

*This guideline has been adapted from the Ottawa Ankle Rules developed by Dr. Ian Stiell et al. Dr. Stiell received financial support from the Institute of Clinical and Evaluative Studies in Ontario.*

## OBJECTIVE

The Ottawa Ankle Rules will assist Alberta clinicians assess if radiography of the foot and ankle is required for adult patients presenting with blunt ankle trauma at health care facilities.

## TARGET POPULATION

Adults, 18 years of age and older

## EXCLUSIONS

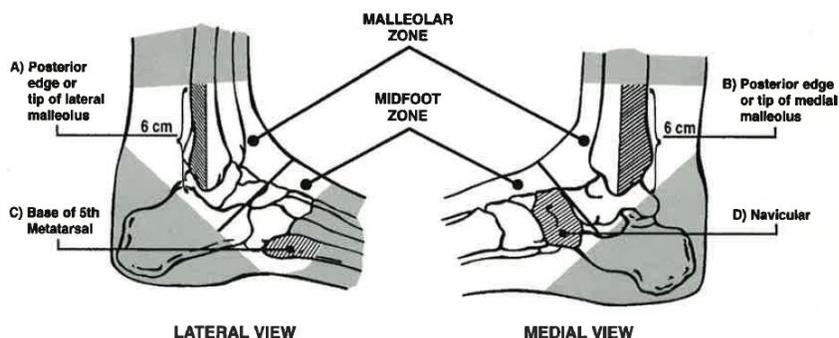
Under 18 years of age, intoxicated, multiple painful injuries, pregnant, head injury, diminished sensation due to neurological deficit

## RECOMMENDATIONS

- ✓ An ankle x-ray series is required only if there is pain in the malleolar zone and any one of the following:
  - Bone tenderness along the distal 6 cm of the posterior edge of the fibula or tip of the lateral malleolus
  - Bone tenderness along the distal 6 cm of the posterior edge of the tibia or tip of the medial malleolus
  - Inability to bear weight for four steps immediately and in the emergency department
- ✓ A foot x-ray series is required only if there is pain in the midfoot zone and any one of the following:
  - Bone tenderness at the base of the 5<sup>th</sup> metatarsal
  - Bone tenderness at the navicular bone
  - Inability to bear weight for four steps both immediately and in the emergency department

## OTTAWA ANKLE RULES POSTER PDF

[http://www.ohri.ca/emerg/cdr/docs/cdr\\_ankle\\_poster.pdf](http://www.ohri.ca/emerg/cdr/docs/cdr_ankle_poster.pdf) (link available as of March 2014)



## BACKGROUND

The Ottawa Ankle Rules were adapted by TOP's predecessor, the Alberta Clinical Practice Guideline Program, in 1996 as a guideline to assist physicians to make decisions about use of radiography for patients with ankle injuries. The Ottawa Ankle Rules were developed, clinically tested and demonstrated that the use of these rules decreased ankle radiography use, waiting times, and costs without patient dissatisfaction or missed fractures.

The investigator, Dr. Ian Stiell, a clinical epidemiologist with a focus on health services research in emergency medicine, led this work. Dr. Stiell conducted five studies to examine the role of radiographic imaging of the ankle and midfoot and the resulting decision rules for use of radiography in ankle injury. Dr. Stiell's studies are summarized below.

## RESEARCH FINDINGS

### *AGREEMENT IN THE EXAMINATION OF ACUTE ANKLE INJURY PATIENTS*

The first study involved a method for measuring interobserver agreement to determine the reliability of physical findings when emergency physicians assessed patients with ankle injuries.

Two adult emergency departments in Ottawa participated. Patients were eligible if they had suffered acute blunt trauma to the ankle, regardless of the cause of injury. Patients were excluded if they were under 18 years of age, pregnant, had isolated superficial skin injury, had been injured more than ten days previously and/or had returned for reassessment of the same injury.

Ten areas of point tenderness and four areas of soft tissue tenderness were included. As well, ecchymosis, range of motion, degree of swelling in four locations, anterior drawer sign and ability to bear weight for at least four steps in the emergency department.

The best agreement was judging ability to bear weight and good agreement judging bone tenderness. Findings related to ecchymosis, range of motion, soft tissue tenderness and anterior drawer sign were unreliable.

The interobserver agreement was most reliable for bearing weight for four steps in the emergency department, swelling of the lateral malleolus, localized bone tenderness of the base of the fifth metatarsal, the anterior and posterior edges of the lateral malleolus, and the inferior tip of the medial malleolus.

### *DEVELOPING CLINICAL DECISION RULES FOR THE USE OF RADIOGRAPHY IN ACUTE ANKLE INJURIES*

A second study was conducted to develop decisions rules that would predict fractures in patients with ankle and midfoot injuries. This prospective study was conducted in two adult emergency departments in Ottawa.

An initial (pilot) study included 155 patients, followed by the main study including 750 patients. They assessed 32 standardized clinical variables and these were assessed for reliability by the kappa coefficient, for association with significant fracture of the ankle or midfoot.

The goal was 100% sensitivity for detecting fractures of the ankle and midfoot. But when applying the rules to the 750 patients, they found 70 (9.3%) significant malleolar fractures and 32 (4.3%) significant midfoot fractures concluding that an ankle X-ray was necessary only if the patient had pain near the malleoli and one or more of the following criteria: over age 55, unable to bear weight for four steps in the emergency department, bone tenderness at the posterior edge or tip of the malleolus. A foot X-ray was necessary if the patient had pain in the midfoot and bone tenderness at the navicular, cuboid, or base of the fifth metatarsal.

