Removing the Pediatric Cervical Collar

Current Practice Patterns

Hisham A. Omran, MD; M. Denise Dowd, MD, MPH; Jane F. Knapp, MD

Objectives: To identify the current practice patterns of emergency medicine practitioners and the typical criteria used in discontinuing cervical spine immobilization (CSI) in the pediatric patient.

Design: Mail-in survey.

Participants: All physicians on the mailing list of the American Academy of Pediatrics Section of Emergency Medicine and an equal number of randomly chosen members of the American College of Emergency Physicians. The total number of participants was 1360.

Methods: The survey consisted of a case scenario describing a 3-year-old child brought to the emergency department with CSI. The approach to such a scenario was assessed. Surveys were mailed with self-addressed stamped envelopes; repeat mailings were sent at 4 and 8 weeks after the first mailing. Those not currently in active practice or not involved in the decision to discontinue CSI were excluded from the study.

Results: The response rate was 55%. Most respondents were younger than 44 years (71%), in practice less than 10 years (56%), and practiced in an urban setting (68%). Nearly two thirds (62.6%) had completed residency training in pediatrics, 24% in emergency medicine and 36% a pediatric emergency medicine fellowship. Most (63%) would discontinue CSI without obtaining radiographs. Factors associated with removal were residency training in pediatrics and being in practice for less than 10 years. The most common criteria for discontinuing CSI were normal neurological (96%) and cervical spine (98%) examinations, normal mental status (92%), and absence of neck pain (93%).

Conclusions: Discontinuing CSI without obtaining radiographs is common, especially among those with residency training in pediatrics and those in practice for less than 10 years. Knowledge of current practice is essential to future development of guidelines for managing pediatric trauma patients for whom cervical spine injury is a consideration.


Pediatric cervical spine injuries are a rare complication of pediatric blunt trauma, with an estimated incidence of 14 per 1 million cases. Despite its rarity, pediatric cervical spine injuries can be devastating and necessitate a cautious approach in the prehospital setting, such as those specified by current Advanced Trauma Life Support protocols. These guidelines recommend that all patients with trauma above the clavicle be considered to have cervical spine injury and undergo out-of-hospital cervical spine immobilization (CSI) until further evaluation at the treating hospital. Therefore, many children come to the emergency department requiring an assessment for potential cervical spine injury; however, rarely will they have this type of injury. Despite the absence of established pediatric guidelines for clinically clearing the cervical spine, emergency medicine physicians commonly discontinue CSI without obtaining radiographs for those patients they deem not to have a cervical spine injury. Little is known about this practice, specifically frequency of occurrence and factors influencing the decision to discontinue CSI without obtaining cervical spine radiographs.

Knowledge of current physician practice and its variability is essential as a prelude to establishing acceptable guidelines for discontinuing CSI without radiography. This study describes the typical practice pattern of emergency medicine physicians in the management of pediatric trauma patients who present with CSI. Eventually, tested guidelines may lead to the avoidance of unnecessary cervical spine radiography, prolonged cervical immobilization, and the inconvenience, time, and expense associated with them.
METHODS

A survey was mailed to all physicians on the mailing list of the American Academy of Pediatrics (AAP) Section of Emergency Medicine and an equal number of randomly chosen members of the American College of Emergency Physicians (ACEP). Only 1 survey was sent to individuals on both mailing lists. The survey consisted of a 2-page questionnaire with an attached cover letter, signed by the chief of the Division of Emergency Medicine, that introduced the investigators and explained the purpose of the study. The survey contained a statement of purpose and an assessment of demographic and professional characteristics, including years in practice (<5 years, 5-10 years, or ≥10 years), type of practice (urban, rural, suburban, or other), training (residency or fellowship), age (25-34 years, 35-44 years, 45-54 years, or ≥55 years), annual emergency department census (<30,000, 30,000-60,000, or >60,000), percentage of patients younger than 19 years (<40%, 40%-59%, 60%-79%, or >80%), and presence of rotating residents in the emergency department. This was followed by a short case scenario describing a three-year-old child who was a rear seat unrestrained passenger struck broadside by another car moving at 30 MPH. He was immobilized at the scene, and transported by paramedics to the ED [emergency department]. He was awake, with normal vital signs, and other than abrasions on the forehead he had a negative physical examination. He cried but calmed on arrival of his parents.

