P = .502). No significant differences were noted in T2 relaxation times. A high correlation was noted between the mean T1rho values of the whole patella of patients with PFP and the degree of patellar tilt (r = 0.72).	3
30. Schiphof D, van Middelkoop M, de Klerk BM, et al. Crepitus is a first indication of patellofemoral osteoarthritis (and not of tibiofemoral osteoarthritis). Osteoarthritis Cartilage. 2014;22(5):631-638.	Observational-Dx	891 women; 1782 knees	To examine the relationship between (early) clinical findings and patellofemoral joint (PFJ) Magnetic resonance Imaging (MRI) features in females (45-60 years) without knee osteoarthritis (OA) (PFJ or tibiofemoral joint (TFJ) OA) based on a recently suggested MRI definition.	In 888 women (1776 knees, mean age: 55.1 years and mean BMI: 27.0 kg/m(2)) we found significant associations between crepitus and all PFJ MRI features (Odds ratios (OR) range: 2.61-5.49). A history of patellar pain was significantly associated with almost all PFJ MRI features (ORcartilage: 1.95; ORcysts: 1.86; ORbone marrow lesions: 1.83), except for osteophytes. No significant associations were found between the clinical findings and TFJ MRI features.	2

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31. Wang J, Antony B, Zhu Z, et al. Association of patellar bone marrow lesions with knee pain, patellar cartilage defect and patellar cartilage volume loss in older adults: a cohort study. <i>Osteoarthritis Cartilage</i> . 2015;23(8):1330-1336.	Observational-Dx	904 patients.	To examine the cross-sectional and longitudinal associations of patellar bone marrow lesion (BMLs) with knee pain, cartilage defects and cartilage volume in older adults.	The prevalence of any patellar BMLs was 19% and was higher in those with tibiofemoral BMLs. In multivariable analyses, patellar BMLs were positively associated with any knee pain at baseline and an increase in knee pain when going up/down stairs (odds ratio (OR): 1.67, 95% confidence interval (CI): 1.08, 2.59) but not with other knee pain subscales. Patella BMLs were also associated with patellar cartilage defects both at baseline and change over time (OR: 1.76, 95% CI: 1.00, 3.70) but not tibiofemoral defects. Patellar BMLs were negatively associated with baseline and change in patella cartilage volume (beta: -2.10%, 95% CI: -3.39%, -0.80%). These associations remained significant after further adjustment for tibiofemoral BMLs.	3
32. Barbier-Brion B, Lerais JM, Aubry S, et al. Magnetic resonance imaging in patellar lateral femoral friction syndrome (PLFFS): prospective case-control study. <i>Diagn Interv Imaging</i> . 2012;93(3):e171-182.	Observational-Dx	21 patients; 23 knees	To describe morphologic abnormalities and signs of patellar lateral femoral friction syndrome (PLFFS) detected by magnetic resonance imaging (MRI).	Patients with PLFFS have anterior and/or lateral knee pain. Their knee has anatomical predispositions for instability, primarily with patella alta (P<0.0001), patellar tilt more than 13.5 degrees (P<0.0001), a patellar nose length less than 9 mm (P=0.0037), a patellar nose ratio less than 0.25 (P<0.0001), a tibial tubercle (TT)-trochlear groove (TG) distance more than 10 mm (P<0.0001), and a trochlear prominence more than 4 mm (P=0.0056). In 35% of patients, patellar chondropathy is visible, and 48% of patients have patellar or trochlear subchondral abnormalities.	2

