

Effect of the Trauma Evaluation and Management module on the knowledge of senior medical students: a prospective cohort study

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Background: Despite the high incidence of motor vehicle collisions and associated mortality rates in Saudi Arabia, formal trauma training and management for undergraduate medical students is not optimal. The aim of our study was to assess the effect of the Trauma Evaluation and Management (TEAM) module on trauma knowledge among senior medical students.

Methods: Final-year medical students were recruited between September 2016 and May 2017 at King Abdulaziz University, Jeddah. They were allocated to 1 of 2 groups: 1 group was exposed to the TEAM module, and the other was not (control group). We employed a widely used 20-item multiple-choice standardized questionnaire to assess trauma-related knowledge of both groups.

Results: Our study included 136 participants, 68 in the TEAM module group and 68 in the control group. The mean scores for trauma-related knowledge were 68.4% (standard deviation [SD] 15.63%) and 45.4% (SD 19.52%), respectively. Linear regression analysis showed that the TEAM module participants scored 23% higher on the test than the control participants ($\beta = 22.94\%$, 95% confidence interval 16.94%–28.94%).

Conclusion: Mean test scores were significantly higher for those who completed the TEAM module than for those who did not. We highly recommend incorporating the TEAM module into the formal medical curriculum at all Saudi universities.

Contexte : Malgré la forte incidence des accidents de la route et la mortalité qui y est associée en Arabie saoudite, la formation formelle au traitement et à la prise en charge en traumatologie chez les étudiants en médecine de premier cycle laisse à désirer. Notre étude avait pour but d'évaluer l'effet du module TEAM (Trauma Evaluation and Management) sur les connaissances en matière de traumatologie acquises par les étudiants en médecine de niveau avancé.

Méthodes : Durant leur dernière année de formation, des étudiants en médecine ont été recrutés entre septembre 2016 et mai 2017 à l'Université du roi Abdulaziz, à Djeddah. On les a assignés à 1 de 2 groupes : un groupe a été exposé au module TEAM, et l'autre non (groupe témoin). Nous avons utilisé un questionnaire à choix multiples standardisé en 20 points pour évaluer les connaissances des 2 groupes en matière de traumatologie.

Résultats : Notre étude a regroupé 136 participants, 68 dans le groupe exposé au module TEAM et 68 dans le groupe témoin. Les scores moyens en ce qui concerne les connaissances en traumatologie ont été de 68,4 % (écart-type [É.-T.] 15,63 %) et de 45,4 % (É.-T. 19,52 %), respectivement. L'analyse de régression linéaire a révélé que les participants exposés au module TEAM ont obtenu des résultats de 23 % supérieurs aux participants du groupe témoin ($\beta = 22,94\%$, intervalle de confiance à 95 % 16,94 %–28,94 %).

Conclusion : Les scores moyens aux tests ont été significativement plus élevés chez les participants ayant complété le module TEAM que chez les autres. Nous recommandons fortement d'intégrer le module TEAM au programme de formation médicale dans toutes les universités de l'Arabie saoudite.

The burden of trauma continues to be an important public health concern worldwide, including in Saudi Arabia, owing to the increased incidence of motor vehicle collisions, with an associated high mortality rate. Motor vehicle crashes account for 4.7% of all deaths in Saudi Arabia, which is about 3 times the rate in the United States.¹⁻⁴ Worldwide, motor vehicle collisions are the leading cause of death among adults aged 18–29 years, and estimates indicate that more than 45 million people sustain moderate to severe disability each year owing to trauma.⁴ According to the World Health Organization, there were about 1.25 million deaths due to motor vehicle collisions in 2014, and it is predicted that trauma will rise to the third-leading cause of disability worldwide by 2030.⁵ Thus, it is becoming increasingly important to train and prepare medical students to face this new reality. In Saudi Arabia, 20% of Saudi Ministry of Health hospital beds are generally occupied by patients with trauma.^{2,6,7} Therefore, appropriate training courses in trauma management for medical students need to be introduced in their education, and also it is important to ascertain whether students retain their training.