The scenario was followed by 9 close-ended questions addressing the respondent’s approach to such a patient. These questions included whether respondents would remove the collar without obtaining radiological studies, and criteria they deemed necessary for removal of the collar without obtaining radiography. Respondents were asked to select the criteria they felt must be met to clinically clear the case child’s cervical spine. A set of 13 choices were presented, plus an open-ended option of adding any other criteria necessary to clear the cervical spine without radiography. Choices included the following: no complaints of neck pain, no history of loss of consciousness, full state of alertness, a score of 15 on the Glasgow Coma Scale, absence of painful or distracting injuries, no evidence of intoxication, a normal cervical spine examination (non-tender, full range of motion, no step-offs on palpation, no swelling, and no other abnormalities), normal neurologic examination, a history of ambulation at the scene, no other injuries above the clavicle, no medical history of high risk for cervical spine instability (eg, Down syndrome) or of a high-risk mechanism for cervical spine injury, no history of ejection from the vehicle, and restraint at the time of the crash. The interpretation of each item was left to the survey respondent, and no further explanation or guidance was given. Additional questions concerning the reasons for obtaining or not obtaining radiographs were asked along with close-ended answers presented in a list. The scenario and questions were evaluated for clarity and appropriateness by the faculty of the Division of Emergency Medicine, with the goal of recreating a common case scenario experienced by physicians working in an emergency department setting.

The survey was mailed with a self-addressed stamped envelope. A repeat mailing was sent to those who had not replied 4 weeks after the first one. A third and final mailing was sent to those who had not responded 4 weeks after the second one. There was an identifying mark on the response sheets to allow for follow-up mailings to those not responding. No personal identifiers were recorded or tracked. Those who were neither currently in active practice nor involved in the decision to remove the cervical collar in trauma patients were excluded from the study. The survey was conducted between February 1998 and November 1998.

The respondents were made aware of the purpose of the study, and their responses remained anonymous. Institutional review board approval was obtained. Frequency distributions were generated for demographic and professional characteristics, and differences were assessed for statistical significance with a χ² test. P<.05 was considered significant. Univariate analysis to assess individual characteristics associated with removal of CSI without radiography was performed, and results were expressed as odds ratios (ORs) with 95% confidence intervals (CIs). To control for confounders and identify characteristics significantly associated with the decision to remove the cervical collar, a multivariate logistic regression was performed. For analysis purposes, certain continuous variables such as age of respondents, annual emergency department census, and percentage of patients younger than 19 years were collapsed into dichotomous variables. All data analysis was performed with the Statistical Product and Service Solutions 8.0 software package.

RESULTS

A total of 1360 surveys were mailed (equal numbers from both groups), and 753 (55%) were returned. A total of 114 respondents were excluded because they were not currently practicing or were not involved in the decision to remove the cervical collar; the final study group was 639 participants. The group consisted of 395 physicians (61.8%) from the AAP Section of Emergency Medicine mailing list and 244 (38.2%) from the ACEP mailing list. The respondents’ demographics and professional characteristics are provided in Table 1. Most respondents (71.2%) were younger than 44 years, in practice for less than 10 years (55.7%), and practiced in an urban setting (68.0%). Nearly two thirds (62.6%) com-
practicing in an urban setting (OR, 1.7; 95% CI, 1.1-2.6), age of 44 years or younger (OR, 1.5; 95% CI, 1.1-2.2), and practicing in a setting where patients younger than 19 years accounted for at least 60% of the patients (OR, 2.0; 95% CI, 1.4-2.8). The total number of annual visits did not appear to be associated with removal of the cervical collar. A logistic regression revealed those characteristics independently associated with removal of CSI. Those trained in pediatrics were nearly twice as likely to remove CSI as those trained in emergency medicine (OR, 1.9; 95% CI, 1.2-3.5). Additionally, those in practice for less than 10 years were 1.7 times more likely to remove CSI than those in practice for more than 10 years (OR, 1.5; 95% CI, 1.1-2.2).

For those who would remove CSI without radiography (n=404), the most common criteria deemed mandatory were normal cervical spine examination results (98.5%), normal neurologic examination results (95.7%), absence of neck pain (93.0%), and a Glasgow Coma Scale score of 15 (92.2%) (Table 3). The least likely criteria were history of restraint (7.3%), ambulation at the scene (17.5%), and absence of injuries above the clavicle (26.1%).

We elicited the rationale for such practice from this group of physicians (Table 4). Most respondents (81%) stated that they trusted their abilities to obtain a history and perform an appropriate physical examination in this case scenario. There was no difference in rationale for removal of CSI between those with pediatric residency training and those with emergency medicine training.

Nearly half (45.6%) believed that there was a low risk of cervical spine injury in this case scenario. The least common reason for discontinuing CSI before obtaining radiography was concern about patient exposure to radiation (13.8%).