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33. Monk AP, Doll HA, Gibbons CL, et al. The patho-anatomy of patellofemoral subluxation. <i>J Bone Joint Surg Br.</i> 2011;93(10):1341-1347.	Review/Other-Dx	60 patients	To investigate the relationship between subluxation and multiple bony, cartilaginous and soft-tissue factors that might predispose to subluxation using discriminant function analysis.	Patella engagement (% of patella cartilage overlapping with trochlea cartilage) had the strongest relationship with subluxation. Patellae with > 30% engagement tended not to sublux; those with < 30% tended to sublux. Other factors that were associated with subluxation included the tibial tubercle-trochlea notch distance, vastus medialis obliquus distance from patella, patella alta, and the bony and cartilaginous sulcus angles in the superior part of the trochlea. No relationship was found between subluxation and sulcus angles for cartilage and bone in the middle and lower part of the trochlea, cartilage thicknesses and Wiberg classification of the patella.	4
34. Tuna BK, Semiz-Oysu A, Pekar B, Bukte Y, Hayirlioglu A. The association of patellofemoral joint morphology with chondromalacia patella: a quantitative MRI analysis. <i>Clin Imaging.</i> 2014;38(4):495-498.	Review/Other-Dx	179 women; 122 men	To investigate the relationship of patellofemoral joint morphology with chondromalacia patellae.	In the chondromalacia patellae (CP) group, Lateral patellar tilt angle (LPTA) and trochlear depth (TD) were significantly low ($P < .01$), SA was high ($P < .01$), while patella angle (PA) showed no difference ($P > .05$). The parameters were also compared between groups with mild and severe CP, and no significant difference was found ($P > .05$).	4
35. Knoop J, Dekker J, van der Leeden M, et al. Is the severity of knee osteoarthritis on magnetic resonance imaging associated with outcome of exercise therapy? <i>Arthritis Care Res (Hoboken).</i> 2014;66(1):63-68.	Observational-Dx	112 patients	To evaluate associations between severity of knee osteoarthritis (OA) on magnetic resonance imaging (MRI) and treatment outcomes in knee OA patients treated with exercise therapy in an exploratory study.	Improvements of 24%, 34%, and 21% on average in activity limitations, pain, and muscle strength, respectively, after 12-week exercise therapy were found ($P < 0.001$). Severity of abnormalities in PF cartilage integrity was significantly associated with fewer improvements in both activity limitations ($P = 0.01$) and muscle strength ($P = 0.04$). Severity of PF osteophyte formation was significantly associated with fewer improvements in muscle strength ($P < 0.01$). All other features on MRI were not associated with treatment outcome.	2

**Chronic Knee Pain
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Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
36. Al-Hadithy N, Gikas P, Mahapatra AM, Dowd G. Review article: Plica syndrome of the knee. <i>J Orthop Surg (Hong Kong)</i> . 2011;19(3):354-358.	Review/Other-Dx	N/A	To review the plica syndrome of the knee.	No results stated in abstract.	4
37. Dean BJ, Reed DW, Matthews JJ, et al. The management of solitary tumours of Hoffa's fat pad. <i>Knee</i> . 2011;18(2):67-70.	Review/Other-Dx	19 cases	To report a consecutive series of 19 cases of solitary symptomatic Hoffa's fat pad (HFP) tumours.	No results stated in abstract.	4
38. Hayashi D, Xu L, Guermazi A, et al. Prevalence of MRI-detected mediopatellar plica in subjects with knee pain and the association with MRI-detected patellofemoral cartilage damage and bone marrow lesions: data from the Joints On Glucosamine study. <i>BMC Musculoskelet Disord</i> . 2013;14:292.	Observational-Dx	177 subjects; 346 knees	To examine the frequency of magnetic resonance imaging (MRI)-detected mediopatellar plica and its cross-sectional association with MRI-detected cartilage damage and bone marrow lesions (BMLs) in the patellofemoral joint (PFJ) in a cohort of subjects with knee pain.	163 (47.7%) knees exhibited mediopatellar plica (76 (22.2%) type A, 69 (20.2%) type B, and 18 (5.3%) type C) on MRI. Significant cross-sectional associations of MRI-detected mediopatellar plica and cartilage damage were observed for the medial patella (adjusted odds ratio (aOR) 2.12, 95% CI 1.23-3.64 for all types combined, and aOR 4.20, 95% CI 1.92-9.19 for type B lesion), but not for the anterior medial femur or the lateral PFJ. No associations were found between the presence of MRI-detected mediopatellar plica and BMLs in any patellofemoral subregion.	2
39. Jalgaonkar A, Dachepalli S, Farid M, Rao S. Angioleiomyoma of the knee: case series and an unusual cause of knee pain. <i>J Knee Surg</i> . 2011;24(1):33-37.	Review/Other-Dx	5 patients	To present a consecutive series of five patients with angioleiomyoma, a rare benign soft tissue tumor around the knee.	No results stated in abstract.	4
40. Mao Y, Dong Q, Wang Y. Ganglion cysts of the cruciate ligaments: a series of 31 cases and review of the literature. <i>BMC Musculoskelet Disord</i> . 2012;13:137.	Review/Other-Dx	31 cases	To review the literature of 31 cases with ganglion cysts of the cruciate ligaments.	MRI proved to be a valuable tool in diagnosing and deciding management of these cases. All 11 patients who underwent arthroscopic treatment were symptom-free on a minimum follow-up of one year.	4

