African Journal of Emergency Medicine 13 (2023) 241–244

Contents lists available at ScienceDirect

African Journal of Emergency Medicine

journal homepage: www.elsevier.com/locate/afjem

ORIGINAL ARTICLE

Knowledge, attitude, and practices regarding cervical collars in adult trauma patients amongst practitioners at three hospitals in KwaZulu-Natal, South Africa

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ARTICLE INFO

Keywords:
Trauma
Hard collars
Cervical spine
Spinal immobilisation
Head blocks

ABSTRACT

Background: The use of cervical collars in adult patients with possible injuries to the cervical spine has been an accepted standard of care for many years, despite the absence of evidence for the efficacy of these devices in preventing unwanted movement and harm. Changes to the terminology and recommendations of major trauma guidelines have been made but are limited by low quality evidence. In this context, little is known about what practitioners know, believe, and do, when managing the cervical spine of trauma patients.

Methods: In this quantitative, observational, descriptive, cross-sectional survey a specifically designed questionnaire was used to collect data on the knowledge, attitude, and practices of practitioners managing adult trauma patients regarding cervical collars at three hospitals in KwaZulu-Natal, South Africa.

Results: A total of 128 completed questionnaires were collected, captured, and analysed. Participants with the additional qualification of ATLS and DipPEC had a mean knowledge score of 8.1 (SD=1.70), compared to those with no additional qualification of 4.5 (SD=1.9) ($p<0.001$). Participants in the Emergency Department (ED) attained a mean knowledge score of 7.1 (SD=2.2) followed by Surgery (Mean=6, SD=2.0), Orthopaedics (Mean=5.5, SD=1.7) and ICU/Anaesthetics (Mean=4.4, SD=1.8), $p<0.001$. Head blocks only were most frequently used by 97.4 % of ED, 55.6 % of Surgery, 3.8 % Orthopaedic and 22.2 % ICU/Anaesthetics participants ($p<0.001$).

Conclusion: The knowledge of management principles of cervical spine injuries was influenced by the department in which practitioners worked, the frequency that they managed patients with suspected injuries and additional courses. Head blocks were the most frequently used spinal protection device in all three hospitals. Most participants would be open to a change in practice if new guidelines were recommended. Further research is needed to determine the optimal management of patients with suspected cervical spine injuries and the role of motion restriction devices in limiting movement of the injured spine.

Introduction

According to the National Spinal Cord Injury Statistical center, the annual incidence of spinal cord injuries is estimated to be 54 cases per one million people in the United States [1]. In a study conducted at King Dinizulu Hospital Spinal Unit, KwaZulu-Natal (2009–2015), the average annual incidence rate of spinal cord injuries was 12.3 per 100 000 population [2]. Spinal Cord Injuries may have a catastrophic effect on an individual's life. The potential life-long disability affects overall quality of life and poses an economic burden on family and society [2].

Application of a cervical collar is recommended for patients with cervical spine injuries to prevent unwanted movement and potential secondary injury to the spinal cord. Hauswald et al. proposed that the secondary injury is more likely caused by the presence of hypoxia, hypotension, oedema, and inflammation of the spinal cord ultimately progressing to ischaemia and worsening neurology. The amount of energy transmitted through the spine during the small movements that occur as part of patient care are minimal compared to the forces experienced during the initial traumatic incident [3].

Cervical collars do not appear to reduce the overall movement of a stable or unstable injured cervical spine. An article in the Journal of Emergency Medicine in 2002 looked at cervical orthoses and the extent

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https://doi.org/10.1016/j.afjem.2023.09.002
Received 10 April 2023; Received in revised form 3 August 2023; Accepted 3 September 2023

to which they immobilise the cervical spine in a cadaveric model and noted that neither of the two collars used reduced the segmental motion in a stable or unstable state, allowing up to 30° of movement. Cervical collars may also create unnatural pivot points in the cervical spine [4].