A total of 227 respondents decided not to discontinue CSI without radiography in this case scenario (Table 5). The reasons for this choice included discomfort with such a decision for the nonverbal pediatric patient (78.8%) and the belief that radiography was medically indicated in this case scenario (68.6%).

The final question asked whether the respondents felt that out-of-hospital criteria should be developed to limit CSI. Almost half stated that criteria should not be developed, irrespective of whether they would (47.8%) or would not (51.8%) remove CSI themselves.

Although pediatric trauma patients commonly come to the emergency department with CSI, no published data describe the physician approach to the situation. In this

Table 1. Characteristics of Respondents*  
Characteristic | No. (%) of Respondents (N = 639)  
---|---
Age, y |  
≤44 | 454 (71.2)  
≥45 | 184 (28.8)  
Length of practice, y |  
<10 | 352 (55.7)  
≥10 | 280 (44.3)  
Setting |  
Urban | 421 (68.0)  
Rural | 31 (5.0)  
Suburban | 158 (25.5)  
Other | 9 (1.5)  
Residency |  
Pediatrics | 393 (62.6)  
Emergency medicine | 152 (24.2)  
Other | 80 (13.2)  
Fellowship |  
Pediatric emergency medicine | 230 (36.0)  
Other | 43 (6.7)  
None | 366 (57.3)  
No. of annual emergency department visits |  
≥30 000 | 441 (69.4)  
<30 000 | 194 (30.6)  
Percentage of patients <19 y |  
≥60 | 322 (50.5)  
<60 | 316 (49.5)  
Rotating residents |  
Yes | 506 (80.6)  
No | 122 (19.4)  
* Responses may not reflect total number of respondents because of lack of response to certain items.

Table 2. Factors Associated With Physician Decision to Remove the Cervical Collar Without Obtaining Radiographs in Sample Case Scenario*  
| Factors | Yes | No | OR (95% CI)†  
---|---|---|---
Age, y |  
≤44 | 301 (74.7) | 149 (65.6) | 1.5 (1.1-2.2)  
≥45 | 102 (25.3) | 78 (34.4) | 1.0 (Reference)  
Length of practice, y |  
<10 | 241 (60.4) | 107 (47.6) | 1.7 (1.2-2.3)  
≥10 | 158 (39.6) | 118 (52.4) | 1.0 (Reference)  
Setting |  
Urban | 281 (72.1) | 134 (60.6) | 1.7 (1.2-2.4)  
Other | 109 (27.9) | 87 (39.4) | 1.0 (Reference)  
Residency |  
Pediatrics | 275 (69.4) | 112 (50.0) | 2.1 (1.4-3.2)  
Emergency medicine | 82 (20.7) | 70 (31.3) | 1.0 (Reference)  
Other | 39 (9.8) | 42 (18.8) | 0.8 (0.5-1.4)  
Fellowship |  
Pediatric emergency medicine | 167 (41.3) | 60 (26.4) | 2.0 (1.4-2.8)  
Other | 28 (6.9) | 15 (6.6) | 1.4 (0.7-2.8)  
None | 209 (51.7) | 152 (67.0) | 1.0 (Reference)  
No. of annual emergency department visits |  
≥30 000 | 281 (69.9) | 153 (68.0) | 1.0 (Reference)  
<30 000 | 121 (30.1) | 72 (32.0) | 0.9 (0.6-1.3)  
Percentage of patients <19 y |  
≥60 | 227 (56.3) | 89 (39.2) | 2.0 (1.4-2.8)  
<60 | 176 (43.7) | 138 (60.8) | 1.0 (Reference)  
Rotating residents |  
Yes | 339 (85.4) | 162 (72.6) | 2.2 (1.5-3.3)  
No | 58 (14.6) | 61 (27.4) | 1.0 (Reference)  
* Responses may not reflect total number of respondents because of lack of response to certain items.  
† OR indicates odds ratio; CI, confidence interval.


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hypothesis case with a nonverbal child, and despite the absence of clinical guidelines for removal of CSI in pediatrics, PEM practitioners (63.2%) frequently discontinued CSI without obtaining radiographs. Because the approach to the nonverbal child is more cautious in comparison with all pediatric trauma patients, the overall prevalence of CSI removal without radiographs is probably higher than 63.2%.

After correction for other confounders, only 2 factors were associated with removal of CSI without radiographs. Physicians with pediatrics residency training were more likely to remove CSI without obtaining radiographs than those trained in other specialties. This is possibly due to greater comfort and confidence in their abilities to assess the young anxious child. Interestingly, PEM training was not associated with an increased likelihood of CSI removal, suggesting that further training did not add to the confidence or ability to assess the young child.