**Chronic Knee Pain
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
41. Orth RC. The pediatric knee. <i>Pediatr Radiol.</i> 2013;43 Suppl 1:S90-98.	Review/Other-Dx	N/A	To highlight differences between adult and pediatric knee imaging with an emphasis on normal developmental variants, injury and disease patterns unique to children and adolescents, and differences in response and presentation to conditions affecting both adults and children.	No results stated in abstract.	4
42. Ottaviani S, Ayril X, Dougados M, Gossec L. Pigmented villonodular synovitis: a retrospective single-center study of 122 cases and review of the literature. <i>Semin Arthritis Rheum.</i> 2011;40(6):539-546.	Review/Other-Dx	121 patients; 122 cases	To describe the clinical presentation and outcomes of pigmented villonodular synovitis (PVNS) according to its localization.	A total of 122 cases (mean age 33.0 +/- 13.1 years, 58% female, 89% diffuse form) of histologically confirmed PVNS were analyzed with a mean follow-up of 5.8 +/- 4.3 years (707 patient-years total). The main localizations were the knee (75%) and ankle (16%). Clinical presentation included joint pain (80%) and joint effusion (79%) with hemarthrosis (75% of analyzed articular fluid). The mean delay before diagnosis was 2.9 +/- 3.7 years. Magnetic resonance imaging was helpful for diagnosis in 83%. Surgical synovectomy was initially performed in 98% of cases and was often associated with isotopic synoviorrhesis (knee: 57%; other localizations: 74%). In patients with a diffuse form treated at first line by surgery followed by isotopic synoviorrhesis, the relapse rate was 30% (knee) and 9% (other localizations), respectively, with a mean delay before relapse of 2.6 +/- 2.4 and 2.4 +/- 0.9 years, respectively.	4
43. Skiadas V, Perdikakis E, Plotas A, Lahanis S. MR imaging of anterior knee pain: a pictorial essay. <i>Knee Surg Sports Traumatol Arthrosc.</i> 2013;21(2):294-304.	Review/Other-Dx	N/A	To present the characteristic magnetic resonance (MR) features of common and uncommon disorders causing anterior knee pain.	No results stated in abstract.	4

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EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
44. Strauss EJ, Kim S, Calcei JG, Park D. Iliotibial band syndrome: evaluation and management. <i>J Am Acad Orthop Surg.</i> 2011;19(12):728-736.	Review/Other-Dx	N/A	To review the evaluation and management of iliotibial band syndrome (ITBS).	No results stated in abstract.	4
45. Toppi J, Fairley J, Cicuttini FM, et al. Factors associated with magnetic resonance imaging defined patellar tendinopathy in community-based middle-aged women: a prospective cohort study. <i>BMC Musculoskelet Disord.</i> 2015;16:184.	Observational-Dx	176 women	To examine the prevalence of magnetic resonance imaging (MRI) defined patellar tendinopathy, the factors associated with this condition, and whether it was associated with knee pain in community-based middle-aged women.	The prevalence of MRI defined patellar tendinopathy was 30.1%. Higher levels of physical activity (odds ratio 1.65, 95% CI 1.09-2.51) and greater vastus medialis cross-sectional area (odds ratio 1.22, 95% CI 1.04-1.43) were associated with increased prevalence of patellar tendinopathy, independent of age and BMI. The persistence of patellar tendinopathy was associated with the worsening of knee pain over 2 years (odds ratio 10.65, 95% CI 1.14-99.77).	2
46. Crema MD, Felson DT, Roemer FW, et al. Peripatellar synovitis: comparison between non-contrast-enhanced and contrast-enhanced MRI and association with pain. <i>The MOST study. Osteoarthritis Cartilage.</i> 2013;21(3):413-418.	Observational-Dx	393 subjects	To assess the diagnostic performance of signal changes in Hoffa's fat pad (HFP) assessed on non-contrast-enhanced (CE) magnetic resonance imaging (MRI) in detecting synovitis, and the association of pain with signal changes in HFP on non-CE MRI and peripatellar synovial thickness on CE MRI.	A total of 393 subjects were included. Sensitivity of infrapatellar and intercondylar signal changes in HFP was high (71% and 88%), but specificity was low (55% and 30%). No significant associations were found between HFP changes on non-CE MRI and pain. Grade 2 synovial thickness assessed on CE MRI was significantly associated with pain after adjustments for potential confounders.	2

