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Decreasing Radiation Exposure in Children Who Need Cervical Spine Clearance After TBI

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Pediatric cervical spine injury (PCSI) can result in devastating neurologic disability. Prompt and accurate diagnosis of PCSI is an essential component of trauma care (1). While computed tomography (CT) imaging is both sensitive and specific in detecting clinically significant injuries, indiscriminate utilization can lead to unnecessary ionizing radiation exposure.

During a routine trauma audit process in 2019, we observed a high CT utilization rate of 54%, and CT's were appropriately obtained only 46% of the time.

In response, and in conjunction with newer published guidelines (2), we updated our institutional PCSI protocol. The updated protocol was developed in a consensus-based process among trauma stakeholders and came into effect February 2022.

OBJECTIVES

This study is a retrospective review to evaluate protocol compliance and CT utilization pre- and post- implementation of updated c-spine clearance protocol for pediatric trauma (2022).

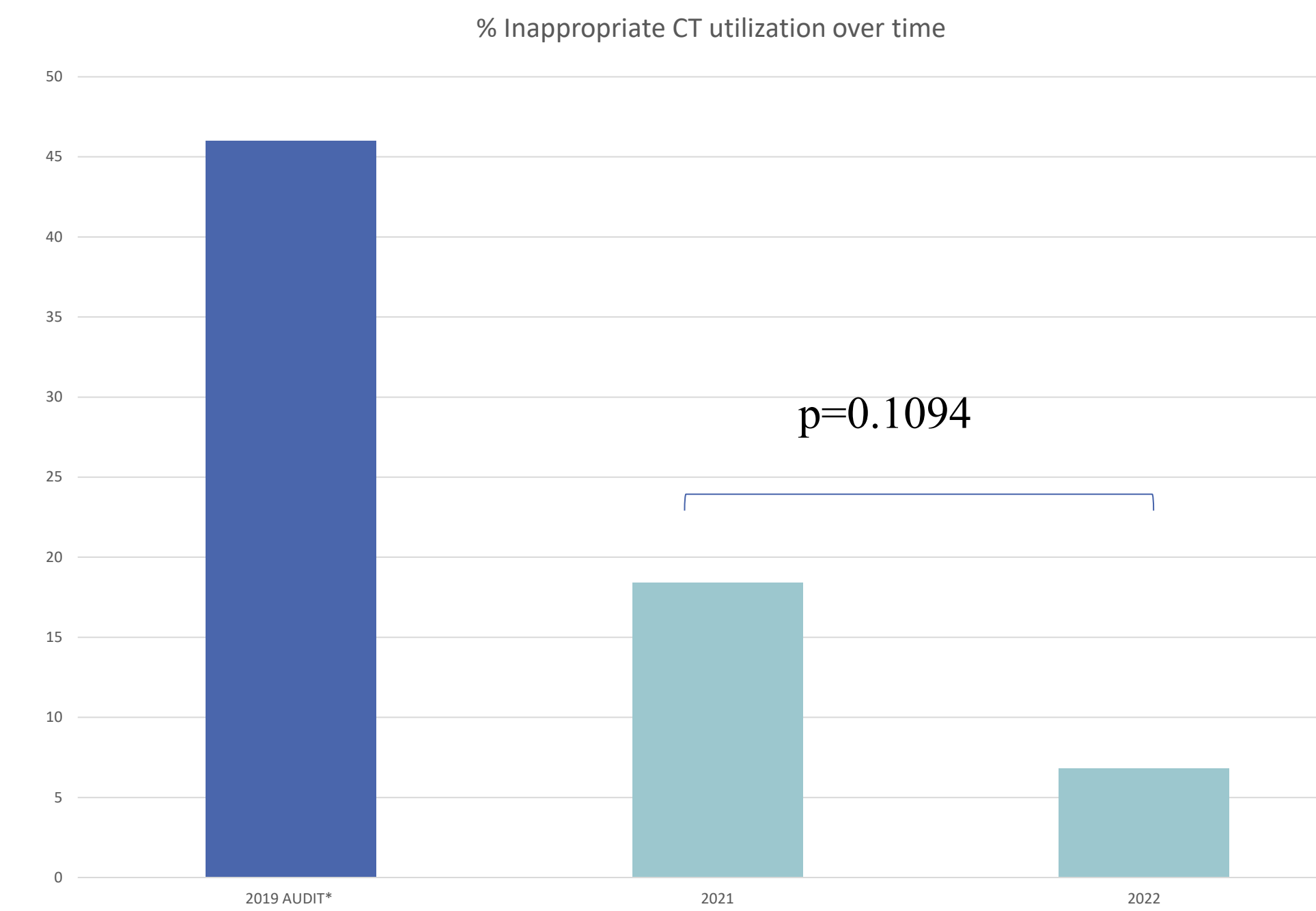
METHODS

We retrospectively reviewed and compared pediatric patients (0-14 years old) in two cohorts (2021 and 2022) with our updated protocol guidelines (Figure 1). We reviewed patients with concurrent mild and moderate traumatic brain injuries to capture the group of patients in whom protocol deviation would most likely occur (GCS 9-15). Outside hospital transfers were excluded from analysis. Data was abstracted from the institutional Trauma and Neurosurgery injury databases. The primary study endpoints were guideline compliance and CT utilization.