In adult patients with penetrating trauma, the current Eastern Association for the Surgery of Trauma guidelines do not recommend the use of spinal immobilisation techniques [5,6]. Spinal immobilisation does not reduce mortality or neurological deficit in this patient population [6]. This recommendation was primarily influenced by a retrospective analysis published in 2010, looking at patients with penetrating trauma who were immobilised with a cervical collar and/or spine backboard before transfer. Of the 45 284 patients studied, 4.3 % had spinal immobilisation, with an overall mortality of 8.1 %. The unadjusted mortality was double in the spine immobilised patients, 14.7 % versus 7.2 % (p 0.001) in the non-immobilised patients [7].

There are reported complications of cervical collars, such as local tissue breakdown and worsened anxiety. Prolonged application can lead to pressure ulcers with an incidence of 6.8 to 38 % [8]. Constriction of the jugular veins and impaired venous return in a head injured patient poses the risk of raising the intracranial pressure [9]. The development of complications impacts the overall care, rehabilitation process, health costs and ultimately quality of life.

The initial management of a trauma patient is internationally influenced by societies such as the American College of Surgeons Committee on Trauma (ACS-COT), who develop the Advanced Trauma Life Support (ATLS) course, the American College of Emergency Physicians (ACEP), and the National Association of EMS Physicians (NAEMSP). ATLS previously recommended spinal immobilisation in all trauma patients until a cervical spine injury has been excluded. The 10th edition revised the terminology to spinal motion restriction, recognising that the spine cannot be fully immobilised [10]. An updated uniform guidance from ACS-COT, ACEP and NAEMSP notes that spinal motion restriction should be applied to the whole spine and advises that a cervical collar of appropriate size forms a vital element [11].

A South African best practice recommendation published in the African Journal of Emergency Medicine in 2016 recommended against the use of hard cervical collars and trauma boards, suggesting that alternate more suitable devices for spinal motion restriction pre-hospital should be used [12]. When caring for the cervical spine it is advised to place the patient in a position of comfort, to immobilise manually, use head blocks or other soft devices. Where possible, the patient may be coached to minimise neck movement. The vacuum mattress, scoop stretcher and ambulance stretcher, possibly with the addition of head blocks are the recommended devices for transport of the motion restricted patient [12].

The aim of this study was to determine the knowledge, attitude, and practices regarding cervical collars in adult trauma patients amongst practitioners at three hospitals in KwaZulu-Natal, South Africa. The objectives included: To describe and analyse the knowledge, attitude, and practices amongst practitioners towards the use of cervical collars in adult trauma patients presenting to three hospitals; to compare the knowledge of spinal motion restriction amongst practitioners with different levels of experience; to compare the practices and attitudes towards cervical collars in adult trauma patients within different departments of one facility; and to compare the practices and attitudes in the three chosen facilities.

Methods

Design and setting

This was a quantitative, observational, descriptive, cross-sectional study. It took place in the KwaZulu-Natal province of South Africa at Ngwelezana Tertiary (NGWTH), General Justice Gizenga Mpanza Regional (GJGMRH) and Harry Gwala Regional Hospitals (HGRH). All three hospitals are training sites for the University of KwaZulu-Natal Emergency Medicine registrar program. Ngwelezana Tertiary Hospital is a 436 bedded hospital in the uMhlathuze Sub-district. It receives referrals from 18 hospitals in Region IV for Secondary and Tertiary Care. General Justice Gizenga Mpanza Regional Hospital is a 500-bedded Regional and District Hospital, in Kwa-Dukuza within the Ilembe Health District, serving an estimated population of 600 000. Harry Gwala Regional Hospital, former Edendale, is situated in the uMgungundlovu District which has a population of approximately 1.4 million. It is currently an 897 bedded hospital, making it the 4th largest hospital in South Africa in terms of bed availability.

Study population, sampling and data collection

The study utilised a pragmatic convenience sampling strategy that included practitioners working in the Emergency, Surgery, Orthopaedic, or Intensive Care Unit (ICU) and Anaesthetic Departments at NGWTH, GJGMRH and HGRH during the three-month period from June 2022 to August 2022. These are the teams involved with the management of adult trauma patients. A specifically designed questionnaire was distributed amongst three levels of practitioner, namely medical officer, registrar, and consultant. The three-page questionnaire collected data on the knowledge, attitude, and practices of practitioners managing adult trauma patients and was formulated using medical literature, published trauma guidelines and expert opinion. It consisted of seven demographic details and 24 closed ended multiple-choice questions: ten related to knowledge, eight to practice and six to attitude (Addendum 1).

