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ORIGINAL RESEARCH ARTICLE

Improving trauma care in India: a recommendation for the implementation of ATLS training for emergency department medical officers

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Abstract
Background Trauma is major cause of morbidity and mortality in India. The Advanced Trauma Life Support (ATLS) programme teaches a standardised method for the initial assessment and management of trauma patients, and has been adopted by more than 50 countries worldwide.
Aim We sought to assess the theoretical knowledge of ATLS principles among emergency department (ED) medical officers (MOs) in Salem, Tamil Nadu, India, and from the Royal Adelaide Hospital, Adelaide, South Australia.
Methods All MOs answered a trauma management quiz based on ATLS-type questions. Quiz scores were compared between senior and junior MO groups for each country, and within each professional group between countries. Categorical data were analysed using χ^2. An α value less than 0.05 was deemed to be statistically significant.
Results We discovered significant differences in the theoretical knowledge of ED MOs from Salem compared with colleagues in Adelaide. Our results demonstrated the positive influence of completion of an ATLS programme upon obtaining a passing grade on the trauma quiz. We failed to determine a link between self-rated experience in trauma management and the ability to pass the quiz.
Conclusions Our study demonstrated the positive influence of completion of an ATLS-type programme on the score obtained on the trauma management quiz. Although previous work has demonstrated mixed results concerning improvement in the care of trauma patients following completion of an ATLS programme, we recommend that such programmes be integrated into the training of Indian ED MOs and suggest that ATLS should be viewed as an integral part of medical training.

Keywords Trauma · ATLS · India · Emergency medicine

Introduction

Treatment of the seriously injured trauma patient requires timely interventions by a multidisciplinary team of well-trained professionals [1, 2]. It is generally recognised that the systematic training of medical personnel in the initial management of seriously injured trauma patients commenced with the introduction of the Advanced Trauma Life Support (ATLS) course in Lincoln, Nebraska, in 1978—the course was introduced generally to the US in January 1980 by the American College of Surgeons [3]. The ATLS programme (or a similar one) is now available in some 50 countries [4]. Data exist that demonstrate an improvement in the care of injured patients following implementation of an ATLS programme [5].

The aim of this study was to assess the theoretical knowledge of ATLS principles amongst emergency department medical officers in a semi-rural area of a developing country (Salem, Tamil Nadu, India) and from a mature trauma

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centre of a western country (Royal Adelaide Hospital, Adelaide, South Australia), and to analyse any difference in the level of knowledge of acute trauma management.

Methods

Questionnaire

Data were collected using a two-part questionnaire. The first part gathered data on medical officer level of seniority, completion of ATLS (or equivalent) and self-rated years of training experience in the management of trauma patients. The second part comprised a ten-question multiple-choice quiz ('the quiz') examining broad areas of the emergency management of the seriously injured trauma patient (Appendix). The questions were derived from knowledge presumed to be required for working in an emergency medicine setting and were prepared by a group of three qualified Salem emergency physicians. Questions were marked on a correct/incorrect basis, with a score of eight or more being deemed a passing mark, mirroring the scoring schema of ATLS.

Study population

The study was initially undertaken amongst ED personnel directly involved in the treatment of trauma patients in various hospitals in the city of Salem, *except* for all staff affiliated with the Vinayaka Missions Hospital and University, as they were being regularly trained and updated via an in-house trauma management programme. Medical officers employed in the various EDs in the Salem area were personally approached by the Indian authors. Completed questionnaires were collected a few days later. Preliminary Indian data were presented as a poster at the EMCON2008 conference in Salem [6] and have recently been published [7].

An identical trauma management quiz was distributed over a 1-month period in January 2009 to medical staff of the ED of the Royal Adelaide Hospital (RAH). Questionnaires were distributed via the ED internal mailing system ('pigeon holes') and were collected from a central collection box. Participants were able to complete the questionnaires at their leisure, and all questionnaires remained anonymous.

