SHORT REPORT

Removal of C-spine protection by A&E triage nurses: a prospective trial of a clinical decision making instrument

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Objective: To investigate if triage nurses could safely apply a set of clinical criteria, removing hard collars and spinal boards at initial triage assessment.

Methods: The Nexus clinical decision rules were applied by trained triage nurses to patients who attended the department with cervical collars and /or on spinal boards. Patients were excluded if they were felt to be in need of immediate medical assessment. Data were collected on the time to nursing assessment, time to medical assessment and time spent restrained. Patients were followed up until discharge and their radiological diagnosis confirmed. Hospital records were checked to ensure that no patients re-presented with injuries that had been missed at initial assessment.

Results: In total, 112 patients were included in the study. Clinical criteria were met in 59 patients and their collar removed at triage assessment. For low risk patients, this reflects a mean reduction in time spent restrained of 23.3 minutes ($p < 0.005$; 95% confidence interval 20.18 to 26.54). No patient who had a collar removed was found to have a significant injury.

Conclusions: Simple criteria can be applied by accident and emergency triage nurses to allow safe removal of cervical collars and spinal boards. The reduced time patients spent immobilised represents an important improvement in patient care.

collars and spinal boards. We prospectively applied the NEXUS criteria, whenever a participating nurse was on duty, to patients who attended the department with cervical collars and/or on spinal boards. After assessment by one of the trained nurses, spinal boards were removed by log roll. If all the clinical criteria (table 1) were met, the collar was also removed. Patients were excluded if they were admitted to the resuscitation room or were felt to be in need of immediate medical assessment. A series of cervical spine radiographs (anterior posterior, lateral, and open mouth peg views) was carried out on all patients felt to meet the NEXUS criteria either when assessed by the nursing staff or when later assessed by medical staff. Radiographs of other body regions were carried out as clinically indicated.

Data were collected on the time to triage assessment, time to involvement of medical staff, whether collars or boards were removed, mechanism of injury, whether radiographs of the spine has been taken, and any spinal injury. A significant cervical spine injury was defined as any radiological diagnosis of fracture, any dislocation, or any evidence of ligamentous instability. Patients were followed up until discharge and their radiological diagnosis confirmed. Hospital records were checked to ensure that no patients re-presented with injuries that had been missed at initial assessment. We used Microsoft Excel software to compile data, and SPSS software (SPSS, Chicago, IL, USA) to perform statistical analysis (Student's *t* test and Wilcoxon signed rank test).

RESULTS

During the study period, approximately 700 patients were received by the A&E department with cervical collar and spinal board in situ. Of these, 112 patients (49 female and 63 male patients; age range 7 to 86 years) were included in the study. Clinical criteria were met in 59 patients and their collar removed at triage assessment. After initial assessment, radiographs were performed on 53 patients. A further seven patients who had their collars removed were felt to require cervical spine radiographs when assessed by medical staff. None of these patients was subsequently found to have suffered a significant cervical spine injury. Cervical spine radiographs were therefore carried out for 60 patients, and two patients with significant cervical spine injuries were identified. Both of these were correctly assessed as high risk at initial triage assessment (table 2). Follow up of all the patients' hospital records revealed that none of the study patients re-presented for further radiographic investigation following the study period.

The mean time to triage nurse assessment was 12.2 minutes compared with a mean time of 35.5 minutes for medical assessment. For low risk patients, this reflects a mean

The widespread acceptance of Advanced Trauma Life Support¹ principles, and the development and implementation of the Pre-hospital Spinal Immobilisation Guidelines² has resulted in many more patients being transferred to accident and emergency (A&E) departments restrained with hard cervical collars and spinal boards. Guidelines recommend that boards only be used as an extrication device or for immobilisation when transit time is short.² Immobilisation may often be prolonged following arrival in hospital,^{3,4} and this can result in significant morbidity.^{5,6}

A large multicentre trial has defined a robust clinical decision instrument that can be used to rule out cervical spine injury and safely reduce the number of cervical spine radiographs in low risk patients following blunt trauma (the National Emergency X Radiography Utilization Study (NEXUS) criteria;⁷ table 1). This decision tool has also been validated in children⁸ and the elderly.⁹

We aimed to investigate if triage nurses could safely apply this set of clinical criteria, removing hard collars and spinal boards at initial triage assessment. We assessed the impact in terms of reduction of time restrained.