Each of the four departments included in the study employs a minimum of two specialist consultants, three registrars and ten medical officers. A weekly meeting is held by each department. We pre-arranged with the department head to attend a meeting to discuss and distribute the questionnaires. Considering the variation in attendance at the given departmental meeting, we estimated a sample size of 120 participants.

All completed questionnaires meeting inclusion criteria were collected and the data from each questionnaire entered onto a Microsoft 365 Excel (Microsoft Corporation, 2018) data spreadsheet.

Analysis

The data was analysed using IBM SPSS Statistics version 28. Descriptive statistics were run to produce and present the profiles of the practitioners in the study as well as their responses to questions on knowledge, practices, and attitude. These were presented in the form of frequencies and percentages, for categorical variables, and in mean scores with standard deviation for numerical variables. The Pearson chi-square test was used to examine differences in knowledge, practices, and attitudes according to the different practitioner profiles as well as by institution. This was done for categorical variables, and in cases where the variables involved exceeded two categories, pairwise comparisons were performed and the Bonferroni correction used to adjust the p-value and lower the chance of making Type 1 errors. In relation to the knowledge score marked out of 10 points, one-way analysis of variance (ANOVA) was used and where the ANOVA indicated statistically significant differences, the Tukey HSD test was performed to identify where exactly those differences existed. Statistical significance testing was set at the 95 % confidence level and therefore a p-value of <0.05 % indicated statistical significance.

Ethics approval

Ethics approval was attained from the Biomedical Research Ethics Committee of the University of KwaZulu-Natal (BREC/00003831/2022), the National Department of Health of South Africa (NHRD Ref: KZ_202203_009) and the management and ethics committees of NGWTH, GJGMRH and HGRH.

Results

A total of 128 completed questionnaires were collected, captured, and analysed. All questionnaires collected were complete, and none excluded from analysis. Of these, 55 were from NGWTH, 29 from GJGMRH and 44 from HGRH.

Questionnaires were completed by 89 medical officers, 8 registrars and 31 consultants. Thirty-eight participants worked in the Emergency Department, 26 in Orthopaedics, 27 in Surgery and 37 in ICU/Anaesthetics (Table 1). Fifty-nine percent were 1–5 years post community service, 16 % 6–10 years and 26 % more than 10 years. A total of 72 participants had completed an ATLS course, 22 had their DipPEC (Diploma in Primary and Emergency Care), 55 had an 'other' qualification and 17 had no additional qualifications. Thirty participants had been at their current hospital for less than 1 year, 63 for 1–4 years and 35 for more than 4 years. Fifty-two percent managed less than 5 adult trauma patients requiring spinal motion restriction per week, 27 % managed 5–10 per week and 22 % managed more than 10 per week.

Knowledge scores were not statistically significant across rank groups. Consultants had a mean score of 6.1 (SD=2.3), registrars 6.8 (SD=1.8) and medical officers 5.6 (SD=2.2) ($p = 0.19$). Mean knowledge scores did vary by department, Emergency Department 7.1 (SD=2.2), Surgery 6.0 (SD=2), Orthopaedics 5.5 (SD=1.7) and ICU/Anaesthetics 4.4 (SD=1.8). The differences between these departments were statistically significant with $p<0.001$. Participants who saw <5 patients with suspected C-spine injuries per week had a lower knowledge score (Mean=4.8, SD=1.9) compared to those who saw 5–10 (Mean=6.5, SD=2) as well as >10 per week (Mean=7.1, SD=2.1) ($p<0.001$). The participants with the additional qualification of DipPEC and ATLS had a higher mean knowledge score of 8.1 (SD=1.70), while participants with no additional qualification had a mean knowledge score of 4.5 (SD=2.2), $p<0.001$. Overall, 65.8 % Emergency Department, 30.8 % Orthopaedics, 51.9 % Surgery, and 32.4 % ICU/Anaesthetics participants accurately answered the question pertaining to penetrating trauma ($p = 0.05$). The hospital and years at that current hospital did not show a statistically significant difference in the mean knowledge score.

