

Diagnostic Imaging Pathways - Knee Pain (Non-Traumatic)

Population Covered By The Guidance

This pathway provides guidance on the imaging of adult patients with new onset, non-traumatic knee pain.

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Quick User Guide

Move the mouse cursor over the **PINK** text boxes inside the flow chart to bring up a pop up box with salient points.

Clicking on the **PINK** text box will bring up the full text.

The relative radiation level (RRL) of each imaging investigation is displayed in the pop up box.

SYMBOL	RRL	EFFECTIVE DOSE RANGE
	None	0
	Minimal	< 1 millisieverts
	Low	1-5 mSv
	Medium	5-10 mSv
	High	>10 mSv

Pathway Diagram

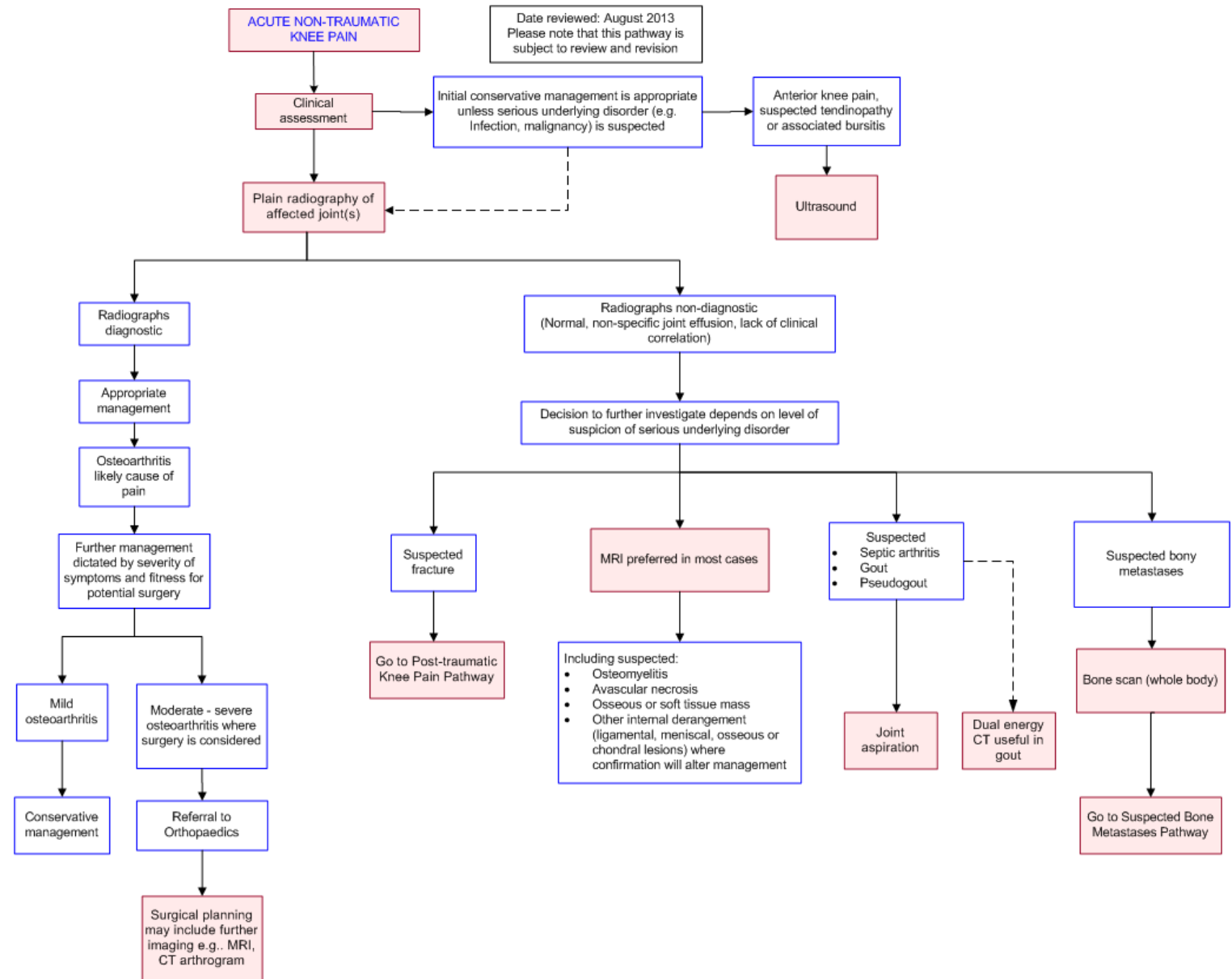


Image Gallery

Note: These images open in a new page

1a



Osteoarthritis

Image 1a, 1b, 1c and 1d (Plain Radiograph): Advanced degenerative changes of the knee joints are demonstrated bilaterally affecting predominantly the medial compartments. There is lateral translation of both tibiae with varus deformity present bilaterally. Osteoarthritic changes are seen in bilateral patello-femoral joints as well. Marked generalised osteoporosis is noted.

1b



1c



1d



Teaching Points

- Initial clinical assessment is important
- Plain radiography is an appropriate first line investigation for those with severe pain and significant functional impairment
- Further imaging is dictated by a provisional diagnosis

Plain Radiography

- Appropriate first line investigation for those with severe pain, and significant functional impairment. [3,4](#) Consider additional hip radiographs in the case of referred pain if hip pathology is suspected
- Osteoarthritis (OA) is diagnosed most effectively by clinical criteria with the aid of radiographic findings (joint space narrowing, osteophytes, subchondral bone sclerosis and subchondral cysts) which correlate well in acute exacerbations. [5,6](#) Further imaging modalities are seldom indicated for diagnosis of OA [1](#)
- Radiography does not alter management in patients with less severe degenerative change [7](#)
- Less helpful in crystalline and septic arthritis. A patient with acute knee pain and joint effusion, particularly if infection is suspected, should have arthrocentesis and synovial fluid examination [6](#)
- Normal plain radiographs do not reliably exclude osteomyelitis as nearly 50% loss of bone density is required before a radiograph becomes abnormal. [8](#) An abnormal radiograph doubles the odds of osteomyelitis [9](#)

