

# Diagnostic Imaging Pathways - Paediatric, Knee Pain

## Population Covered By The Guidance

This pathway provides guidance on imaging children with knee pain.

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## Quick User Guide

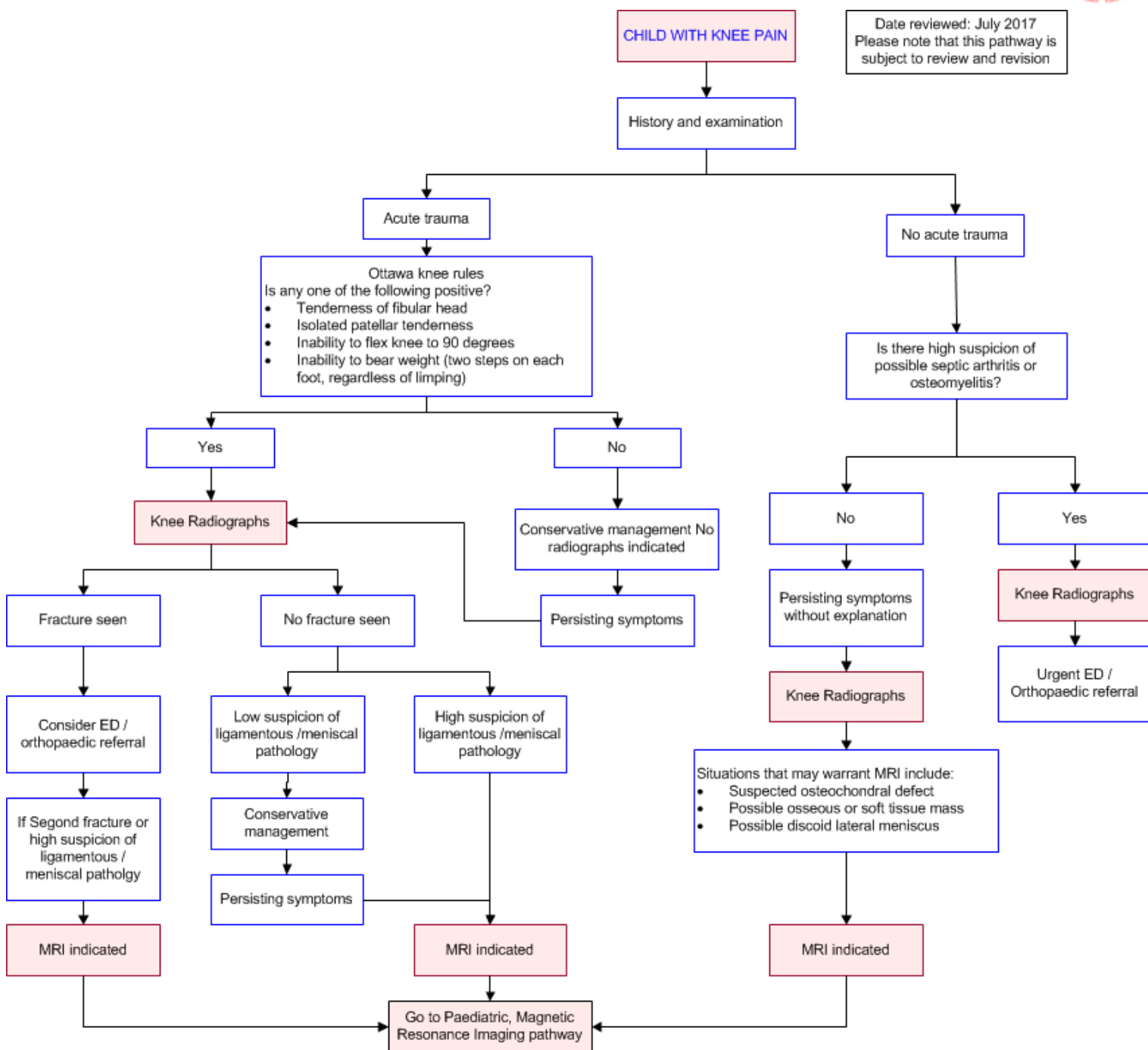
Move the mouse cursor over the **PINK** text boxes inside the flow chart to bring up a pop up box with salient points.