All 8 (100 %) of the registrars would advocate for the use of clinical decision rules by pre-hospital health care providers in the prehospital setting, to clear an adult trauma patient's cervical spine, 60.7 % of medical officers agreed, however 61.3 % of consultants disagreed ($p = 0.01$).For the same statement, 76.3 % of participants in the ED, 48.1 % in Surgery, 53.8 % in Orthopaedics and 45.9 % in ICU/Anaesthetics agreed ($p<0.001$). A total of 4 participants (3 medical officers, 1 consultant) disagreed that if an adult trauma patient with a spinal injury were to move their cervical spine, there is a risk that they may worsen or cause a secondary neurological injury, 95 % agreed with this statement. ($p = 0.19$). When asked whether a cervical collar is better at motion restriction than headblocks or a soft collar; 32.6 % of medical officers, 62.5 % of registrars and 67.7 % of consultants disagreed ($p = 0.01$). Of those participants with ATLS and DipPEC, 92.9 % disagreed that a cervical collar is better at motion restriction than head blocks ($p = 0.01$). If a patient reported that the cervical collar was uncomfortable; 31.6 % of ED, 66.7 % of Surgery, 30.8 % of Orthopaedics and 48.6 % of ICU/Anaesthetics participants would leave the collar on and administer additional analgesia or sedation ($p = 0.01$).

Regarding the practice in the Emergency department at all three hospitals, 97.4 % of participants opt to use head blocks most frequently. The Surgical department also reported primarily using head blocks (55.6 %). In the Orthopaedic and ICU/Anaesthetic departments, 57.7 % and 41.7 % use cervical collars respectively. All results were statistically significant ($p<0.001$). Clinical decision rules were regularly used to clear the adult trauma patient's cervical spine by 35.5 % of consultants, 87.5 % of registrars and 31 % of medical officers ($p = 0.03$). Clinical decision rules were similarly used by 64.9 % of participants in the ED, 18.5 % in Surgery, 32 % Orthopaedics and 21.6 % ICU/Anaesthetics ($p<0.001$). Twenty-four-hour access to Computed Tomography imaging is always available at NGWTH according to 72.7 % of participants, at GJGMRH 69 %, and HGRH 27.3 % ($p<0.001$).

Table 1
Position by department.

Position by department					
		Position			Total
		Medical officer	Registrar	Consultant	
Department	Emergency Department	27	5	6	38
	Orthopaedics	17	1	8	26
	Surgery	18	1	8	27
	ICU/ Anaesthetics	27	1	9	37
Total		89	8	31	128

Discussion

The knowledge score varied amongst participants with additional qualifications and within departments. Practitioners who have the additional qualification of ATLS and DipPEC performed better than those with neither, achieving a mean knowledge score of 8.1 (SD=1.70) and 4.5 (SD=1.9) respectively ($p<0.001$). The value of continuing education is emphasised by this finding. There were statistically significant differences in the knowledge score by department. Knowledge scores were better in departments that most frequently manage patients with suspected spinal cord injuries, and amongst practitioners that reported seeing more of these patients per week. Participants in the emergency department attained a mean knowledge score of 7.1 (SD=2.2) compared to those in ICU/Anaesthetics (Mean=4.4, SD=1.8), $p<0.001$. Participants who saw <5 patients with suspected cervical spine injuries per week had a lower knowledge score (Mean=4.8, SD=1.9) compared to those who saw >10 per week (Mean=7.1, SD=2.1), $p<0.001$. Relating to cervical motion restriction in penetrating trauma, 65.8 % Emergency Department, 30.8 % Orthopaedics, 51.9 % Surgery, and 32.4 % ICU/Anaesthetics participants would not apply a collar, aligning with the EAST guideline's recommendation. ($p = 0.05$) [5,6]. The hospital and years at that hospital did not show much difference in the mean knowledge score and were not statistically significant.