Magnetic Resonance Imaging (MRI)

- MRI is effective in ruling out internal derangement of the knee. [10-12](#) MRI significantly affects the clinical decision-making process and can often prevent unnecessary knee arthroscopy [12-19](#)
- High accuracy in the detection of meniscal and ligamentous pathology, and osseous and chondral lesions such as bone marrow oedema, spontaneous osteonecrosis, insufficiency fractures and chondromalacia patella [20,21](#)
- Useful in patients with persistent undiagnosed pain, including suspected avascular necrosis and sepsis

Ultrasound

- While MRI is diagnostically superior, ultrasound is useful to quickly and inexpensively visualise superficial soft tissue structures and has the advantage of a dynamic evaluation of the knee in active and passive motion
- Useful in the rapid evaluation of the extensor mechanism, suspected tendinopathy or associated bursitis, or popliteal cyst [22,23](#)
- Improves diagnostic accuracy and guidance of local steroid injection in Achilles and patella tendinopathy [24](#)

Computed Tomography (CT) and Arthrography

- CT arthrography has higher spatial resolution than MRI for articular and meniscal pathology and is an excellent alternative test if MRI is contra-indicated or not available [25](#)
- In post-operative knees MDCT arthrography is more accurate than MRI in the diagnosis of meniscal re-tear [26](#)
- Dual energy CT may be used to noninvasively diagnose and monitor gouty arthropathy of the knee by analysis of the chemical composition of the scanned materials [2,27,28](#)
- CT may be used for assessment of patellar maltracking in patients [29,30](#)

Bone Scintigraphy

- Initial imaging modality of choice in detecting widespread bone metastases
- Advantages
 - Allows total body survey for systemic involvement of osseous and joint pathology [31,32](#)
- Limitations [31,32](#)
 - Non-specific – a positive bone scan may require correlation with other imaging modalities
 - Some metastases may not show increased uptake on bone scan, particularly those that are lytic, for example kidney, thyroid and melanoma. Lytic tumours are better detected by metabolic scans such as FDG-PET because they have a high glucose metabolism [33](#), or anatomical assessment with CT or MRI

References

Date of literature search: April 2013

The search methodology is available on request. [Email](#)

References are graded from Level I to V according to the Oxford Centre for Evidence-Based Medicine, Levels of Evidence. [Download the document](#)

