



African Federation for Emergency Medicine
African Journal of Emergency Medicine

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ORIGINAL RESEARCH ARTICLES

An online learning programme improves traumatic brain injury guideline adherence in a South African Helicopter Emergency Medical Service



Un programme d'apprentissage en ligne permet d'améliorer le respect des directives relatives aux lésions cérébrales traumatiques dans un service médical d'urgence par hélicoptère sud-africain

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Received 3 March 2015; revised 6 May 2015; accepted 13 May 2015; available online 24 June 2015

Abstract Introduction: It is difficult to initiate clinical quality improvement projects through continuous education in the prehospital environment due to the very nature of their mobile workplace and unpredictable presence in a specific location. This study reviews the impact of an online learning platform and the effect it had on the clinical quality of care offered to patients with traumatic brain injury (TBI) during Helicopter Emergency Medical Services (HEMS) operations.

Methods: A prospective improvement project was initiated to improve the clinical care for patients with TBI. A clinical monitoring tool, based on the prehospital care guidelines of the Brain Trauma Foundation was designed to assess the clinical quality of TBI patient care. The clinical indicators measured included initial Glasgow Coma Score, motor function, pupil size and reactivity, hypotension, hypoxaemia, carbon dioxide levels, temperature control, and patient position. A four month baseline monitoring was completed to determine the level of adherence to the guidelines, and subsequently an online, free access lecture series was presented to the HEMS operational staff. The clinical monitoring tool was applied during this time and afterwards to review adherence to guidelines.

Results: A total of 71 cases of TBI were seen during the period of assessment and 64.8% of HEMS crew participated in the online training programme. A change in the average adherence to the clinical guidelines improved from 66.9% to 75.7% ($p = 0.033$) from the baseline monitoring period, to the period immediately after the online training.

Conclusion: Free and open online learning platforms can be implemented at little to no cost and can be accessed anywhere. This initiative has shown benefit in ensuring best care for critically ill TBI HEMS patients.

Abstract Introduction: Il est difficile d'initier des projets d'amélioration de la qualité clinique au sein des SMUH par le biais d'une formation continue dans l'environnement pré-hospitalier en raison de la nature même du lieu de travail mobile de ses membres, et de leur présence imprévisible en un lieu ou un autre. Cette étude examine l'impact d'une plateforme d'apprentissage en ligne et son effet sur la qualité clinique de la prise en charge proposée aux patients victimes de lésions cérébrales traumatiques (LCT) au cours des opérations des Services médicaux d'urgence par hélicoptère (SMUH).

Méthodes: Un projet d'amélioration prospectif a été entamé afin d'améliorer la prise en charge clinique des patients victimes de LCT. Un outil de suivi clinique, fondé sur les directives de prise en charge pré-hospitalière de la Brain Trauma Foundation, a été développé afin d'évaluer la qualité clinique de la prise en charge des patients victimes de LCT. Les indicateurs cliniques mesurés incluaient l'échelle de coma de Glasgow, les fonctions motrices, la dimension de la pupille et sa réactivité, l'hypotension, l'hypoxémie, le taux de dioxyde de carbone, le contrôle de la température et la position du patient. Un suivi de référence sur quatre mois a été réalisé afin de déterminer le degré de respect des directives et par la suite, une série de cours en accès libre a été présentée au personnel opérationnel du SMUH. L'outil de suivi clinique a été appliqué au cours de cette période et par la suite, afin d'examiner le respect des directives.

Résultats: Au total, 71 cas de LCT ont été vus au cours de la période d'évaluation, et 64,8% des membres de l'équipe du SMUH ont participé au programme de formation en ligne. Un changement a été observé dans le respect moyen des directives cliniques, qui s'est amélioré pour passer de 66,9% à 75,7% ($p = 0,033$) entre la période de suivi de référence et la période suivant immédiatement la formation en ligne.

Conclusion: Les plateformes d'apprentissage en ligne gratuites et en accès libre peuvent être mises en œuvre à peu de frais, voire sans frais, et sont accessibles de n'importe où. Cette initiative a montré qu'elle était utile pour garantir la meilleure prise en charge possible pour les patients des SMUH victimes de graves LCT.

African relevance

- Access to CME activities is limited due to geographical constraints.

- Successful implementation of online learning to improve guideline adherence is emphasised.
- This model may be applied in Africa to improve adherence too.

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Peer review under responsibility of African Federation for Emergency Medicine.



Introduction

There is an age-old adage stating: *African solutions should be sought for African problems*. This creates an opportunity for innovation. The ongoing problem of access to continuous

medical education towards eventual improvement in patient safety is something that is well studied. This paper presents the use of an open access online learning platform and the effect that it has had on the clinical quality of care offered to patients with traumatic brain injury (TBI) during Helicopter Emergency Service (HEMS) operations in ER24.