Clinicians reported that the rules were practical and maintained 100% sensitivity. However, 77% of the X-rays were still negative. When excluding bone tenderness of the inferior tip of the lateral malleolus as part of the examination, specificity increased to 55.7% from 40%, and a potential cost savings of 49.8% but the sensitivity decreased to 95.7% concluding that this decrease in sensitivity would not be acceptable to physicians in North America.

### *DECISION RULES FOR THE USE OF RADIOGRAPHY IN ACUTE ANKLE INJURIES*

The third study validated and refined the clinical decision rules for acute ankle injuries. A prospective convenience survey was administered in two stages: validation and refinement of the original rules, followed by validation of the refined rules.

The findings revealed that an ankle X-ray was necessary only if the patient had pain near the malleoli and one of the following: inability to bear weight for four steps in the emergency department, bone tenderness at the posterior edge or tip of either malleolus. Foot X-ray was necessary only if the patient had pain in the midfoot and inability to bear weight for four steps or bone tenderness at the navicular or base of the fifth metatarsal.

### *IMPLEMENTING THE OTTAWA ANKLE RULES*

The fourth study addressed the Ottawa Ankle Rules implementation and the impact on clinical practice.

Applying the rules resulted in a relative reduction in ankle radiographs of 28% and in foot radiographs of 14%. The rules were found to be 100% sensitive. Wait times decreased, patients were satisfied with their treatment, and significant fractures did not go undetected.

The findings from this study led to the final decision rules stated in the current Ottawa Ankle Rules, for the use of radiography in ankle injury.

### *MULTI TRIAL TO INTRODUCE THE OTTAWA ANKLE RULE FOR THE USE OF RADIOGRAPHY IN ACUTE ANKLE INJURIES*

The fifth study assessed the feasibility and impact of introducing the Ottawa Ankle Rules in a wide variety of teaching and community hospital settings. Findings suggested that applying the Ottawa

Ankle Rules was feasible in a wide variety of hospital and community settings. When physicians applied the rules, ankle radiography, waiting times and costs decreased, and the rate of undetected fractures did not increase.

## *VALIDATION STUDIES*

Subsequent validation studies were also reviewed and results varied. One study was found to be methodologically flawed. One replicated the 100% sensitivity of Stiell's work, and another concluded that the rules were more sensitive than clinical suspicion alone but could not replicate the 100% sensitivity. However the undetected fractures in the latter study were diagnosed by physician assistants or emergency medicine residents.

## *SUMMARY*

Although physicians have clinical skills to identify patients at low risk of fracture, there is always concern for a missed fracture. This guideline provides evidence-based guidance when making a diagnosis and several benefits for patients and the health care system including unnecessary radiation exposure, reduced wait times and decreased health care costs. However, the rules are guidelines only and not meant to be inflexible or dogmatic. Physician judgement and common sense is still the best approach.

## *PHYSICIAN ADVICE TO PATIENTS*

An integral part of managing patients when radiography is not used is clear communication. It is important to explain to the patient the nature of a sprained ankle, the reason for the decision to conduct or not conduct an X-ray, and what the patient should expect in the week following the examination. Patients require written instruction recommending treatment and need for follow-up in five to seven days if pain and/or ability to walk do not improve.

Note: The Ottawa Ankle Rules approach 100% sensitivity in emergency departments with trained physicians. To date, we are not aware of any implementation research that has been conducted outside emergency departments. Validation studies will likely continue and may affect these recommendations in the future.

## **PRIMARY REFERENCES**

1. Stiell IG, McKnight RD, Greenberg GH, et al. Interobserver agreement in the examination of acute ankle injury patients. *Am J Emerg Med.* 1992;10:14-17.
2. Stiell IG, Greenberg GH, McKnight RD, et al. A study to develop clinical decision rules for the use of radiography in acute ankle injuries. *Ann Emerg Med.* 1992;21:384-90.
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5. Stiell IG, Wells G, Laupacis A, et al. Multicentre trial to introduce the Ottawa ankle rules for use of radiography in acute ankle injuries. *BMJ.* 1995;311:594-7.

## ADDITIONAL REFERENCES

1. Pigman EC, et al. Evaluation of the Ottawa clinical decision rules for the use of radiography in acute ankle and midfoot injuries in the emergency department: an independent site assessment. *Ann Emerg Med.* 1994;24:1:41-5.
2. Kerr L, et al. Failed validation of a clinical decision rule the use of radiography in acute ankle injury. *N Z Med J.* 1994 Jul;294-5.
3. Stiell IG, McKnight RD, Greenberg GH, Well G. Ottawa ankle rules for radiography of ankle injuries. *N Z Med J.* 1995;108:111.
4. Lucchesi GM, Jackson RE, Cerasani C, Swor RA. Sensitivity of the Ottawa rules. *Ann Emerg Med.* 1995;26-1:1-5.

### ***SUGGESTED CITATION***

Toward Optimized Practice (TOP) Committee on Ankle Injuries. January 2007. Radiography of the ankle and foot (Ottawa ankle rules): clinical practice guideline. Edmonton, AB: Available from: <http://www.topalbertadoctors.org>

For more information see [www.topalbertadoctors.org](http://www.topalbertadoctors.org)

### ***GUIDELINE COMMITTEE***

The committee consisted of representatives of general practitioners, emergency physicians, a radiologist, orthopedist, internist, nurse, health system representative, and a member of the public.

March 1996

Reviewed January 2007

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