**Chronic Knee Pain
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
47. Guermazi A, Roemer FW, Hayashi D, et al. Assessment of synovitis with contrast-enhanced MRI using a whole-joint semiquantitative scoring system in people with, or at high risk of, knee osteoarthritis: the MOST study. <i>Ann Rheum Dis.</i> 2011;70(5):805-811.	Experiment al-Dx	400 subjects	To introduce a comprehensive and reliable scoring system for the assessment of whole-knee joint synovitis based on contrast-enhanced (CE) magnetic resonance imaging (MRI).	400 subjects were included (mean age 58.8+/-7.0 years, body mass index 29.5+/-4.9 kg/m(2), 46% women). For individual sites, intrareader reliability (weighted kappa) was 0.67-1.00 for reader 1 and 0.60-1.00 for reader 2. Inter-reader agreement (kappa) was 0.67-0.92. For the summed synovitis scores, intrareader reliability (intraclass correlation coefficient (ICC)) was 0.98 and 0.96 for each reader and inter-reader agreement (ICC) was 0.94. Moderate to severe synovitis in the parapatellar subregion was associated with the higher maximum pain score (adjusted OR (95% CI), 2.8 (1.4 to 5.4) and 3.1 (1.2 to 7.9), respectively).	2
48. Wenham CY, Balamoody S, Grainger AJ, et al. The responsiveness of novel, dynamic, contrast-enhanced magnetic resonance measures of total knee synovitis after intra-articular corticosteroid for painful osteoarthritis. <i>Osteoarthritis Cartilage.</i> 2014;22(10):1614-1618.	Experiment al-Dx	13 patients	To examine dynamic, contrast-enhanced (DCE)-assessed synovial response to intra-articular corticosteroid (IACS)	13 participants (5 male, mean age 63, mean pain visual analogue score (VAS) 66 mm mean body mass index (BMI) 31.3 kg/m(2)) were included. The majority of magnetic resonance imaging (MRIs) demonstrated no change in SQ score although the DCE variables changed to some extent in all. There was generally a reduction in synovial volume ((Wilcoxon test) median (interquartile range (IQR)) reduction 14 cm(3) (-1, 29)), early enhancement rate (EER)(0.2% (-0.3, 0.6)) and late enhancement ratio (8% (-0.5, 41)). Synovial volume x late enhancement ratio demonstrated a substantive reduction (2250 (-930, 5630)) as well as the largest effect size, r = 0.45. There was a median 26% reduction in EER in participants with good symptomatic response to IACS, contrasting with a 23% increase in those who responded poorly.	2

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EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
49. Botanlioglu H, Kantarci F, Kaynak G, et al. Shear wave elastography properties of vastus lateralis and vastus medialis obliquus muscles in normal subjects and female patients with patellofemoral pain syndrome. <i>Skeletal Radiol.</i> 2013;42(5):659-666.	Observational-Dx	33 patients	To define and compare the mechanical properties of the vastus lateralis (VL) and vastus medialis obliquus muscles (VMO) by the way of quantitative shear-wave elastography in male and female healthy control (HC) subjects, and in female patients with patellofemoral pain syndrome (PFPS).	The mean elasticity values in the contraction capacity (CC) for VL and VMO muscles were significantly higher in male HC subjects when compared to female HC subjects ($p < 0.05$). The contraction ratio (CR) of the VL muscle in female patients with PFPS was not significantly different than the female HC group. The CR for the VMO muscle was significantly lower in female patients with PFPS when compared to female HC subjects ($p < 0.05$).	2
50. Kijowski R, Blankenbaker DG, Shinki K, Fine JP, Graf BK, De Smet AA. Juvenile versus adult osteochondritis dissecans of the knee: appropriate MR imaging criteria for instability. <i>Radiology.</i> 2008; 248(2):571-578.	Observational-Dx	36 juvenile osteochondritis dissecans lesions of the knee and 34 adult osteochondritis dissecans lesions of the knee	To retrospectively compare the sensitivity and specificity of previously described MR imaging criteria for the detection of instability in patients with juvenile or adult osteochondritis dissecans of the knee, with arthroscopic findings as the reference standard.	Separately, previously described MRI criteria for detection of osteochondritis dissecans instability were 0%-88% sensitive and 21%-100% specific for juvenile osteochondritis dissecans lesions and 27%-54% sensitive and 100% specific for adult osteochondritis dissecans lesions. When used together, the criteria were 100% sensitive and 11% specific for instability in juvenile osteochondritis dissecans lesions and 100% sensitive and 100% specific for instability in adult osteochondritis dissecans lesions. Previously described MRI criteria for osteochondritis dissecans instability have high specificity for adult but not juvenile lesions of the knee.	3

