



Title: X-ray Series for Foot and Ankle Injuries: Clinical Evidence, Cost-Effectiveness, and Guidelines

DATE: 06 November 2013

RESEARCH QUESTIONS

1. What is the clinical evidence for the accuracy of the Ottawa ankle rules to determine the need for X-rays to identify potential bone fracture?
2. What is the cost-effectiveness of using the Ottawa ankle rules to determine the need for X-rays to identify potential bone fracture?
3. What are the evidence-based guidelines for ankle or foot X-ray series for patients with suspected foot or ankle injury?

KEY MESSAGE

Two systematic reviews, one meta-analysis, six non-randomized studies, one economic evaluation, and four evidence-based guidelines were identified regarding the Ottawa ankle rules to determine the need for X-rays to identify potential bone fracture.

METHODS

A limited literature search was conducted on key resources including PubMed, The Cochrane Library (2013, Issue 10), University of York Centre for Reviews and Dissemination (CRD) databases, ECRI (Health Devices Gold), Canadian and major international health technology agencies, as well as a focused Internet search. No methodological filters were applied to limit retrieval by publication type for questions 1 and 2. A guideline filter was used to limit retrieval to guidelines for question 3. Where possible, retrieval was limited to the human population. The search was also limited to English language documents published between January 1, 2013 and October 30, 2013. Internet links were provided, where available.

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RESULTS

Rapid Response reports are organized so that the higher quality evidence is presented first. Therefore, health technology assessment reports, systematic reviews, and meta-analyses are presented first. These are followed by randomized controlled trials, non-randomized studies, economic evaluations, and evidence-based guidelines.

Two systematic reviews, one meta-analysis, six non-randomized studies, one economic evaluation, and four evidence-based guidelines were identified regarding the Ottawa ankle rules to determine the need for X-rays to identify potential bone fracture. No health technology assessments or randomized controlled trials were identified. Additional references of potential interest are provided in the appendix.

Health Technology Assessments

No literature identified.

Systematic Reviews and Meta-analyses

1. Seah R, Mani-Babu S. Managing ankle sprains in primary care: what is best practice? A systematic review of the last 10 years of evidence. *Br Med Bull*. 2011;97:105-35.
[PubMed: PM20710025](#)
2. Jenkin M, Sittler MR, Kelly JD. Clinical usefulness of the Ottawa Ankle Rules for detecting fractures of the ankle and midfoot. *J Athl Train* [Internet]. 2010 Sep [cited 2013 Nov 5];45(5):480-2. Available from: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2938320>
[PubMed: PM20831394](#)
3. Dowling S, Spooner CH, Liang Y, Dryden DM, Friesen C, Klassen TP, et al. Accuracy of Ottawa Ankle Rules to exclude fractures of the ankle and midfoot in children: a meta-analysis. *Acad Emerg Med*. 2009 Apr;16(4):277-87.
[PubMed: PM19187397](#)

Randomized Controlled Trials

No literature identified.

Non-Randomized Studies

4. Wang X, Chang SM, Yu GR, Rao ZT. Clinical value of the Ottawa ankle rules for diagnosis of fractures in acute ankle injuries. *PLoS ONE* [Internet]. 2013 [cited 2013 Nov 5];8(4):e63228. Available from: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3640009>
[PubMed: PM23646202](#)
5. Knudsen R, Vijdea R, Damborg F. Validation of the Ottawa ankle rules in a Danish emergency department. *Dan Med Bull*. 2010 May;57(5):A4142.
[PubMed: PM20441713](#)
6. Petscavage J, Baker SR, Clarkin K, Luk L. Overuse of concomitant foot radiographic series in patients sustaining minor ankle injuries. *Emerg Radiol*. 2010 Jul;17(4):261-5.
[PubMed: PM19834751](#)

7. Gravel J, Hedrei P, Grimard G, Gouin S. Prospective validation and head-to-head comparison of 3 ankle rules in a pediatric population. *Ann Emerg Med*. 2009 Oct;54(4):534-40.
[PubMed: PM19647341](#)
8. Blackham JE, Claridge T, Bengler JR. Can patients apply the Ottawa ankle rules to themselves? *Emerg Med J*. 2008 Nov;25(11):750-1.
[PubMed: PM18955612](#)
9. Can U, Ruckert R, Held U, Buchmann P, Platz A, Bachmann LM. Safety and efficiency of the Ottawa Ankle Rule in a Swiss population with ankle sprains. *Swiss Med Wkly*. 2008 May 3;138(19-20):292-6.
[PubMed: PM18491243](#)

Economic Evaluations

10. Lin CW, Uegaki K, Coupe VM, Kerkhoffs GM, van Tulder MW. Economic evaluations of diagnostic tests, treatment and prevention for lateral ankle sprains: a systematic review. *Br J Sports Med*. 2012 May 3.
[PubMed: PM22554849](#)