1. Zhang W, Doherty M, Peat G, Bierma-Zeinstra SMA, Arden NK, Bresnihan B, et al. **EULAR evidence-based recommendations for the diagnosis of knee osteoarthritis.** Ann Rheum Dis. 2010;69(3):483-9.
2. Dalbeth N, Choi HK. **Dual-energy computed tomography for gout diagnosis and management.** Curr Rheumatol Rep. 2013;15(1):301. (Review article)
3. Glaves J. **The use of radiological guidelines to achieve a sustained reduction in the number of radiographic examinations of the cervical spine, lumbar spine and knees performed for GPs.** Clin Radiol. 2005;60(8):914-20. (Level II/III evidence)
4. Expert Panel on Musculoskeletal Imaging: Bennett DL, Nelson JW, Weissman BN, Kransdorf MJ, Appel M, Bencardino JT, et al. **ACR Appropriateness Criteria: nontraumatic knee pain.** American College of Radiology; 2012 [cited 2013 May 1]. (Consensus guidelines). [View the guidelines](#)
5. Kinds MB, Welsing PMJ, Vignon EP, Bijlsma JWJ, Viergever MA, Marijnissen ACA, et al. **A systematic review of the association between radiographic and clinical osteoarthritis of hip and knee.** Osteoarthritis Cartilage. 2011;19(7):768-78. (Level I evidence)
6. Jackson JL, O'Malley PG, Kroenke K. **Evaluation of acute knee pain in primary care.** Ann Intern Med. 2003;139(7):575-88. (Level II evidence)
7. Morgan B, Mullick S, Harper WM, Finlay DB. **An audit of knee radiographs performed for general practitioners.** Br J Radiol. 1997;70(831):256-60.
8. Pineda C, Espinosa R, Pena A. **Radiographic imaging in osteomyelitis: the role of plain radiography, computed tomography, ultrasonography, magnetic resonance imaging, and scintigraphy.** Semin Plastic Surg. 2009;23(2):80-9.
9. Butalia S, Palda VA, Sargeant RJ, Detsky AS, Mourad O. **Does this patient with diabetes have osteomyelitis of the lower extremity?** JAMA. 2008;299(7):806-13.
10. Skiadas V, Perdikakis E, Plotas A, Lahanis S. **MR imaging of anterior knee pain: a pictorial essay.** Knee Surg Sports Traumatol Arthrosc. 2013;21(2):294-304. (Review article)
11. Bussieres AE, Taylor JAM, Peterson C. **Diagnostic imaging practice guidelines for musculoskeletal complaints in adults: an evidence-based approach - Part 1: lower extremity disorders.** J Manipulative Physiol Ther. 2007;30(9):684-717. (Evidence-based guidelines)
12. Crawford R, Walley G, Bridgman S, Maffulli N. **Magnetic resonance imaging versus arthroscopy in the diagnosis of knee pathology, concentrating on meniscal lesions and ACL tears: a systematic review.** Br Med Bull. 2007;84(1):5-23. (Level II evidence)
13. Nikken JJ, Oei EH, Ginai AZ, Krestin GP, Verhaar JAN, van Vugt AB, et al. **Acute peripheral joint injury: cost and effectiveness of low-field-strength MR imaging: results of randomized controlled trial.** Radiology. 2005;236(3):958-67. (Level II evidence)
14. Vincken PWJ, ter Braak BPM, van Erckell A, de Rooy TPW, Mallens WMC, Post W, et al. **Effectiveness of MR imaging in selection of patients for arthroscopy of the knee.** Radiology. 2002;223(3):739-46. (Level II evidence)
15. BuiMansfield LT, Youngberg RA, Warne W, Pitcher JD, Nguyen PLL. **Potential cost savings of MR imaging obtained before arthroscopy of the knee: evaluation of 50 consecutive patients.** AJR Am J Roentgenol. 1997;168(4):913-18. (Level II evidence)
16. Oei EH, Nikken JJ, Verstijnen ACM, Ginai AZ, Hunink MGM. **MR imaging of the menisci and cruciate ligaments: a systematic review.** Radiology. 2003;226(3):837-48. (Level II evidence)
17. Galea A, Giuffre B, Dimmick S, Coolican MRJ, Parker D. **The accuracy of magnetic resonance imaging scanning and its influence on management decisions in knee surgery.** Arthroscopy. 2009;25(5):473-80. (Level II evidence)