Physicians practicing for less than 10 years were more likely to remove CSI without obtaining radiographs. Reasons may include a more recent exposure to pediatrics and an increasing emphasis on pediatrics in emergency medicine and family practice residencies. Other reasons possibly include a change in approach over time; those with more recent training may have been exposed to newer research about the hazards of CSI practices\(^4,7\) or evidence showing that immobilization has no effect on neurologic outcome.\(^8\)

Clinical guidelines for removal of CSI have been developed for adults,\(^9\) and the set of criteria used to clinically determine the absence of cervical spine injury has recently been validated in a large, mostly adult multicenter study.\(^10\) This study identified 5 criteria that must be met to clinically rule out cervical spine injury: no posterior midline cervical spine tenderness, no evidence of intoxication, normal level of alertness, no focal neurological deficit, and no painful or distracting injuries. This set of clinical criteria was found to be 99% sensitive for identifying blunt-trauma patients with cervical spine injury. All 5 items were selected as mandatory for clearing the cervical spine by most respondents in our study (Table 2). Interestingly, most respondents also indicated that additional criteria such as absence of neck pain and no history of high-risk preconditions should be met. The present study was conducted prior to publication of the validated set of criteria.

There is a growing interest in developing and validating clinical decision standards for ruling out cervical spine injuries in pediatric patients.\(^11\) Because of the rarity of pediatric cervical spine injuries, a prohibitively large number of pediatric trauma patients would need to be studied to construct an outcome-based decision rule with sufficiently high sensitivity. Additionally, because clinical criteria such as examination findings are by nature subjective, agreement between practitioners will be essential to create a reliable instrument. Although good-to-excellent interobserver reliability has been demonstrated in the decision rule tested by Hoffman et al,\(^10\) measurement of agreement in a predominately pediatric population will be necessary to prove reliability for the injured child.

Acceptability of clinical guidelines is influenced by many factors, including perceived confidence with the decision.\(^12,13\) Most respondents (81%) who would not move the cervical collar without obtaining radiographs appeared confident with their abilities to obtain a history and perform an appropriate physical examination. To become widely adopted, clinical guidelines must be based on sound outcome data and be perceived as use-
ful by physicians. The perception of usefulness is based on such factors as how acceptable the guidelines are to those currently in practice and to what degree they improve confidence in clinical decision making. Understanding current practice will be helpful in gauging acceptability of future guidelines. This is supported by studies on other clinically validated guidelines, including a prediction rule for the triage of emergency department patients with chest pain that has not been widely accepted because of lack of perceived usefulness.13,14

Those who would not remove CSI in our scenario stated their discomfort with the nonverbal pediatric patient as the most common reason, although past unfavorable experiences with removal of the cervical collar were not addressed. Despite the fact that most respondents would discontinue CSI without obtaining radiographs, there is no outcome data to support this widespread practice. Future studies should address the safety of this practice.

Approximately half of the respondents believed that criteria should not be developed to limit CSI in the out-of-hospital setting. It is apparent that development of out-of-hospital guidelines, although possibly advantageous in limiting discomfort and unnecessary delays, is not related to current physician practice regarding CSI removal. This is especially interesting for physicians who would remove CSI without obtaining radiographs. They may believe that a short period of discomfort prior to arrival in the emergency department, where an assessment can be performed more easily, is preferable to attempting to avoid all unnecessary immobilizations.

The limitations of the study should be addressed. It was not possible to obtain information about the nonrespondents, which precluded a comparison with respondents. This is of particular interest because there was a significant difference in the nonresponse rate of those from the ACEP mailing list vs those from the emergency medicine section of the AAP. This is important because those identified from the AAP list are more likely to have been trained in pediatrics than those on the ACEP list. Because pediatrics training was related to the tendency to remove the collar in the case scenario, the group result may not accurately reflect the practice of all emergency medicine physicians. Certainly this selection bias may limit ability to generalize the results. Generalizing the behavior of cervical collar removal to other clinical situations is limited, as only 1 scenario was presented. The survey described physicians’ statements of their practices; because actual application may differ, extrapolation to a real-life situation must be done with caution. We attempted to minimize the potential for such a difference by keeping the scenario short and simple and by ensuring anonymity.

Emergency medicine physicians commonly discontinue CSI without radiography. The criteria these physicians use for removal of CSI may lay the foundation for outcome-based prediction rules. These rules must address both current practice patterns and perceived comfort with this practice.

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Corresponding author and reprints: Hisham A. Omran, MD, Division of Emergency Medicine, St Christopher’s Hospital for Children, Erie Avenue at Front Street, Philadelphia, PA 19134 (e-mail: Hisham.omran@hotmail.com).

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