Guidelines and Recommendations

11. Polzer H, Kanz KG, Prall WC, Haasters F, Ockert B, Mutschler W, et al. Diagnosis and treatment of acute ankle injuries: development of an evidence-based algorithm. *Orthop Rev (Pavia)* [Internet]. 2012 Jan 2 [cited 2013 Nov 5];4(1):e5. Available from:
<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3348693>
[PubMed: PM22577506](#)
12. National Guideline Clearinghouse [Internet]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 1997 -. Guideline summary: Ankle and foot disorders; 2013 Oct 28 [cited 2013 Nov 5]. Available from:
<http://www.guideline.gov/content.aspx?id=36625>
See: Table 1. Summary of Recommendations for Diagnostic and Other Testing for Ankle and Foot Disorders
13. National Guideline Clearinghouse [Internet]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 1997 -. Guideline summary: ACR Appropriateness Criteria® acute trauma to the foot; 2011 Sep 19 [cited 2013 Nov 5]. Available from:
<http://www.guideline.gov/content.aspx?id=32647>
14. National Guideline Clearinghouse [Internet]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 1997 -. Guideline summary: Ankle & foot (acute & chronic); 2013 Oct 28 [cited 2013 Nov 5]. Available from:
<http://www.guideline.gov/content.aspx?id=33177>

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APPENDIX – FURTHER INFORMATION:

Randomized Controlled Trials – Mnemonic for Remembering the Ottawa Ankle Rules

15. Gravel J, Roy M, Carriere B. 44-55-66-PM, a mnemonic that improves retention of the Ottawa Ankle and Foot Rules: a randomized controlled trial. *Acad Emerg Med.* 2010 Aug;17(8):859-64.
[PubMed: PM20670323](#)

Randomized and Non Randomized Studies – Practice Patterns or Change in Practice

16. Lau LH, Kerr D, Law I, Ritchie P. Nurse practitioners treating ankle and foot injuries using the Ottawa Ankle Rules: a comparative study in the emergency department. *Australas Emerg Nurs J.* 2013 Aug;16(3):110-5.
[PubMed: PM23953094](#)
17. Dowling SK, Wishart I. Use of the Ottawa Ankle Rules in children: a survey of physicians' practice patterns. *CJEM.* 2011 Sep;13(5):333-8.
[PubMed: PM21955415](#)
18. Hopkins M. A comparative analysis of ENP's and SHO's in the application of the Ottawa ankle rules. *Int Emerg Nurs.* 2010 Oct;18(4):188-95.
[PubMed: PM20869659](#)
19. Bessen T, Clark R, Shakib S, Hughes G. A multifaceted strategy for implementation of the Ottawa ankle rules in two emergency departments. *BMJ [Internet].* 2009 [cited 20123 Nov 5];339:b3056. Available from: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2726279>
[PubMed: PM19675080](#)

Clinical Practice Guidelines – Methodology Uncertain

20. Agrawal P, Kosowsky JM. Clinical practice guidelines in the emergency department. *Emerg Med Clin North Am.* 2009 Nov;27(4):555-67, vii.
[PubMed: PM19932391](#)
21. Ankle Injury – x-ray for acute injury of the ankle or mid-foot [Internet]. Victoria (BC): British Columbia Medical Association; 2009 Jan 30. [cited 2013 Nov 5]. Available from: <http://www.bcguidelines.ca/pdf/anklex.pdf>

Review Articles

22. Tiemstra JD. Update on acute ankle sprains. *Am Fam Physician.* 2012 Jun 15;85(12):1170-6.
[PubMed: PM22962897](#)

Additional References

23. van der Wees PJ, Hendriks EJ, Bruls V, Dekker J, de Bie RA. Applicability of the Ottawa Ankle Rules in primary care: results from a pilot study. *J Eval Clin Pract.* 2011

Dec;17(6):1246-8.

[PubMed: PM20630013](#)

24. Sorensen EL, Keeling A, Snyder A, Syverud S. Decreasing ED length of stay with use of the Ottawa Ankle Rules among nurses. J Emerg Nurs. 2012 Jul;38(4):350-2.
[PubMed: PM21714995](#)
25. Salazar L, Best TM, Hiestand B. Incomplete documentation of elements of Ottawa Ankle Rules despite an electronic medical record. Am J Emerg Med. 2011 Nov;29(9):999-1002.
[PubMed: PM20674227](#)
26. Runyon MS. Can we safely apply the Ottawa Ankle Rules to children? Acad Emerg Med. 2009 Apr;16(4):352-4.
[PubMed: PM19456297](#)