Data analysis

We divided our study cohorts into 'senior' and 'junior' medical officer (MO) groupings. For the Salem cohort, a senior MO was defined as one that had completed examinations for recognition as an Indian Emergency Medicine Specialist, and a junior MO as any other MO employed in the Emergency Department. Only recently has emergency medicine been officially recognised as a medical specialty in India, and until now, formal training to attain recognition as an Emergency Medicine Specialist in India has been conducted via a 3-year university-based Doctor Of Medicine (MD) programme in Accident and Emergency Medicine.

For the RAH MOs, a senior MO was defined as an MO that had completed at least Part I examinations towards Fellowship of the Australasian College for Emergency Medicine (ACEM), which encompassed consultants and advanced trainees of the College. Entry to advanced training with the ACEM necessitates a minimum of 3 years of basic and provisional training, as well as successful completion of the Part I examination; a junior MO was any provisional or basic emergency medicine trainee, or a resident MO or intern completing a term in the ED. After discussion among the authors, we felt that the years of training of each group, as described, were equivalent.

Trauma management quiz scores were compared between senior and junior MO groups for each country, and within each professional group between countries. We also examined whether previous completion of an ATLS (or equivalent) course, or self-rated years of training in the management of trauma patients ('trauma training') impacted upon the ability to successfully complete the trauma management quiz.

Categorical data were analysed using the χ^2 test. An α value less than 0.05 was deemed to be statistically significant.

Results

A total of 77 (Salem) and 44 (RAH) MOs returned questionnaires for incorporation into the study. Three RAH questionnaires were excluded due to incomplete data. Response rates for the distributed questionnaires, and trauma management quiz scores for senior and junior MO groups in each study cohort are presented in Table 1.

Trauma management quiz score

Our data demonstrated that a greater number of senior MOs achieved a passing score than their junior counterparts in both study cohorts (Salem 39% vs. 6%, $P<0.001$; RAH 96% vs. 68%, $P<0.05$). A greater number of both senior and junior MOs in the RAH cohort achieved a passing score in the quiz compared to their Indian counterparts (senior MO 96% vs. 39%, $P<0.001$; junior MO 68% vs. 6%, $P<0.001$). Indeed, the overall achievement of RAH junior MOs significantly exceeded that of their senior Indian colleagues (68% vs. 39%, $P<0.01$).

Table 1 Completed questionnaires, trauma management quiz result, and ATLS completion and self-rated trauma management experience, by cohort and study group

	Completed surveys (%)	Total passed quiz (%)	Trauma experience							
			<1year				>1year			
			N (%)	Passed quiz (%)	Completed ATLS (%)	Completed ATLS and passed quiz (%)	N (%)	Passed quiz (%)	Completed ATLS (%)	Completed ATLS and passed quiz (%)
Salem										
Snr	23/32 (72)	9 (39)	2 (9)	0	0	n/a	21 (91)	9 (43)	8 (38)	8 (100)
Jnr	33/45 (73)	2 (6)	20 (61)	0	0	n/a	13 (39)	2 (15)	2 (15)	2 (100)
Total	56/77 (73)	11 (20)	22 (39)	0	0	n/a	34 (61)	11 (32)	10 (29)	10 (100)
RAH										
Snr	22/45 (49)	21 (96)	5 (23)	5 (100)	5 (100)	5 (100)	17 (77)	16 (94)	14 (82)	13 (93)
Jnr	19/80 (24)	13 (68)	15 (79)	9 (60)	3 (33)	3 (100)	4 (21)	4 (100)	4 (100)	4 (100)
Total	41/125 (33)	34 (83)	20 (49)	14 (70)	8 (57)	8 (100)	21 (51)	20 (95)	18 (86)	17 (94)

Influence of completion of ATLS on quiz score

We next examined whether completion of an ATLS (or equivalent) course influenced the ability to achieve a passing score on the quiz. Our survey provided clear results. For the Salem cohort, of the 11 MOs that passed the quiz, ten (91%) had completed an ATLS course. There was no case where an MO had completed an ATLS course only to fail the quiz.

For the RAH cohort, 26/41 MOs (63%) had completed an ATLS course. Of these 26, 25 (96%) passed the quiz. There was a single case (a senior MO) whose completion of an ATLS course did not result in passing the quiz.