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: Images coming soon*

## Teaching Points

- Trauma to the paediatric knee is common and knee pain is the second most common paediatric musculoskeletal presentation to the emergency department

- Unrecognised fractures may result in permanent neurovascular deficit and growth disturbances
- Knee radiographs are one of the most common radiographs used to assess trauma in the ER. However it has the lowest yield for diagnosing clinically significant fractures
- Clinical decision rules such as the Ottawa Knee Rule (OKR) can be used to reduce the rate of unnecessary radiographs performed
- MRI is a valuable adjunct and has the potential to change management

## Child with Knee pain

- Knee pain is a common complaint amongst children accounting for more than a third of paediatric musculoskeletal complaints [1, 2](#)
- A thorough history and examination should be performed including the characteristics of the pain, onset, location, duration, severity and radiation [1](#)

## Knee Radiographs

- Plain radiography of the knee is the investigative mainstay for assessing knee injuries in children
- Interpretation is complicated by a number of issues [3, 4](#)
  - Relative radiolucency of the cartilaginous anatomy found in skeletally immature patients
  - Paediatric patients sustain different injuries compared to adults, particularly involving the physis
  - Low yield nature of knee radiographs for knee trauma, even in adults
- Clinical decision rules such as the Ottawa Knee Rule (OKR) can be used to reduce the rate of unnecessary radiographs performed. [1, 2](#) The OKR has been widely validated and investigated in adult populations, and shown to allow a relative reduction in use of radiography by around one third [5](#)
- Meta-analysis of their use in a paediatric population showed that the OKR had high sensitivity and adequate specificity for children over the age of 5. There was insufficient evidence for children under the age of 5 [4, 6](#)
- Advantages
  - Fast, readily accessible
  - Will identify obvious fractures and joint effusions
- Disadvantages
  - Ionising radiation – albeit small exposure
  - Majority of patients with acute knee injuries have soft tissue injury

## Magnetic Resonance Imaging (MRI)

- The knee is one of the most commonly imaged joints by MRI in the paediatric population [7, 8](#)
- Magnetic resonance imaging has several advantages over other modalities
  - No ionising radiation [7](#)
  - Excellent soft tissue resolution, contrast & detail
    - MRI is able to evaluate injuries to the soft tissues, ligaments, menisci, epiphyses and bone contusions [4, 7, 9](#)
    - With improvements in MRI technology, accuracy of diagnosing paediatric meniscal and cruciate ligament tears is approaching that for adults. Studies suggest 92% sensitivity & 88% specificity for detecting anterior cruciate ligament (ACL) tears and

93-100% sensitivity and 87-95% specificity for meniscal injuries [4, 8, 10-12](#)

- Capable of multiplanar reconstructions
- MRI can affect management, although this has only been extensively investigated in adult patients so far
  - MRI has been shown to alter management in a proportion of adult patients with knee injuries [13](#)
  - Nikken et al performed two prospective studies on adult patients with acute knee injury without radiographic fracture. MRI imaging was found to shorten the time to diagnosis, reduce number of diagnostic procedures during follow-up, reduce medical costs & costs to society and improve quality of life in the first 6 weeks following injury [14, 15](#)
- Disadvantages include [7](#)
  - Cost
  - Limited access
  - The need for patient sedation/general anaesthesia in young children
  - A good understanding of normal skeletal development is required to avoid misdiagnosis
  - Some paediatric studies have shown MRI to be no more accurate in detecting ACL and meniscal tears than a knee examination performed by a skilled and experienced clinician [4](#)

