NURSE EVALUATION
OF
CERVICAL SPINE INJURIES

A sample manuscript for use in peer reviewer training
ABSTRACT

Study Objective: Emergency physicians (EPs) routinely use clinical criteria to guide their evaluation of trauma patients with potential cervical spine injuries. This study sought to determine whether nurses can accurately apply these same criteria to trauma patients in the ED setting.

Setting: Inner City emergency department of a level 1 trauma center.

Participants: Experienced emergency nurses and resident and attending EPs in an approved emergency medicine training program.

Design: Nurses completed a data form based on their initial assessment of all adult trauma patients for whom the mechanism of injury indicated immobilization. Data collected included the presence or absence of neck pain/tenderness; altered mental status; history of loss of consciousness; drug/alcohol use; neurologic deficit; and other painful/distracting injury. EPs caring for the patient then completed an identical data form based on his/her assessment. Immobilization was considered to be indicated if any one of the six criteria were present. Agreement between EP and nurse assessments was analyzed using the Kappa statistic.

Results: Four hundred one patients were included in the study. EP and nurse assessments matched in 78.6% (n = 242 + 73 = 315) of the cases. In 13.6% (n = 55) of the cases, the nurse assessment indicated immobilization, but the EP assessment did not. In 7.7% (n = 31) of the patients, EP assessment indicated immobilization, but the nurse assessment did not. The Kappa for the individual components of the assessments ranged from 0.35 to 0.81, with the Kappa for the decision to immobilize being 0.48. Assessments for neurologic deficit and other distracting injuries had the lowest Kappa values, with the nurses’ assessments being more conservative than the EPs.

Conclusion: Nurse and EP assessments to rule out cervical spine injury have moderate to substantial
agreement. Our study shows that nurses are a cost-effective substitute for busy physicians in evaluating C spine injuries in traumatized patients.
INTRODUCTION

In the hospital setting, emergency nurses have traditionally been taught to assume the presence of a cervical spine injury in any patient with an appropriate mechanism of injury.\textsuperscript{1,2} Recently, the practice of immobilizing all patients regardless of clinical findings has been questioned.\textsuperscript{3-5} Studies have shown that immobilization can cause iatrogenic pain\textsuperscript{6-8} and respiratory compromise,\textsuperscript{9,10} and can be a potential source of pressure sores.\textsuperscript{6,11}

Emergency physicians (EP) routinely “clear” immobilized patients based on their clinical examination. There are published criteria to aid the EP in their evaluation of the trauma patient’s cervical spine.\textsuperscript{12-17} The criteria include the absence of pain or tenderness of the cervical spine; lack of any neurologic deficits; a normal level of consciousness; no evidence of drug use (particularly alcohol, analgesics, sedatives, or stimulants); and no other significant trauma which may act as a distracting injury. Some studies have suggested that emergency nursing personnel routinely evaluate trauma patients for the above criteria.\textsuperscript{3,4} However, a review of the literature reveals no published clinical studies examining the accuracy of these evaluations. The purpose of this study was to determine how well nursing assessments of trauma patients, using the above criteria, compare to those of EPs.
MATERIALS AND METHODS

This prospective study was approved by the university and hospital combined Institutional Review Board. The setting was the ED of a Level I trauma center located in the inner city with an annual ED census of 75,000 visits. The participants were experienced emergency nurses and resident and attending EPs in an approved emergency medicine residency training program. Both the EPs and nurses were aware of the purpose of the study and participation was voluntary.

Prior to the data collection phase of the study the authors met with the EPs and nurses to review the study and the data collection form. The nurses were instructed to complete the form based on their initial assessment of the patient, and EPs were instructed to complete the form based on their assessment of the patient, independent of the nurse evaluation. The components of the assessment are listed in the table. No specific training was instituted on how to conduct the assessments, however, the participants were instructed that equivocal findings (e.g., if the patient was unsure as to whether he had experienced a loss of consciousness) should be recorded as positive findings. Each element of the assessment was recorded as either present or absent.

Data were collected for a 12 month period beginning January 1, 1996. Upon arrival the nurses assessed all adult patients for the six criteria listed above. The nurses completed the bottom half of the data collection form based on their initial assessment of the patient. The nurse assessment was then detached from the data form and deposited in a collection box located at the ED. The nurses then placed the remainder of the data form with the patient. The EP caring for the patient completed the top portion of the data form based on his/her assessment and placed the data form in the collection box. Both portions of the data form were consecutively numbered to allow for matching of the two assessments.

The agreement between EP and nurse assessments was analyzed using the Kappa statistic. We compared the findings for each component of the assessment, and whether immobilization was indicated by the examination findings. Immobilization was considered to be indicated if any one of the six criteria were present.
RESULTS

There were 401 evaluable pairs of patient assessments during the study period. Both the EP and nurse assessments indicated immobilization in 242 (60.4%) of the patients. For 73 (18.2%) of the patients, both the EP and nurse assessments did not indicated immobilization. EP and nurse assessments differed for 83 (20.6%) of the patients; in 31 (7.7%) of the EP assessment indicated immobilization when the nurse assessment did not, and in 51 (12.7%) the nurse assessment indicated immobilization when the EP assessment did not. The agreement between the EP and nurse assessments was moderate, with a Kappa of 0.48.

