The Journal of Emergency Medicine, Vol. 28, No. 2, pp. 127–131, 2005

0736-4679/05 $–see front matter

ELSEVIER

doi:10.1016/j.jemermed.2004.08.016

Original Contributions

IMPLEMENTATION OF THE CANADIAN C-SPINE RULE REDUCES CERVICAL SPINE X-RAY RATE FOR ALERT PATIENTS WITH POTENTIAL NECK INJURY

Debra Kerr, BN, MBL,* Luke Bradshaw,† and Anne-Maree Kelly, MD, MClinEd, FACEM*

*Joseph Epstein Centre for Emergency Medicine Research, Western Health and The University of Melbourne, Melbourne, Australia and †Advanced Medical Science Program, The University of Melbourne, Melbourne, Australia

Reprint Address: Dr. Anne-Maree Kelly, Department of Emergency Medicine, Western Hospital, Private Bag, Footscray, VIC 3011, Australia

□ **Abstract—The objectives of this before-and-after study of alert, stable adult patients presenting to the Emergency Department of Western Hospital with potential neck injuries who were immobilized in hard cervical collars were to determine the impact of implementation of the Canadian C-spine rule on x-ray ordering rates and whether implementation of the rule reduced time in hard collars for patients with potential neck injury. Data collected included demographics, mechanism of injury, x-ray rate, and time in hard collar. Data analysis was by chi-square test for proportions and Mann-Whitney U test for continuous variables. There were 211 patients studied. The x-ray ordering rate decreased from 67% to 50% (25% relative reduction, $p = 0.0187$). Time in hard collar was also reduced from a median of 128 min to a median of 103 min (effect size 25.5 min), but this did not reach statistical significance. Implementation of the Canadian C-spine rule reduced x-ray ordering by 25%.** © 2005 Elsevier Inc.

□ **Keywords—x-ray; cervical spine; trauma; decision rules**

INTRODUCTION

The evaluation of the cervical spine (c-spine) with x-rays is a controversial area of trauma management (1,2). C-spine assessment continues to be driven by the fear of the consequences associated with "missed" significant injury (1–4). This has led to high c-spine x-ray ordering rates, despite the low incidence of clinically significant c-spine injuries (2,5,6). However, for patients this means unnecessary exposure to ionizing radiation, monetary expense, and lengthier immobilization in hard collars (7).

Recent efforts to address this have focused on the development and validation of clinical decision rules to reduce the need for x-rays in the assessment of the c-spine. Two such rules have been developed, the NEXUS guidelines and the Canadian C-spine Rule (CCR) (1,8–11). These studies report an expected reduction in c-spine x-ray ordering rates of 12.6% and 15.5%, respectively, but this has not been evaluated in a site not involved in the deriving studies (9,10).

This study aims to evaluate the impact of implementation of the CCR in an Emergency Department (ED) setting with respect to c-spine x-ray ordering rates and time spent by patients in hard collars.

METHODS

This before-and-after study was conducted in the ED of a community, teaching hospital in Melbourne, Australia, with an annual census of approximately 34,000 adult patients. All patients are treated in the pre-hospital setting by a single ambulance service (Metropolitan Ambulance Service, Victoria) and criteria for application of hard collars to patients having sustained trauma is governed by a clinical practice guideline. The ED is staffed

RECEIVED: 10 October 2003; FINAL SUBMISSION RECEIVED: 22 July 2004;
ACCEPTED: 11 August 2004

