# Critical Review Form
## Diagnostic Test

HYPERLINK "http://pmid.us/20046238"Pincus S, Weber M, Meakin A, et al. Introducing a Clinical Practice Guideline Using Early CT in the Diagnosis of Scaphoid and Other Fractures. West J Emerg Med. 2009 Nov;10(4):227-32.

**Objectives:** **To test the hypothesis "that early CT with this CPG [clinical practice guideline] would avoid unnecessary immobilization. We also hypothesized that this would result in early return to normal duties and satisfied patients." (p. 228)**

**Methods:** **This prospective, observational study was conducted at a single emergency department in Ballarat, Australia between April 2006 and March 2008. Patients at least 14 years of age with a mechanism of injury consistent with scaphoid trauma, anatomical snuffbox tenderness, and normal x-rays of the wrist and scaphoid were eligible for enrollment. Patients who were pregnant and those unable or unwilling to consent were excluded.**

**Following normal x-rays, patients underwent a CT scan using a 64-slice scanner. Patients with an identified fracture were immobilized with plaster of Paris and referred to the orthopedics clinic. Those with a normal CT and without "significant pain" (< 5/10) were not immobilized; supportive immobilization was offered to those with significant pain. Patients without fracture were then interviewed by telephone at day 10 to assess loss of function and ongoing pain. Those with ongoing pain > 4/10 were referred for an MRI. A diagnosis of "no fracture" was based on resolution of pain at 10 days or a negative MRI.**

**There were 87 patients enrolled during the study period, of whom 4 were excluded for failure to undergo CT scan. There were 56 patients with no fracture identified, 28 with a fracture identified, and 2 with additional injuries (scapholunate dislocation in one, radial head fracture in one). Three patients with a normal CT were lost to follow-up, 45 had resolution of pain at 10 days, and 8 underwent MRI ("bone bruise" identified in 2 and no fracture identified in 6).**

| Guide | | Comments |
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| **I.** | **Are the results valid?** | |
| **A.** | **Did clinicians face diagnostic uncertainty?** | Yes. The rate of occult scaphoid fractures in patients with signs of possible fracture and normal plain radiography ranges from 0% to 16%. The ability to clinically rule out significant fracture during the initial ED visit would be valuable, obviating the need for immobilization and repeat outpatient imaging. |

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| **B.** | **Was there a blind comparison with an independent gold standard applied similarly to all patients? (Confirmation Bias)** | No. The gold standard would typically be MRI, which was only performed in 8 of 53 patients with a normal CT (15%). Fracture was excluded in the remaining patients by lack of "significant" pain or loss of function on telephone follow-up at 10 days (differential verification bias). |
| **C.** | **Did the results of the test being evaluated influence the decision to perform the gold standard? (Ascertainment Bias)** | Sort of. Patients with an abnormal CT scan did not undergo MRI, which in this case would not be necessary to confirm findings. Patients with a negative CT only underwent MRI if they were still having significant pain or loss of function at 10-day follow-up. |
| **II.** | **What are the results?** | |
| **A.** | **What likelihood ratios were associated with the range of possible test results?** | • CT was found to have a sensitivity of 100% (95% CU 93.5% to 100%) and negative predictive values of 100% (95% CI 93.5% to 100%) for fracture.<br>  ○ Two patients with bone "bruises" did require longer immobilization.<br>• Participants spent a mean 2.85 days immobilized and had a mean time off work of 1.6 days. |
| **III.** | **How can I apply the results to patient care?** | |
| **A.** | **Will the reproducibility of the test result and its interpretation be satisfactory in my clinical setting?** | Yes. We are able to perform multidetector CT scans in our emergency department and have real-time reads by board-certified radiologists (or residents during off-hours with overreads by attendings in the morning). |
| **B.** | **Are the results applicable to the patients in my practice?** | Yes. We frequently encounter patients with traumatic injuries consistent with scaphoid fracture who have snuffbox tenderness and negative initial x-rays. In many cases there are social barriers to follow-up for repeat x-rays (homelessness, lack of transportation, lack of insurance) and many patients would be unable to work while immobilized. The ability to more accurately exclude fracture during the initial ED visit would be beneficial for such patients. |
| **C.** | **Will the results change my management strategy?** | Potentially, yes. In select patients with poor access to follow-up or in whom early immobilization would be overly burdensome, I would consider CT to more accurately rule out occult fracture. |
| **D.** | **Will patients be better off as a result of the test?** | Again, yes, in select cases. |

**Limitations:**

1. **MRI was only performed in 8 of 53 patients with a normal CT (differential verification bias).**

2. **This was a relatively small, single-center study in Australia. Confirmation of these findings in disparate healthcare settings would make the findings more robust.**

3. **While the practice guideline and CT scanning were 100% sensitive in detecting fracture, 2 patients were found to have bone "bruises" which required prolonged immobilization.**

**Bottom Line:**

**In this single-center study, a clinical practice guideline utilizing early CT scanning in patients with signs of possible scaphoid fracture but negative x-rays allowed early mobilization without risk of missed fracture. The guideline had 100% sensitivity and 100% negative predictive value for occult fracture.**