RESULTS

A total 82 subjects were enrolled in our study. In 2021, there were 38 subjects (female/male 15/23, mean age 5.87 years old) with an average GCS of 13.6. In 2022, there were 44 subjects (female/male 19/25, mean age 5.19 years old) with an average GCS of 14.0.

In 2021, the overall protocol compliance rate was 81.6% and post-implementation in 2022, compliance was 93.2% (p = 0.1094). CT was used to clear the c-spine in all the protocol violations.



Differences in data collection preclude formal statistical comparison of the 2019, 2021, and 2022 cohorts.

Pediatric C-spine Clearance Guideline – Age 0-14 years

Any patient w/ neuro deficits from c-spine injury requires CT imaging and immediate spine consult.
 See page bottom for high risk mechanism of injury AND unable to clear clinically.

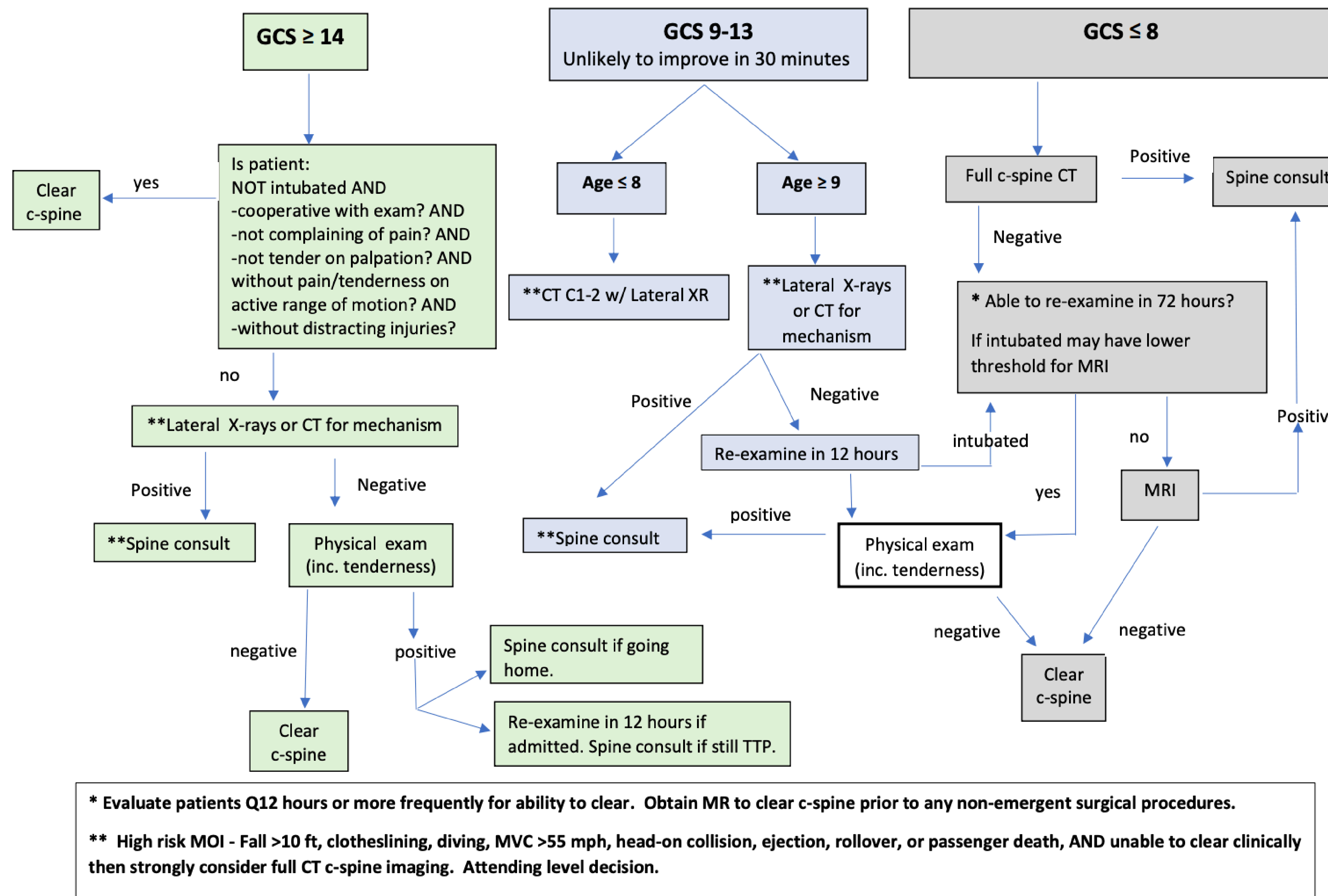


Figure 1. Updated Pediatric Cervical Spine Clearance Guideline
 Consensus-based algorithm to determine cervical spine (c-spine) clearance in pediatric (0-14 years old) patients presenting with traumatic brain injury.

DISCUSSION & CONCLUSIONS

Implementation of a new evidence-based institutional protocol for PCSI was associated with improved adherence and ordering of fewer unnecessary CTs in children over time, especially when compared to the historical audit data at UC Davis.

Differences in data collection precluded a formal statistical analysis of the historical audit data and the study cohorts. In the current study, a modest effect pre- and post-implementation was demonstrated.

Increased awareness of the stakeholders during the process of PCSI revision may have affected behavior and reduced inappropriate CT utilization immediately prior to protocol implementation. Ongoing monitoring will allow us to determine if these improvements are sustained.

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