

August 1, 2017

A Deeper Dive into Cost

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We would like to commend the authors of “Diagnosis of Occult Scaphoid Fractures” for attempting to determine the most cost-effective way to diagnose and treat occult scaphoid fractures. They conducted their cost analysis using a decision tree model of management strategies, comparing empiric casting with repeat radiographs at two weeks versus immediate advanced imaging with either MRI or CT. The authors conclude that in the setting of suspected scaphoid fracture with negative radiographs, CT or MRI imaging “represents a cost-effective strategy for reducing both costs and morbidity.” While acknowledging the challenging task of accurately simulating scenarios for such a diagnostic dilemma, we nonetheless feel it is important to highlight limitations beyond those mentioned by Karl and colleagues.

The largest individual contributor to cost in the immobilization branch of this study is “days of work missed.” An average base time of 5 days was used in the analysis, referencing articles by Brooks,(1) Hansen,(2) and Kukla.(3) Closer analysis of these studies, however, challenges the use of this amount of time away from work as a cost that is only associated with the immobilization branch. In the Brooks study,

there was no statistically significant difference in days of work missed between immobilized control and MRI groups. Hansen's study finds that MRI "reduces sick leave from 27 days (1-92) to 11 days (0-28)," with a highly variable range based on a limited patient population of 27 patients in the MRI and control groups. Finally, the Kukla study, a prospective trial comparing diagnostic accuracy of MRI at presentation to four-view radiographs at 14 days following injury, was not designed to target the number of days of work lost by empiric casting versus MRI at evaluation. All three of these studies were designed to examine MRI effectiveness in diagnosis, rather than evaluation of time off work. Stronger references to estimate lost time may be necessary to determine a more appropriate base factor in a simulated cost analysis. More importantly, a confounding factor may include missed work due to pain or other wrist pathology in patients discharged after negative advanced imaging. An assumption of no days of work missed following negative imaging in the CT and MRI branches likely underestimates cost projections in this group.

After carefully reviewing the estimated advanced imaging costs, we found that the base cost for CT appeared low – reported as \$374 USD. At our institution, the combined cost of hospital billing fees and professional fees, for an upper extremity CT focused on the wrist, amounted to more than \$2000. With only two references for CT cost, additional samples of advanced imaging costs may be necessary to better estimate average costs. Additionally, in busy emergency room settings where immediate access to CT or MRI may be limited, both direct and opportunity costs to emergency rooms while waiting for advanced imaging and radiology readings should not be discounted. These type of cost variabilities are essential to further investigate because the authors state, "advanced imaging would have to increase in cost to more than \$2000 for empiric cast immobilization to be cost-effective."

Advanced imaging as a screening tool in the patient with wrist pain is neither cost-effective nor practical and depends significantly on pretest probability, determined by focused history and physical exam. In a prospective study investigating hand surgery referrals from primary care providers, Hartzell et al.(4) found that, "the correct diagnosis was established only 34 percent of the time in new patients before presentation... [and] 74 percent of patients had a test ordered and/or intervention performed on them before arriving, with 70 percent of these tests being unnecessary. Expensive imaging modalities, such as magnetic resonance imaging or computed tomography, were an especially bad offender, with 90 percent of these ordered studies not critical to the diagnosis or care of the patient's problem. Not only are costs and efficiency a major concern with this practice, but so is the finding that 17 percent of patients suffered complications as a result of unnecessary studies or interventions."

Thus, with lower pretest probability among urgent care and emergency department providers, it may be appropriate to delay advanced imaging until a focused musculoskeletal examination can be performed by a specialist who can make the decision to order a CT or MRI based on higher pretest probability. This idea is further emphasized in the recent Cochrane Review by Mallee et al.,(5) where the authors state that “there is a need to raise the initially detected prevalence of true fractures in order to reduce the effect of the relatively low specificity in daily practice.”

Finally, the instructional review article by Duckworth et al.(6) reinforces this with the conclusion that, “the best strategy for improving the diagnosis of true fractures among suspected fractures of the scaphoid may well be to develop a clinical prediction rule incorporating a set of demographic and clinical factors which together increase the pre-test probability of a fracture of the scaphoid.”

Beyond the scope of upper extremity, it is notable that parallel advanced imaging cost analysis across the body have been investigated for screening diagnosis of fracture based on presentation with joint pain. For example, Keeney et al.(7) determined “although MRI can be valuable for diagnosing or staging specific conditions, it is not cost-effective as a screening tool for hip pain that is not supported by history, [and] clinical examination....” Thus, in any discussion regarding cost effectiveness of early advanced imaging, the benefits should be weighed against increasing the pretest probability via focused history and exam whereby the test would have tangible clinical impact.

The authors should be credited for their dedicated effort to simulate cost analysis in an area where most agree that there exists a lack of a clear consensus on best practice guidelines. We also agree that the authors conclusion that “the ultimate decision on casting compared with further imaging should be made jointly with the patient in a shared decision-making discussion, rather than prescribed to them on the basis of the quantitative results of this study.”

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Conflict of Interest: None Declared