## References

Date of literature search: July 2017

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

1. Yen YM. **Assessment and treatment of knee pain in the child and adolescent athlete.** *Pediatr Clin North Am.* 2014;61(6):1155-73. (Review article) [View the reference](#)
2. National Guideline C. **ACR Appropriateness Criteria; acute trauma to the knee.** 2014;11:11. (Guidelines). [View the reference](#)
3. Alaia MJ, Khatib O, Shah M, J AB, L MJ, Strauss EJ. **The utility of plain radiographs in the initial evaluation of knee pain amongst sports medicine patients.** *Knee Surg Sports Traumatol Arthrosc.* 2015;23(8):2213-7. (Level II evidence). [View the reference](#)
4. Approach to acute knee pain and injury in children and skeletally immature adolescents [Internet]. UpToDate. 2017 [cited July 3, 2017]. Available from: [View the reference](#)
5. Jenny JY, Boeri C, El Amrani H, Dosch JC, Dupuis M, Moussaoui A, et al. **Should plain X-rays be routinely performed after blunt knee trauma? A prospective analysis.** *J Trauma.* 2005;58(6):1179-82. (Level III evidence). [View the reference](#)
6. Vijayasankar D, Boyle AA, Atkinson P. **Can the Ottawa knee rule be applied to children? A systematic review and meta-analysis of observational studies.** *Emerg Med J.* 2009;26(4):250-3. (Level I evidence). [View the reference](#)
7. Gill KG, Nemeth BA, Davis KW. **Magnetic resonance imaging of the pediatric knee.** *Magn Reson Imaging Clin N Am.* 2014;22(4):743-63. (Review article). [View the reference](#)
8. Orth RC. **The pediatric knee.** *Pediatr Radiol.* 2013;43 Suppl 1:S90-8. (Review article). [View the reference](#)
9. Jans LB, Jaremko JL, Ditchfield M, Verstraete KL. **MR imaging findings of lesions involving cartilage and bone in the paediatric knee: a pictorial review.** *Jbr-btr.* 2011;94(5):247-53. (Review article). [View the reference](#)
10. Major NM, Beard LN, Jr., Helms CA. **Accuracy of MR imaging of the knee in adolescents.** *AJR Am J Roentgenol.* 2003;180(1):17-9. (Level III evidence). [View the reference](#)



11. Yan R, Wang H, Yang Z, Ji ZH, Guo YM. **Predicted probability of meniscus tears: comparing history and physical examination with MRI.** Swiss Med Wkly. 2011;141:1-7. (Level III evidence). [View the reference](#)
12. Lee K, Siegel MJ, Lau DM, Hildebolt CF, Matava MJ. **Anterior cruciate ligament tears: MR imaging-based diagnosis in a pediatric population.** Radiology. 1999;213(3):697-704. (Level III evidence). [View the reference](#)
13. Subhas N, Patel SH, Obuchowski NA, Jones MH. **Value of knee MRI in the diagnosis and management of knee disorders.** Orthopedics. 2014;37(2):e109-16. (Level III evidence). [View the reference](#)
14. Nikken JJ, Oei EH, Ginai AZ, Krestin GP, Verhaar JA, 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). [View the reference](#)
15. Oei EH, Nikken JJ, Ginai AZ, Krestin GP, Verhaar JA, van Vugt AB, et al. **Costs and effectiveness of a brief MRI examination of patients with acute knee injury.** Eur Radiol. 2009;19(2):409-18. (Level II evidence). [View the reference](#)

## Information for Consumers

Information from this website	Information from the Royal Australian and New Zealand College of Radiologists' website
<p><a href="#">Consent to Procedure or Treatment</a></p> <p><a href="#">Radiation Risks of X-rays and Scans</a></p> <p><a href="#">Magnetic Resonance Imaging (MRI)</a></p> <p><a href="#">Plain Radiography (X-ray)</a></p>	<p><a href="#">Magnetic Resonance Imaging (MRI)</a></p> <p><a href="#">Plain Radiography/X-rays</a></p> <p><a href="#">Radiation Risk of Medical Imaging for Adults and Children</a></p> <p><a href="#">Making Your Child's Test or Procedure Less Stressful</a></p>

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