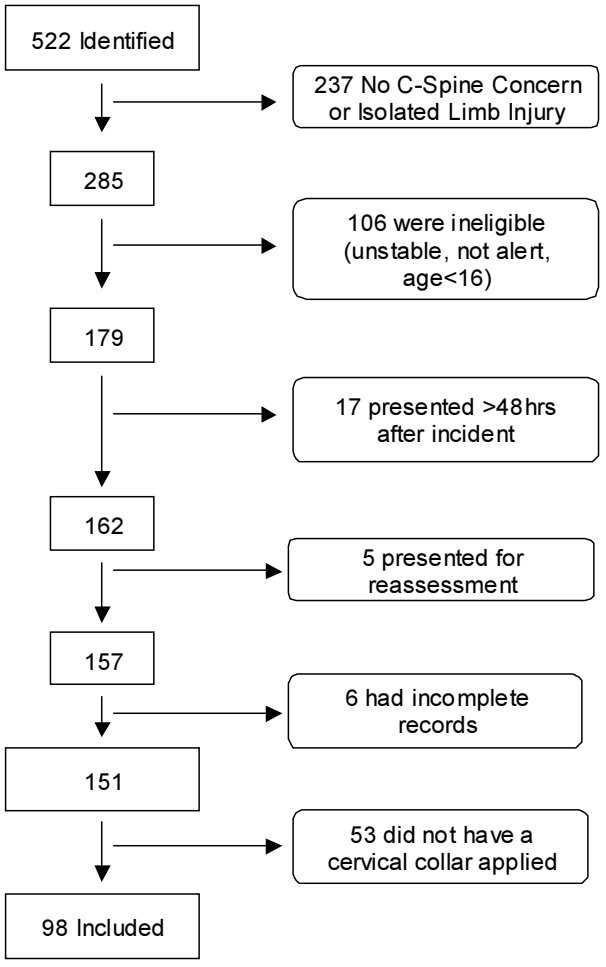

Figure 1. Derivation of before sample.

by a mixture of PGY1–3, training registrars in Emergency Medicine, and specialist emergency physicians. The study was approved by the institutional research and ethics committee.

The before component of the study was conducted by retrospective, explicit medical record and ambulance case note review for eligible patients who presented in the period 1 March to 31 May, 2002. Eligible patients were identified from the ED computer information system, using indicators of injury cause and ED discharge diagnosis suggesting head and neck injury and indicators of potential trauma. These were intentionally broad to minimize the risk of missed cases. Patients were excluded if there was no evidence of trauma in their record, there was an isolated limb injury, where the record made it clear that a c-spine injury was not of clinical concern, or the patient did not meet the criteria for application of the CCR (1). Patients were also excluded if they had minor trauma and a hard collar was not applied, on the assumption that this indicated that a significant c-spine injury was not of concern. Data collected included demographic information, date and time of presentation to ED, mode of transport to ED, injury cause, CCR eligibility criteria, whether or not a hard collar was applied and by whom as well as total duration of application in the ED, whether an x-ray was ordered and the result. A significant injury was defined as a fracture, dislocation, or ligamentous instability of the cervical spine identified by x-ray or computed tomography (CT) scan. Duration of neck immobilization by hard collar was calculated as the difference between the recorded time of application and time of removal of hard collar, both routinely documented by paramedics in the pre-hospital setting and nursing staff in the ED. Ten percent of the records were independently reviewed by a second researcher to assess inter-observer reliability of data collection.

Over a 2-month period, staff were educated in groups and individually about the CCR and its application. In addition, staff were provided with a reminder card containing the CCR and exclusion criteria, which attached to their identification badge. The CCR was formally adopted as ED policy for the assessment of potential neck injuries on 1 November, 2002.

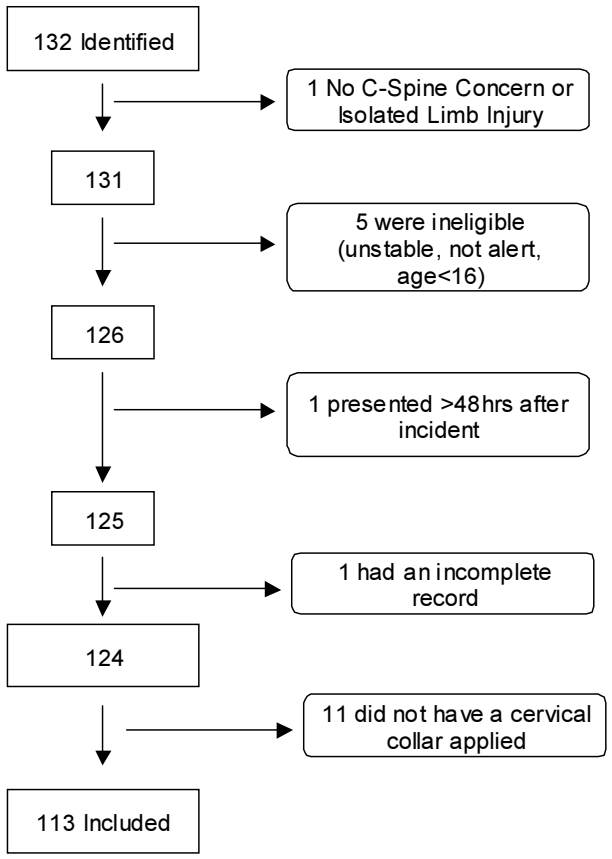

Figure 2. Derivation of after sample.