**Chronic Knee Pain
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
51. Gelber PE, Batista J, Millan-Billi A, et al. Magnetic resonance evaluation of TruFit(R) plugs for the treatment of osteochondral lesions of the knee shows the poor characteristics of the repair tissue. <i>Knee</i> . 2014;21(4):827-832.	Experimental-Tx	57 patients	To evaluate the relationship between magnetic resonance imaging (MRI) findings and functional scores of patients with osteochondral lesions of the knee treated with TruFit(R).	Fifty-seven patients with median follow-up of 44.8 months (range 24-73) were included. Knee injury and osteoarthritis outcome score (KOOS), Short-Form-36 (SF-36) and visual analogue score (VAS) improved from a mean 58.5, 53.9 and 8.5 points to a mean 87.4, 86.6 and 1.2 at last follow-up (p<0.001). Larger lesions showed less improvement in KOOS (p=0.04) and SF-36 (p=0.029). Median Tegner values were restored to preinjury situation (5, range 2-10). Mean Magnetic Resonance Observation of Cartilage Repair Tissue (MOCART) score was 43.2 +/- 16.1. Although the cartilage layer had good integration, it showed high heterogeneity and no filling of the subchondral bone layer.	2
52. Ojala R, Kerimaa P, Lakovaara M, et al. MRI-guided percutaneous retrograde drilling of osteochondritis dissecans of the knee. <i>Skeletal Radiol</i> . 2011;40(6):765-770.	Experimental-Tx	10 patients	To evaluate the feasibility of a new method for osteochondritis dissecans (OCD) treatment.	All the OCD lesions were located and drilled using the 0.23 T open Magnetic Resonance Imaging (MRI) scanner without procedural complications. All the patients had pain relief, mean visual analog score (VAS) declined from 6 to 2. Follow-up MRI showed ossification in all lesions. Eight patients could return to normal physical activity with no or minor effect on function (Hughston score 3-4). Treatment failed in two cases where the continuation of symptoms led to arthroscopy and transchondral fixation.	2

**Chronic Knee Pain
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
53. Roemer FW, Guermazi A, Trattnig S, et al. Whole joint MRI assessment of surgical cartilage repair of the knee: cartilage repair osteoarthritis knee score (CROAKS). Osteoarthritis Cartilage. 2014;22(6):779-799.	Experimental-Tx	20 patients	To develop a magnetic resonance imaging (MRI) scoring system for follow-up of knee cartilage repair procedures integrating assessment of the repair site and the whole joint called Cartilage Repair OsteoArthritis Knee Score (CROAKS), and to assess its reliability.	For cartilage, reliability on a plate level ranged between 0.48 (lateral femur) and 1.00 (medial femur). Bone marrow lesion (BML) assessment showed comparable results ranging on a plate level between 0.46 and 1.00 with overall percent agreement between 83.3% and 100%. Meniscal morphology assessment ranged between 0.62 and 0.94. For repair site assessment reliability ranged from 0.41 (signal intensity inter-observer) to 1.00 (several features). Overall percent agreement was above 80% for 17 of 22 features assessed (intra- and inter-observer results combined).	2

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Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
54. Stanish WD, McCormack R, Forriol F, et al. Novel scaffold-based BST-CarGel treatment results in superior cartilage repair compared with microfracture in a randomized controlled trial. <i>J Bone Joint Surg Am.</i> 2013;95(18):1640-1650.	Experiment al-Tx	80 patients.	To evaluate bioscaffold technology for enhancing cartilage regeneration (BST-CarGel) treatment compared with microfracture alone in the repair of cartilage lesions in the knee.	Patient baseline characteristics were similar in the two groups, although baseline lesion areas were slightly larger on quantitative magnetic resonance imaging for the BST-CarGel group compared with the microfracture group. Blinded quantitative magnetic resonance imaging analysis demonstrated that, at twelve months, when compared with microfracture treatment alone, BST-CarGel treatment met both primary end points by achieving statistical superiority for greater lesion filling ($p = 0.011$) and more hyaline cartilage-like T2 values ($p = 0.033$). The lesion filling values were 92.8% +/- 2.0% for the BST-CarGel treatment group and 85.2% +/- 2.1% for the microfracture treatment group, and the mean T2 values were 70.5 +/- 4.5 ms for the BST-CarGel treatment group and 85.0 +/- 4.9 ms for the microfracture treatment group. Western Ontario and McMaster Universities Osteoarthritis Index subscales for pain, stiffness, and function yielded equivalent improvement for both groups at twelve months, which were significant ($p < 0.0001$) from baseline. Treatment safety profiles were considered comparable.	1