This resulted in a net pass rate of those that had completed an ATLS course of greater than 97%. By comparison, from a combined group of 61 Salem and RAH MOs that had not completed an ATLS course, only 9 (15%) passed the quiz ($P<0.001$).

Influence of self-rated trauma management training and experience on quiz score

Finally, we searched for an association between self-rated years of training in the management of trauma patients and the ability to pass the quiz. We chose an arbitrary 'cutoff' of 1 year of trauma training as significant.

For the Salem cohort, none of the 22 MOs with less than 1 year of trauma training passed the quiz. Additionally, none of these MOs had completed an ATLS course. For the 20 RAH MOs with less than 1 year of trauma training, 14 (70%) passed the quiz. Of these 14, 8 had completed an ATLS course—all 8 passed the quiz. Of the remaining 12 MOs, only 6 (50%) passed the quiz ($P<0.001$).

There were 34 Salem MOs with 1 year or more of trauma training.

Eleven of these MOs (32%) passed the quiz. Ten of these 11 had also completed an ATLS course—all 10 passed the quiz. Only 1/24 of the remaining MOs (4%) passed the quiz ($P<0.001$).

Twenty-one RAH MOs had 1 year or more of trauma training. Twenty (95%) passed the trauma management quiz. Eighteen of the 21 MOs had completed an ATLS course—17/18 (94%) of these MOs passed the trauma management quiz. All three of the remaining MOs also passed the quiz ($P>0.50$, NS). Interestingly, for the RAH junior MOs, few (21%) had 1 year or more of trauma training experience, even though 68% of the group passed the quiz.

Finally, we compared all non-ATLS trained MOs with less than 1 year of trauma training with those with more than 1 year of trauma training. Of the MOs with less than 1 year of trauma training, 6/34 (17%) passed the quiz. Similarly, 4/27 (16%) of MOs with more than 1 year of trauma experience passed the quiz ($P>0.25$, NS).

We can then conclude that there is no apparent link then between self-rated trauma training experience and an ability to pass the trauma management quiz, as we would have expected to find a significant difference between the groups with respect to time spent undertaking trauma training.

Discussion

Our results demonstrate that a direct relationship exists between completion of an ATLS (or equivalent) programme and the ability to achieve a passing mark on the trauma management quiz. Generally, experience (or the lack thereof) in self-rated trauma management appears to have no effect upon the ability of MOs to pass the quiz.

In developing countries, ED MOs are often the first trained responders to see seriously injured trauma patients as trained pre-hospital emergency response services are not available [8–10]. Initial resuscitation and management of the seriously injured trauma patient is often performed by relatively inexperienced junior MOs who, overwhelmingly, have not been trained in the principles of ATLS. Even in centres where specialist-level staff are employed, consultant supervision is not always available—a situation described by Crandon et al. [11].

There is evidence to suggest that ATLS (or equivalent) programmes improve the knowledge of *what* to do [12, 13] and improve the performance of medical staff in the management of simulated trauma cases [14]. Disappointingly, a systematic review of all studies and trials comparing the effectiveness of hospitals with an ATLS-trained trauma response team with hospitals without such a response system concluded that there was no clear evidence to suggest that ATLS training impacts on the *outcome* for trauma victims [15]. There is however evidence of statistically significant improvement in trauma patient mortality in the first hour after admission [16], in the application of (potentially) life-saving interventions [17] and in the number of patients receiving inadequate (initial) management [18]. Participants also feel that the completion of an ATLS-type course improves their clinical skills and other professional attributes [19].

Therefore, although no conclusive evidence exists for an overall benefit for trauma patients, it may be intuitively correct to introduce trauma training courses into India in an effort to improve the management of severe trauma cases.

Our study had a number of limitations. Firstly, our trauma management quiz was not validated, having been compiled on the basis of knowledge presumed necessary to work in an emergency medicine department. In particular, closer examination of individual questions on the quiz has suggested ambiguity in the correct answer to question five, which may have altered the number of participants that achieved a passing grade on the quiz. A deeper analysis of RAH quiz results failed to alter the net pass rate on the quiz, even when substituting an alternative 'correct' answer to question 5. Although we suspect that the interpretation of a different 'correct' answer to the question lies in the different trauma practises of each country's cohort (and understanding of the principles of ATLS), it is beyond the ability of this paper to examine this possibility in greater detail.