18. Bryan S, Bungay H, Weatherburn G, Field S. **Magnetic resonance imaging for investigation of the knee joint: a clinical and economic evaluation.** Int J Technol Assess Health Care. 2004;20(2):222-29. (Level III/IV evidence)
19. Vincken PWJ, ter Braak BPM, van Erkel A, Bloem R, van Luijt P, Coene LNJEM, et al. **Only MR can safely exclude patients from arthroscopy.** Skeletal Radiol. 2009;38(10):977-82. (Level II evidence)
20. O'Keefe SA, Hogan BA, Eustace SJ, Kavanagh EC. **Overuse injuries of the knee.** Magn Reson Imaging Clin N Am. 2009;17(4):725-39. (Review article)
21. Fotiadou A, Karantanas A. **Acute nontraumatic adult knee pain: the role of MR imaging.** Radiologia Medica. 2009;114(3):437-47. (Review article)
22. Paczesny L, Kruczynski J. **Ultrasound of the knee.** Sem Ultrasound CT MR. 2011;32(2):114-24. (Review article)
23. Kang B, Du JY, Liu JR, Luo HC, Huang JH. **Sonographic diagnosis of the knee effusion.** Journal Tongji Med Univ. 1994;14(2):105-9. (Level III evidence)
24. Fredberg U, Bolvig L, Pfeiffer-Jensen M, Clemmensen D, Jakobsen BW, Stengaard-Pedersen K. **Ultrasonography as a tool for diagnosis, guidance of local steroid injection and, together with pressure algometry, monitoring of the treatment of athletes with chronic jumper's knee and Achilles tendinitis: a randomized, double-blind, placebo-controlled study.** Scand Journal Rheumatol. 2004;33(2):94-101. (Level I evidence)
25. Smith TO, Drew BT, Toms AP, Donell ST, Hing CB. **Accuracy of magnetic resonance imaging, magnetic resonance arthrography and computed tomography for the detection of chondral lesions of the knee.** Knee Surg Sports Traumatol Arthrosc. 2012;20(12):2367-79. (Level II evidence)
26. Filippo M, Bertellini A, Pogliacomini F, Sverzellati N, Corradi D, Garlaschi G, et al. **Multidetector computed tomography arthrography of the knee: diagnostic accuracy and indications.** Eur J Radiol. 2009;70(2):342-51. (Level II/III evidence)
27. Choi H, Burns L, Shojania K, Koenig N, Reid G, Abufayyah M, et al. **Dual energy CT in gout: a prospective validation study.** Ann Rheum Dis. 2012;71(9):1466-71. (Level IV evidence)
28. Manger B, Lell M, Wacker J, Schett G, Rech J. **Detection of periarticular urate deposits with dual energy CT in patients with acute gouty arthritis.** Ann Rheum Dis. 2012;71(3):470-2. (Level III evidence)
29. Parikh S, Noyes FR. **Patellofemoral disorders: role of computed tomography and magnetic resonance imaging in defining abnormal rotational lower limb alignment..** Sports Health 2011;3(2):158-69. (Review article)
30. Smith T, Davies L, Toms A, Hing C, Donell S. **The reliability and validity of radiological assessment for patellar instability: a systematic review and meta-analysis.** Skeletal Radiol. 2011;40(4):399-414. (Level II evidence)
31. Rybak LD, Rosenthal DI. **Radiological imaging for the diagnosis of bone metastases.** Q J Nuclear Med. 2001;45(1):53-64. (Review article)
32. Schaffer DL, Pendergrass HP. **Comparison of enzyme, clinical, radiographic, and radionuclide methods of detecting bone metastases from carcinoma of the prostate.** Radiology. 1976;121(2):431-4. (Level III evidence)
33. Du Y, Cullum I, Illidge T, Ell P. **Fusion of metabolic function and morphology: sequential [18F]fluorodeoxyglucose positron-emission tomography/computed tomography studies yield new insights into the natural history of bone metastases in breast cancer.** J Clin Oncol. 2007;25(23):3440-7. (Level II evidence)

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