The Kappa values for the individual components of the assessment are listed in the table. With the exception of assessment for neurological deficit, the Kappa values were all in the moderate to substantial agreement range, because there were 21 patients for whom the EP and nurse assessments of neurological deficit differed.
DISCUSSION

The clinical evaluation of the cervical spine in the ED has been widely studied. In 1988, Ringenberg et al reported on 312 spinal injury patients. No alert patient had a cervical spine injury in the absence of signs or symptoms consistent with neck injury or another painful, potentially distracting injury. Several other authors have since reported similar findings. In 1992, Hoffman, et al, reported on one-thousand patients for whom cervical spine radiographs were ordered. There were 27 patients with fractures, and all had at least one of the following characteristics: neck tenderness, intoxication, altered mental status, or distracting painful injury.

Few studies have examined the application of the criteria for evaluating cervical spine injury. Pennardt, et al reported that EMS providers include the criteria for cervical spine clearance in their documented patient assessment, and, recently, Domeier, et al reported that prehospital personnel documented a positive finding for at least one of the criteria for every patient that had a cervical injury. To our knowledge, ours is the first study to prospectively evaluate the ability of nurses to apply the criteria for cervical spine clearance to actual patients.

The level of agreement in this study was lower than would be expected based on previous studies. In their study of EMS assessments performed on simulated patients, Sahni et al found Kappa values ranging from 0.62 to 0.77, and the Kappa statistic for the overall immobilization decision was 0.90. In our study, assessments for neurological deficit and other distracting injuries had Kappa values of 0.35 and 0.42, respectively. However, in our study, the nurse assessments and immobilization decisions were more conservative than the physician assessments. For example, for assessment of neurological deficit there were 21 patients for whom the nurse and EP assessments did not match; for 15 (70%) of these patients the nursing assessment indicated immobilization, and the EP assessment did not. For assessment of other distracting injury there were 108 patients for whom the nurse and EP assessments did not match; for 77 (71%) of these patients the nurse assessment indicated immobilization, and the EP assessment did not.

We used the EP assessment as the gold standard for this study. In our ED, patients are seen by EPs with varying degrees of experience. To determine whether the experience level of the EP
affected the results of our study, we conducted a post hoc analysis of the data excluding those patients evaluated by first and second year residents. When comparing the assessments of third year residents and attending physicians to the nurse assessments, the Kappa for the decision to immobilize was 0.61, indicating substantial agreement.

There are some limitations to this study. First, the nurse and EP examinations were performed at different times. Previous studies have demonstrated that immobilization is a source of pain and discomfort for trauma patients,\textsuperscript{6-8} and this may account for some of the discrepancy between the assessments. It is also not uncommon for patient complaints to change between assessments. Although not widely studied, this phenomenon of “history shift” is well known to every nurse, medical student and physician. A final problem of the independent assessments is the subjectivity of some of the criteria. Is tingling of the fingers a neurological deficit? Is a superficial laceration on the lower leg a distracting injury? We had instructed participants to consider any finding that was not clearly negative to be positive, but individuals may have differing opinions about what constitutes “clearly negative.” Indeed, omitting the subjective assessment of other distracting injury from the criteria for whether or not to immobilize improved the overall agreement to a Kappa of 0.63, which represents substantial agreement.

Another limitation of the study is that we did not follow the patients to determine the presence or absence of cervical spine injury. This study was undertaken to determine whether or not nursing personnel can accurately apply the criteria for cervical spine clearance. It was not our intention to test the criteria themselves. The criteria have been previously studied and are well established.\textsuperscript{12-17}

Finally, this study is limited to advanced level nurses in our institution. We cannot comment on the ability of other nurses to apply these criteria.

This study demonstrates that there is moderate to substantial agreement between nurses and EP assessments for cervical spine injury. Based on our findings we conclude that advanced level nursing personnel can accurately apply the clinical criteria for assessment of cervical spine injury. Such an expansion of nursing evaluation is a cost-effective alternative to the use of busy physicians
and should be implemented to speed patient evaluation as well.
REFERENCES


TABLE

Assessment criteria and Kappa statistics for the EP and EMS assessments.

<table>
<thead>
<tr>
<th>Assessment Criteria</th>
<th>Kappa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does the patient have an altered mental status?</td>
<td>0.66</td>
</tr>
<tr>
<td>Was there a history of loss of consciousness?</td>
<td>0.72</td>
</tr>
<tr>
<td>Is there evidence of alcohol or drug use?</td>
<td>0.81</td>
</tr>
<tr>
<td>Does the patient complain of neck pain/tenderness?</td>
<td>0.60</td>
</tr>
<tr>
<td>Does the patient have any neurological deficit?</td>
<td>0.35</td>
</tr>
<tr>
<td>Does the patient have any other severe/painful injury?</td>
<td>0.42</td>
</tr>
<tr>
<td>Immobilization indicated (yes to any of the above)</td>
<td>0.48</td>
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</table>