**Chronic Knee Pain
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
55. Eckstein F, Collins JE, Nevitt MC, et al. Brief Report: Cartilage Thickness Change as an Imaging Biomarker of Knee Osteoarthritis Progression: Data From the Foundation for the National Institutes of Health Osteoarthritis Biomarkers Consortium. <i>Arthritis Rheumatol.</i> 2015;67(12):3184-3189.	Observational-Dx	4,796 patients	To investigate the association of cartilage thickness change over 24 months, as determined by magnetic resonance imaging (MRI), with knee osteoarthritis (OA) progression at 24-48 months.	Central medial femorotibial compartment thickness loss was significantly associated with case status, with an odds ratio (OR) of 1.9 (95% confidence interval [95% CI] 1.6-2.3) (P < 0.0001). Association with case status reached P < 0.05 for both the central femur (OR 1.8 [95% CI 1.5-2.2]) and the central tibia (OR 1.6 [95% CI 1.3-1.9]). Lateral femorotibial compartment cartilage thickness loss, in contrast, was not significantly associated with case status. A reduction in central medial femorotibial compartment cartilage thickness was strongly associated with radiographic progression (OR 4.0 [95% CI 2.9-5.3]; P < 0.0001) and only weakly associated with pain progression (OR 1.3 [95% CI 1.1-1.6]; P < 0.01).	3
56. Schiphof D, Oei EH, Hofman A, Waarsing JH, Weinans H, Bierma-Zeinstra SM. Sensitivity and associations with pain and body weight of an MRI definition of knee osteoarthritis compared with radiographic Kellgren and Lawrence criteria: a population-based study in middle-aged females. <i>Osteoarthritis Cartilage.</i> 2014;22(3):440-446.	Observational-Dx	888 women; 1766 knees	To assess the association between the knee osteoarthritis (OA) definitions and (1) knee pain at baseline, (2) persistent knee pain during the 2-year follow-up period, (3) new onset of knee pain 2 years later, and (4) body mass index (BMI).	Of 1766 knees, 77 knees (4%) were diagnosed with Kellgren & Lawrence (K&L) \geq 2, whereas 160 knees (9%) met the tibiofemoral osteoarthritis magnetic resonance imaging (TFOAMRI) criteria. Only 43 knees met both definitions (34 knees were graded with K&L \geq 2 and no TFOAMRI and 117 knees met only the TFOAMRI criteria). The association between the definitions and knee pain at baseline was higher when TFOAMRI was included [TFOAMRI alone: odds ratio (OR) = 2.83 (95% confidence interval (CI): 1.84-4.36); TFOAMRI & K&L \geq 2: OR = 6.28 (95% CI: 2.99-13.19)] than for K&L \geq 2 alone (OR = 1.83 (95% CI: 0.63-5.32)). This was similar for the association between the definitions and persistent knee pain, and between the definitions and BMI.	2

**Chronic Knee Pain
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
57. Roemer FW, Jarraya M, Kwok CK, et al. Brief report: symmetry of radiographic and MRI-detected structural joint damage in persons with knee pain--the Joints on Glucosamine (JOG) Study. <i>Osteoarthritis Cartilage</i> . 2015;23(8):1343-1347.	Observational-Dx	169 patients	To describe symmetry of Magnetic Resonance Imaging (MRI)-detected osteoarthritis (OA) features in a cohort of subjects with knee pain.	51.2% of participants were men, mean age was 52.1 (± 6.2), mean body mass index (BMI) was 29.0 kg/m ² (± 4.1). All plates showed a significant higher degree of symmetry for cartilage damage as evidenced by weighted kappas ranging from 0.32 to 0.59. For bone marrow lesions (BMLs) the degree of symmetry was higher for the patella, trochlea, medial tibia, lateral femur, and medial femur; for meniscal damage the degree of unilaterality was lower for all medial meniscal subregions but not all lateral. Kappas ranged between 0.52 and 0.68 for cartilage and 0.30 and 0.55 for BMLs for the four subregions with highest agreement.	2
58. Pihlajamaki HK, Kuikka PI, Leppanen VV, Kiuru MJ, Mattila VM. Reliability of clinical findings and magnetic resonance imaging for the diagnosis of chondromalacia patellae. <i>J Bone Joint Surg Am</i> . 2010; 92(4):927-934.	Observational-Dx	56 patients	To prospectively evaluate the reliability of clinical findings and MRI for the diagnosis of chondromalacia patellae.	The PPV for the ability of 1.0-T MRI to detect chondromalacia patellae was 75% (95% CI, 53%-89%), the NPV was 72% (95% CI, 56%-84%), the sensitivity was 60% (95% CI, 41%-77%), the specificity was 84% (95% CI, 67%-93%), and the diagnostic accuracy was 73% (95% CI, 60%-83%). The sensitivity was 13% (95% CI, 2%-49%) for grade-I lesions and 83% (95% CI, 59%-94%) for grade-II, III, or IV lesions. Chondromalacia patellae cannot be diagnosed by clinical findings; MRI sensitivity for diagnosing chondromalacia patellae is low for grade I lesions (13%), but higher (83%) for grade II- IV lesions.	3