METHOD

Senior nurses were trained using factual and scenario based teaching on applying the clinical criteria for safe removal of

Abbreviations: A&E, accident and emergency; NEXUS, National Emergency X Radiography Utilization Study

Table 1 Clinical criteria for removal of cervical spine collars

No midline cervical spine tenderness
No focal neurological deficit
Normal alertness
Not intoxicated
No painful distracting injury

reduction in time spent restrained of 23.3 minutes ($p < 0.005$; 95% confidence interval 20.18 to 26.54)

DISCUSSION

In our study, we found that triage nurses trained to remove spinal boards and collars, using a set of clinical criteria, significantly reduced the time patients spent restrained. No patient who had a collar removed was found to have a cervical fracture. Both patients with cervical fractures had midline tenderness and so did not fit criteria for removal of collar. Our results concur with those of Sexton,¹⁰ who also showed a reduction of time when A&E nurses removed collars before patients were seen by medical staff. Sexton also reported that no cervical injuries had been missed and no spinal injuries caused by removal of boards.

A recent review by Morris⁵ regarding use of spinal boards and unconscious patients noted that prolonged use of boards and collars is associated with notable morbidity and mortality, usually due to pressure necrosis, and that the risks of prolonged immobilisation are poorly appreciated. A survey by Cooke *et al*³ suggested that the A&E department was using spinal boards for prolonged immobilisation. However, a more recent survey by Porter *et al*¹¹ revealed that most departments (76.3%) removed the boards during some part of the secondary survey. They suggested it should be standardised to become part of the primary survey. Our study brought forward the removal of immobilisation to the triage assessment stage in low risk patients. Some authors suggest that removal of boards must be achieved within 1 hour of arrival.¹⁰ In many areas of the country, however, the patient may already have been on a board or in a collar for over an hour prior to arriving at hospital. Hence, removal at the earliest safe juncture should be encouraged as a measure of good patient care.

We chose the NEXUS criteria for its simplicity and ease of use, particularly as part of a rapid triage assessment. A recent study has demonstrated that the Canadian C-spine rule may have greater sensitivity and specificity in clinical practice.¹² The other instrument which may be of value in this setting is the guidance included in the National Institute for Clinical Excellence head injury recommendations.¹³

Lack of randomisation and small numbers limited our study. However, the decision instrument used has been extensively validated for safety in a similar clinical setting. It is also possible that initial nursing intervention delayed medical assessment given that a doctor was not called to remove the restraints.

Simple criteria can be applied by A&E triage nurses to allow safe removal of cervical collars and spinal boards. The reduced time patients spent immobilised represents an important improvement in patient care. We believe that the appropriate removal of spinal immobilisation in low risk patients should be part of an initial triage assessment.

Table 2 Patient characteristics and reduction in time spent immobilised

	No. of study patients (n = 112)
Mean age (years)	34 (range 7 to 86)
Sex	63 male; 49 female
Mechanism of injury	
RTA	59
Pedestrian RTA	3
Fall > 2 metres	11
Fall < 2 metres	16
Assault	3
Sport	5
Other	15
Immobilisation	
Collar removed	59 (47 collar and board)
Board removed	86 (39 board only)
Neither removed	14
Spinal injury	
Cervical spine	2 (C7 lamina process, flexion fracture of C4)
Nursing triage assessment*	12.2 (10)
Medical assessment*	35.5 (34.5)
Reduction in time immobilised*	23.3 (20) ($p < 0.005$; 95% CI 20.18–26.54)

*Mean time in minutes (median). RTA, road traffic accident.

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