

Can we do Less? Review of Imaging practices for Cervical Spine in Pediatric Trauma Patients

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Purpose: Traumatic cervical spine injuries in children are uncommon but potentially devastating. The risk of missing a true cervical spine injury carries severe consequences and leads to increased costs and overutilization of ionizing radiation and MRI in the evaluation and treatment of pediatric patients. There is currently no protocol-based evaluation in use to risk stratify and identify patients who may be clinically cleared from cervical spine fracture, without imaging. The national emergency x-radiography utilization study (NEXUS) is a set of validated clinical criteria to help decide which patient does not need imaging. The purpose of this report is to evaluate the effectiveness of applying NEXUS criteria for cervical spine imaging in the pediatric trauma setting at our institution.

Methods: A retrospective review of all pediatric trauma patients admitted to a level 1 Trauma hospital over a 3-year period (2015-2018) was conducted. Data regarding demographics, type and mechanism of injury, clinical evaluation, and outcome were collected. Imaging data for the cervical spine were noted and their results tabulated. Length of stay as well as duration required to clear the spine were also studied. The cohort was divided by mechanism, age, gender, and GCS levels and compared, with a p value of less than 0.05 considered significant.

Results: A total of 1,321 pediatric blunt trauma patients were found during the study period, of which 483 (36.6%) were evaluated radiologically for cervical spine injury. We noted 58% were male, 34% were 0-5 years old, 26% were 6-10 years old, and 40% were 11-15 years old. The majority were Caucasian (68%), and most had public insurance (56%). The most common mechanism of injury was by motor vehicle collision (51%). The clinical presentation included neck tenderness (11%), altered mental status (8%), and midline cervical spine tenderness (10%). Overall, 453 cases had multiple imaging modalities performed. 447 had CT, 110 MRI, and 62 Flex-Ex films for evaluation of the cervical spine. Of these, 38 CT, 31 MRI, and 4 Flex-Ex, showed cervical spine abnormalities, while 88.5% of the studies were normal. The most common abnormalities discovered were ligamentous injury, anterolisthesis, or joint space widening, with only 6 patients requiring an intervention. Application of the NEXUS criteria would have resulted in a 21% reduction in imaging and all of the injuries would have been identified. Based on imaging charges alone, that would save \$77,685, with even more cost reduction when considering anesthesia and ancillary staff use.

Conclusion: Cervical spine injury was very uncommon in our experience, and the vast majority of imaging studies were negative. Application of validated criteria would result in substantial reduction in imaging, decreased ionizing radiation in children, marked cost saving, and no missed injuries. Based on these data, a clinical pathway will be introduced to streamline trauma imaging.