**Chronic Knee Pain
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
59. Ballegaard C, Riis RG, Bliddal H, et al. Knee pain and inflammation in the infrapatellar fat pad estimated by conventional and dynamic contrast-enhanced magnetic resonance imaging in obese patients with osteoarthritis: a cross-sectional study. <i>Osteoarthritis Cartilage</i> . 2014;22(7):933-940.	Observational-Dx	134 patients	To investigate the association between knee pain and signs of inflammation in the infrapatellar fat pad (IPFP) in obese patients with knee osteoarthritis (KOA).	Magnetic resonance imaging (MRI) and clinical data were obtained in 95 patients. The typical patient was a woman (82%) with an average age of 65 years (SD 6.5) and a body mass index (BMI) of 32 kg/m ² (SD 3.7). The bivariate association between Knee injury and Osteoarthritis Outcome Score (KOOS) pain and the dynamic contrast-enhanced (DCE)-MRI perfusion variable "Inflammation" showed a statistically significant correlation ($r = -0.42$, $P < 0.0001$). A statistically significant correlation was also found between KOOS pain and MRI Osteoarthritis Knee Score (MOAKS) Hoffa-synovitis ($r = -0.21$, $P = 0.046$).	3
60. Keen HI, Hensor EM, Wakefield RJ, Mease PJ, Bingham CO, 3rd, Conaghan PG. Ultrasound assessment of response to intra-articular therapy in osteoarthritis of the knee. <i>Rheumatology (Oxford)</i> . 2015;54(8):1385-1391.	Experimental-Dx	35 patients	To examine whether Ultrasonography (US) can detect synovial response to IA corticosteroid (IACS) therapy and to explore associations between synovial characteristics and symptoms.	One week of data were available for 33 patients (19 received IACS and 14 others). Synovial thickness (ST) decreased in 16 IACS patients and 2 others [mean between-group difference 4.7 mm (95% CI 1.1, 8.2), $P = 0.012$]. Absolute reduction was not associated with absolute reduction in pain ($r = 0.20$, $P = 0.289$), but decreased ST was substantively associated with reduction in pain greater than or equal to the Minimum clinically important improvement (MCII) (52.9% vs 23.1%, $P = 0.098$, $\phi = 0.30$). The power Doppler score decreased in 13 IACS patients and 3 others {median change in IACS patients -1.0 [interquartile range (IQR) -5.0-0.0], others 0.0 [-0.3-1.3], $P = 0.004$ }. Absolute changes in pain and power Doppler score were weakly associated ($\rho = 0.36$, $P = 0.049$) and a decreased power Doppler score was associated with reduction in pain greater than or equal to the MCII (64.3% vs 18.8%, $P = 0.011$, $\phi = 0.46$).	1

**Chronic Knee Pain
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
61. O'Neill TW, Parkes MJ, Maricar N, et al. Synovial tissue volume: a treatment target in knee osteoarthritis (OA). <i>Ann Rheum Dis.</i> 2016;75(1):84-90.	Experimental-Dx	120 patients	To determine (i) whether synovial tissue volume (STV) as assessed using contrast-enhanced magnetic resonance imaging (MRI) changes in response to intra-articular steroid therapy and (ii) whether change in symptoms of pain correlates with changes in STV.	120 subjects with preinjection and postinjection contrast enhanced (CE) MRI were followed. Their mean age was 62.3 years (SD=10.3) and 62 (52%) were women. The median time between injection and follow-up scan was 8 days (IQR 7-14 days). 85/120 (71%) were Osteoarthritis Research Society International (OARSI) responders. Pain decreased (mean change in Knee Injury and Osteoarthritis Outcome Score (KOOS) =+23.9; 95% CI 20.1 to 27.8, p<0.001) following steroid injection, as did mean STV (mean change=-1071 mm ³ ; 95% CI -1839 mm ³ to -303 mm ³ , p=0.01). Of the 80 who returned for a third MRI, pain relapsed in 57, and in the 48 of those with MRI data, STV increased between follow-up and final visit (+1220 mm ³ ; 95% CI 25 mm ³ to 2414 mm ³ , p=0.05). 23 were persistent responders at 6 months and, in these, STV did not increase (mean change=-202 mm ³ ; 95% CI -2008 mm ³ to 1604 mm ³ , p=0.83). Controlling for variation over time, there was a significant association between synovitis volume and KOOS pain (b coefficient-change in KOOS pain score per 1000 mm ³ change in STV=-1.13; 95% CI -1.87 to -0.39, p=0.003), although STV accounted for only a small proportion of the variance in change in pain	2