Practice guidelines on TBI recommend the avoidance of hypoxaemia, hypotension and the maintenance of low normal end-tidal carbon dioxide levels.¹ A local retrospective chart review, published in 2014 aimed at establishing the prevalence of hypotension and hypoxaemia in moderate to severe traumatic brain injuries in Johannesburg, Gauteng.² Forty-five percent of the sample was transported by helicopter. This study outlined the obvious non-adherence to international guidelines. It reported a mean prehospital prevalence of 33.3% and 37.9% of hypotension and hypoxaemia, respectively. In conclusion, the study recommended an urgent need for educational interventions in order to improve the quality of care provided to patients who have suffered a TBI.²

However, these educational interventions are of little value if practitioners at the sharp end do not have access to them. In an unpublished research report that investigated the non-compliance to regulations set by the Health Professions Council of South Africa by Advanced Life Support practitioners,³ a major concern was that there was limited access to opportunities for continued professional development (CPD). This was especially the case in paramedics practicing within the rural regions of the country,³ and it also highlighted the link between a lack of continuous professional development and a lack of adherence to clinical guidelines.³ Three out of the four HEMS within ER24 are operated in predominantly rural areas.

This lack of access to educational resources may be solved by the use of internet-based learning. In South Africa, an estimated 40.9% of the population enjoys Internet access.⁴ Most Internet consumers use mobile phones to surf the net.⁴ Within the continent, Internet usage has rocketed from 79 million users in 2010 to an estimated 172 million users in 2014.⁵

Online learning has been used successfully in many settings of healthcare education^{6,7} and other fields.⁸ It has numerous distinct benefits over traditional didactic or seminar-based learning in that it can lead to better mastery of the content, can optimise performance, can deepen memory and promote recall and it can improve communication in written format.⁷

Within the ER24 HEMS operation, it was assumed that guideline adherence was similar to that cited by

Christopher.³ The geographical distribution was also similar to that within the studies.³ For this reason, many staff members were unable to attend educational days and continuous medical education events. The ER24 Clinical Team came up with the solution to this problem. In the coming sections, success with using an online learning initiative at little cost, to improve the quality of care given to HEMS patients with TBI, measured through guideline adherence by using a self-designed clinical monitoring tool, will be discussed.

Methods

A prospective improvement project was conducted among four helicopter bases in South Africa. Bases are located in the South African cities of Johannesburg, Mbombela (formerly Nelspruit), Klerksdorp, and Bloemfontein. A clinical monitoring tool (Table 1) was designed to assess the clinical guideline adherence of TBI patient care. This tool was based on the pre-hospital care guidelines of the Brain Trauma Foundation,¹ and looked at adherence to these guidelines as parameters influential of outcome. A three month (June to August 2014) retrospective and one month (September 2014) prospective baseline monitoring phase was completed in order to determine the level of adherence to the guidelines at the outset; this was done by extracting relevant data from patient care records. Hereafter, an online lecture series (Table 2) was developed and recorded. Lectures were prepared using Prezi (Prezi. Inc., San Francisco, United States) and recorded using Screencast-O-Matic (Screencast-o-matic, Washington, United States) by a Senior Flight Paramedic with a Masters Degree in Emergency Medicine. Videos were then uploaded to a YouTube account and embedded within a free online learning website (OpenLearning.com, New South Wales, Australia).

All HEMS crews (Intermediate and Advanced Life Support levels) were invited to partake in the online learning programme. Crews were required to register on the website for a free account and enter a unique access code to access the content as a learner. Lectures involved a video presentation of 15–20 min on each topic. After each lecture, learners were required to complete a brief online quiz with a set pass rate of 100%. Learners were able to attempt each quiz an unlimited amount of times until the pass rate was achieved. The quiz was available from October to December 2014. The baseline adherence to clinical guidelines was compared to the prospectively collected adherence for each month that followed (October 2014

Table 1 Clinical adherence monitoring tool.

Parameter	Outcome measure for adherence
Initial GCS	Reported on the patient record
Motor function	Specifically mentioned on the patient record
Pupil size and reaction	Specifically mentioned on the patient record
Hypotension	Avoided, blood pressure to remain > 90 mmHg
Hypoxaemia	Avoided, SpO ₂ to remain > 90%
CO ₂	Controlled, ETCO ₂ to remain between 35 and 40 mmHg
Temp control	Controlled, pyrexia avoided
Patient position	Maintained in a head-up position unless contra-indicated
Adverse events	Avoided, no adverse events experienced

Note: GCS, Glasgow Coma Scale; mmHG, millimetres of mercury; SpO₂, peripheral capillary oxygen saturation; CO₂, carbon dioxide; ETCO₂, end-tidal carbon dioxide.

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