We cannot exclude the possibility of selection bias, especially for the RAH cohort, due to the low response rate to the distributed questionnaire.

However, we have assumed that the anonymity of the questionnaire should have encouraged some potential participants to participate despite the concern of poor quiz performance, but we cannot exclude the possibility that only the more motivated MOs completed the questionnaire. A further selection bias may have resulted from the self-rating of trauma management experience, as there was no advice on the data collection sheet suggesting a rating system. Finally, it is beyond the scope of this paper to determine whether performance on the trauma management quiz is a true reflection of an individual MO's trauma patient management capability.

Conclusion

Our paper demonstrated a clear difference between the ability of ED MOs employed in Australia and their Indian counterparts in successfully completing a trauma management quiz based on common severe trauma scenarios. The study also demonstrated the positive influence of completion of an ATLS-type course on the score obtained in the trauma management quiz. Although systemic review [15] has not conclusively shown on overall benefit on outcomes for trauma victims, based on our study, we recommend that ATLS-type courses be introduced to the training of Indian ED MOs, with the joint aims of increasing the theoretical knowledge of Indian ED MOs in the management of severely injured trauma patients, and of decreasing the morbidity and mortality experienced by those patients.

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Conflicts of interest None.

ATLS Trauma Quiz

1. Middle-aged man was brought to the emergency room following thoracic injury. He is tachypnoeic and profusely sweating. HR-180, peripheral pulses are feeble B.P-70/?. Air entry is reduced on the left side. Mediastinum is shifted to right, hyper resonance on the left side. He is on 15L O_2 with NRB mask. IV access in situ. What is the next intervention of choice?
   A. Chest X-ray to rule out pneumothorax
   B. Intercostal drainage
   C. Needle thoracocentesis
   D. Give a bolus of colloid
2. In an unconscious victim of MVA, how will you open the airway?
   A. Head tilt, chin lift and jaw thrust
   B. Jaw thrust only

C. Cricothyroidotomy
D. Flexion of neck

3. Patient is in hypotension following MVA. He has pulsatile bleeding in the right arm. O2 and IV access are in place. How will you control bleeding in the ER?

A. Clamp the artery
B. Apply a tourniquet
C. Stop bleeding with compression bandage
D. Explore the wound in ER

4. The following are indications to suspect base of skull fracture, except

A. Battle's sign (discolouration in the mastoid region)
B. Raccoon eyes (peri-orbital ecchymoses)
C. CSF rhinorrhoea
D. Broken teeth

5. A patient was brought to the ER following polytrauma and you suspect pelvic fracture. You are allowed to do all the following, except:

A. Administer oxygen, apply cervical collar, assess breathing and gain IV access for fluid resuscitation
B. Apply pelvic binder if compression distraction test is positive
C. Log roll and per rectal examination should be done
D. Send blood for group typing and cross match

6. In a patient with injuries due to burns inhalation injury is suspected in case of

A. Blackening of teeth
B. Haematemesis
C. Carbonaceous sputum
D. Haemoptysis

7. One of the following is not the preferred site of venous access in paediatric trauma:

A. Percutaneous peripheral vein
B. Scalp vein
C. Intraosseous
D. Venous cut down—saphenous vein at the ankle

8. In a case of polytrauma, a nasogastric tube should not be inserted when there is

A. Broken teeth
B. Fracture of the mandible
C. Blunt injury to the abdomen
D. Base of skull fracture

9. In case of polytrauma involving an adult male, the preferred size of IV cannula is

A. 20 G
B. 22 G
C. 18 G
D. 16 G

10. One of the following is an indication for intubation in a case of polytrauma

A. Penetrating wound to the abdomen
B. Suspected head injury with h/o one episode of seizure
C. GCS less than 8
D. Open femur fracture

Answers: 1C; 2B; 3C; 4D; 5C (Salem) 5B (RAH); 6C; 7D; 8D; 9D; 10C

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