**Chronic Knee Pain
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
62. De Filippo M, Bertellini A, Pogliacomi F, et al. Multidetector computed tomography arthrography of the knee: diagnostic accuracy and indications. <i>Eur J Radiol.</i> 2009;70(2):342-351.	Observational-Dx	68 knees	To evaluate the diagnostic accuracy and indications of arthrography with multidetector computed tomography (arthro-MDCT) of the knee, in patients with absolute or relative contraindications to MRI and in patients with periarticular metal implants using diagnostic arthroscopy as the gold standard.	In non-operated patients the comparison between arthro-MDCT and arthroscopy showed sensitivity and specificity ranging between 86% and 100%. In the 37 operated knees, arthro-MDCT had an accuracy of 95% compared with 53% of the MRI. Inter-observer agreement was almost perfect (K=0.97) in the evaluation of all types lesions, both on MDCT and MRI. When arthro-MDCT was compared with MRI in post-operative patients by a McNemar test, a significant difference (p<0.05) was found between these two techniques.	2
63. Vande Berg BC, Lecouvet FE, Poilvache P, Dubuc JE, Maldague B, Malghem J. Anterior cruciate ligament tears and associated meniscal lesions: assessment at dual-detector spiral CT arthrography. <i>Radiology.</i> 2002; 223(2):403-409.	Observational-Dx	125 patients	Retrospective review to assess the sensitivity and specificity for helical CT arthrography in the evaluation of anterior cruciate ligament tears and associated meniscal lesions.	Helical CT arthrography is an accurate (ie, good sensitivity and specificity >90%) method for detecting anterior cruciate ligament tears and associated meniscal lesions.	2
64. Vande Berg BC, Lecouvet FE, Poilvache P, et al. Dual-detector spiral CT arthrography of the knee: accuracy for detection of meniscal abnormalities and unstable meniscal tears. <i>Radiology.</i> 2000;216(3):851-857.	Observational-Dx	50 consecutive patients	To determine the sensitivity and specificity of dual-detector spiral computed tomographic (CT) arthrography of the knee in the detection of meniscal abnormalities and unstable meniscal tears.	The sensitivity and specificity for the detection of meniscal abnormalities were 98% and 94%, respectively. The sensitivity and specificity for the detection of unstable meniscal tears were 97% and 90%, respectively. Interobserver agreement was excellent for the detection of meniscal abnormalities (kappa = 0.899) and of unstable meniscal tears (kappa = 0.885).	2

**Chronic Knee Pain
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
65. Vlychou M, Hantes M, Michalitsis S, Tsezou A, Fezoulidis IV, Malizos K. Chronic anterior cruciate ligament tears and associated meniscal and traumatic cartilage lesions: evaluation with morphological sequences at 3.0 T. <i>Skeletal Radiol.</i> 2011;40(6):709-716.	Experimental-Dx	43 patients	To investigate the diagnostic efficacy of morphological sequences at 3.0 Tesla (T) Magnetic Resonance (MR) imaging in detecting anterior cruciate ligament (ACL), meniscal pathology and traumatic cartilage lesions in young patients with chronic deficient anterior cruciate ligament knees.	All ACL tears were correctly interpreted by 3.0 T MR images. The sensitivity of the MR scans regarding tears of the medial meniscus was 93.7%, the specificity 92.6%, the positive predictive value 88.2% and the negative predictive value 95.8%. The sensitivity of the MR scans regarding tears of lateral meniscus was 85.7%, the specificity was 93.1%, the positive predictive value 85.7% and the negative predictive value 93.1%. With regard to the grading of the cartilage lesions, Cohen's kappa coefficient indicated moderate agreement for grade I and II cartilage lesions (0.5), substantial agreement for grade III and IV cartilage lesions (0.70 and 0.66) and substantial agreement for normal regions (0.75). Regarding location of the cartilage lesions, Cohen's kappa coefficient varied between almost perfect agreement in the lateral femoral condyle and no agreement in the trochlea.	2
66. American College of Radiology. ACR Appropriateness Criteria® Radiation Dose Assessment Introduction. Available at: https://www.acr.org/-/media/ACR/Files/Appropriateness-Criteria/RadiationDoseAssessmentIntro.pdf .	Review/Other-Dx	N/A	Guidance document on exposure of patients to ionizing radiation.	No results stated in abstract.	4

Evidence Table Key

Study Quality Category Definitions

- *Category 1* The study is well-designed and accounts for common biases.
- *Category 2* The study is moderately well-designed and accounts for most common biases.
- *Category 3* There are important study design limitations.
- *Category 4* The study is not useful as primary evidence. The article may not be a clinical study or the study design is invalid, or conclusions are based on expert consensus. For example:
 - a. The study does not meet the criteria for or is not a hypothesis-based clinical study (e.g., a book chapter or case report or case series description);
 - b. The study may synthesize and draw conclusions about several studies such as a literature review article or book chapter but is not primary evidence;
 - c. The study is an expert opinion or consensus document.
- Meta-analysis
 - a. *Good quality* – the study design, methods, analysis, and results are valid and the conclusion is supported.
 - b. *Inadequate quality* – the study design, analysis, and results lack the methodological rigor to be considered a good meta-analysis study.

Abbreviations Key

Dx = Diagnostic

Tx = Treatment