Cost-Effectiveness of a Novel Cervical Spine Clearance Protocol: Obviating the Need for Routine Magnetic Resonance Imaging

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Introduction

Cervical spine injury (CSI) occurs in 2-4% of trauma patients in the USA causing significant decrements in quality of life and even death. Treatment of CSI is estimated to cost $9.7 billion annually. Computed tomography (CT) has an almost 100% negative predictive value (NPV) for cervical spine (c-spine) clearance, in both alert and obtunded patients. However, MRI can depict occult discoligamentous injury in some patients with negative CT scans. It remains unclear whether MRI findings should preclude c-spine clearance and prolong hospital stay. This review intends to critically assess CT-missed CSI patients and derive a safe, economically sustainable protocol for c-spine clearance.

Methods

A retrospective review of prospectively collected CSI data from two, level-1 trauma centers, was conducted from 2015-2016. Primary outcome measures include: NPV and the incremental cost-effectiveness ratio (ICER) of a novel c-spine clearance protocol compared with standard of care. The protocol included thin-cut CT scans with either weight-bearing or flexion-extension films. The ICER was calculated using standard cost-utility analysis techniques in US dollars ($) per quality-adjusted-life-year (QALY), assuming a willingness-to-pay threshold of 50,000 $/QALY.

Results

A total of 614 patients were reviewed. Mean age was 38.3 years (SD 18.6), 147 (23.9%) had altered mentation, and 12 (2%) had clinically meaningful CT-missed acute discoligamentous disruption. Our c-spine clearance protocol had a NPV of 99.8% (CI 96.5-100%). There was no statistically significant difference between awake and obtunded patients (p=0.74). Mean time to c-spine clearance improved by 1.3 days (SD 0.9). Duration of c-spine immobilization was reduced by 930 person-days. Mean cost savings was $1230 (SD $242) per patient. Mean change in QALY was 0.02 (SD 0.01). The ICER was –61,500 $/QALY.

Conclusions

Our novel CSI clearance protocol is both safe and highly cost-effective. It improves outcomes at less cost, making it a dominant strategy that centers should consider implementing.

Learning Objectives

By the conclusion of this session participants should be able to: 1) Describe the important of cost-effectiveness in spine trauma management; 2) Discuss in small groups practice patterns for safely clearing the cervical spine in trauma; and, 3) Identify an effective treatment for clearing the cervical spine in trauma patients that does not rely on unsustainable practices, such as ordering MRIs on everyone.

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