Overall, 60 % of participants agreed to adopting a different practice if new guidelines recommend the use of soft collars in place of hard collars in the awake and alert adult trauma patient. This is an encouraging result, as a change in attitude and practice can prevent the complications that may arise from the current more rigid forms of cervical motion restriction. In a retrospective consecutive case series that took place in Queensland, Australia, the authors aimed to describe the neurological outcome of patients with traumatic cervical spine injuries [13]. There were 2036 patients included in the study, of which 1133 had a soft collar applied. The rest of the patients were managed in a rigid cervical collar. Two of the patients in the rigid collar were found to have a new neurological deficit, while one case in the soft collar had an incomplete initial neurological assessment. The study concluded that the use of soft collars in patients who are at risk of cervical spine injury does not appear to increase the development of a secondary injury and that such an injury may develop irrespective of spinal immobilisation [13]. Ninety-five percent of participants remained concerned that if an adult trauma patient with a spinal injury moves his cervical spine, they may worsen or cause a secondary neurological injury. Hauswald argued that secondary injury is more likely caused by the presence of hypoxia, hypotension, oedema, and inflammation of the spinal cord ultimately progressing to ischaemia and worsening neurology, and that minor, low-velocity movements that occur during patient care are unlikely to cause significant harm [3].

All 8 participating registrars would advocate for the use of clinical decision rules by pre-hospital health care providers in the prehospital setting, to clear an adult trauma patient's cervical spine, 60.7 % of medical officers agreed, however 61.3 % of consultants disagreed ($p = 0.01$). A recent single prospective cohort looking at the use of the Modified Canadian C-spine rule by paramedics in a pre-hospital setting, noted that it is possible for Emergency Medical Services personnel to safely identify, and transport selected patients without formal immobilisation [14]. The validated score failed to identify 1 of 11 patients with a clinically significant injury, with no adverse outcomes [14]. The study took place in the city of Ottawa, Ontario, Canada. Different levels of training between Canadian and South African pre-hospital care providers makes this study difficult to extrapolate to our setting. The rule was, however, uncomplicated and was taught in a 2-hour training session. Further research in other study settings like the South African context would be useful to guide us in the future application of this clinical decision rule.

In keeping with the local practice recommendations published in 2016 by Stanton et al., 97.4 % of practitioners working in the Emergency department use head blocks most frequently as a spinal motion restriction device [12]. The Surgical department, in which the trauma departments are included, also primarily chose head blocks (55.6 %). However, in the Orthopaedic and ICU/Anaesthetic departments, 57.7 % and 41.7 % chose hard collars respectively. The choice of cervical motion restriction device may be influenced by the availability of devices, results of advanced imaging guiding definitive management and the absence of a standardised spinal motion restriction guideline.

Application of clinical decision rules, the use of reusable headblocks and standardisation of care is essential in a resource poor setting such as South Africa, where access to advanced imaging is limited, with a high trauma burden applying more pressure to the fragile healthcare system.

Limitations

We undertook a non-probability, convenience study that focused on the knowledge, attitude, and practices of practitioners working in a regional or tertiary centre, restricted to four chosen departments of interest within the public health sector of KwaZulu-Natal. Pre-hospital health care providers, nurses, clinical associates, or medical interns were not included in this study, but their responses are important and could be included in future research. The study has a small sample size and took place in institutions that may have similar practice patterns. Further research will be required to determine whether these findings are consistent with other provinces and other practice environments. An original questionnaire was used, limiting comparisons with other studies.

Conclusion

The knowledge of practitioners regarding the management of patients with potential injuries to the cervical spine was consistently influenced by the departments in which they worked and whether they had done additional short courses or diplomas in emergency care. Head blocks were the most used motion restriction device in the emergency department at all three participating hospitals. Most participating practitioners reported being open to change in practice if new guidelines recommended to do so. Further research is needed to determine the optimal management of patients with suspected cervical spine injuries and the role of motion restriction devices.

Dissemination of results

The results of this study will be shared with the management team of Ngwelezana Tertiary, General Justice Gizenga Mpanza Regional and Harry Gwala Regional Hospitals as well as the departments involved in the study. This will be done via an informal presentation.

Author contribution

Authors contributed as follow to the conception or design of the work; the acquisition, analysis, or interpretation of data for the work; and drafting the work or revising it critically for important intellectual content: NK 70 %, DM 30 %. All authors approved the version to be published and agreed to be accountable for all aspects of the work.

Declaration of Competing Interest

The authors declare no conflict of interest.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.afjem.2023.09.002.

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