Debate about the usefulness of incorporating trauma assessment and management modules into undergraduate medical students' education is ongoing. However, a meta-analysis revealed lack of knowledge and competencies in acute care management among most undergraduate students.⁸ The Advanced Trauma Life Support (ATLS) module was initially introduced in some universities around the world. The University of Manitoba reported the successful completion of the ATLS course by senior medical students, with failure rates nearly equal to those among practising physicians.⁹ University of Toronto students who completed the ATLS course showed better trauma-related cognitive and management skills than those who did not complete the course.¹⁰ However, the ATLS module is not part of the undergraduate curriculum in most universities.¹⁰⁻¹²

Consequently, the American College of Surgeons designed the Trauma Evaluation and Management (TEAM) module for senior medical students to deliver the fundamental concepts of ATLS, aiming to close the knowledge gap in trauma care between senior medical students and practising physicians. The module, which consists of variable educational modalities including dedicated lectures, focus discussion and simulation stations based on ATLS principles, aims to enhance a unified and effective approach to the management of patients with trauma.^{11,12} Delgado-Reyes and colleagues¹³ recently evaluated the effectiveness of the TEAM course among undergraduate medical students in Mexico and found that it improved the students' trauma cognitive skills and was widely accepted by the students. Several US universities have incorporated the TEAM module into their curriculum.¹⁴ The University of the West Indies¹⁵ tested the efficacy of the module using

the Objective Structured Clinical Examination, multiple-choice questions and a student-administered questionnaire and found that students who had training with the TEAM module showed improvement in all outcomes compared to the control group. In addition, nearly all students supported the notion that the TEAM module should be part of their undergraduate curriculum. The University of Toronto reported a considerable improvement in the post-test results for students who completed the TEAM module, with more than half reaching the ATLS passing score of 80%.¹¹ Finally, an Australian study showed significant improvement in students' trauma-related cognitive skills after they completed the TEAM module, and most participants concurred on the need for the module to be included in the undergraduate curriculum.¹⁶

The objective of the present study was to evaluate the efficacy of the TEAM module in improving the knowledge of senior medical students in Jeddah, Saudi Arabia, in order to reach an informed decision on incorporating the module into the formal university medical curriculum.

METHODS

Setting

We conducted the study at King Abdulaziz University Hospital (the teaching hospital of King Abdulaziz University), Jeddah, between September 2016 and May 2017. We followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines¹⁷ for reporting our study methods and results. The study protocol was approved by the Unit of Biomedical Ethics of King Abdulaziz University and the Academic Affairs at of King Abdulaziz University Hospital. An initial invitation and explanation were conducted at clinical sessions at King Abdulaziz University Hospital to describe the objectives of the study and to obtain participants' consent. Informed written consent was obtained from all participants.

Study design

Our study was a prospective cohort study to evaluate the effect of participating in the TEAM module on trauma-related knowledge of final-year medical students in the Western region of Saudi Arabia.

Participants

To enhance the comparability of the study groups and to reduce selection bias, we included only final-year medical students of the same academic year. All final-year medical students during the 2016/17 academic year at King Abdulaziz University were invited to participate in the study. None of the participants had been exposed to a training

course comparable to the TEAM module. However, all participants had undergone trauma teaching sessions and lectures during their 4-month surgical rotation in their final year. The study participants voluntarily participated in 1 of 2 groups: 1 group was exposed to the TEAM module, and the other was not (control group).

Description of intervention

The TEAM module included a videotape on resuscitation of a patient with multiple injuries, a discussion on the management of the patient, and a lecture on resuscitation and management of a patient with multiple injuries.¹¹ The module duration was 5–7 hours. Participants completed the module individually during the academic year.

Outcome assessment

With the purpose of reducing information bias, we measured our primary outcome, trauma-related knowledge, in a standardized way using a 20-item multiple-choice self-administered questionnaire used in several previous studies.^{9,11–13} Trauma-related knowledge was assessed in the exposed group immediately after they completed the module and in the control group. No baseline assessment of trauma-related knowledge was conducted. Correct answers across all questions were added for each participant to build a total score; all questions had the same weight. A score of 70% or higher was considered a passing score.

Determination of sample size

We planned 1 control participant per exposed participant. In a previous study, the response within each subgroup was normally distributed, with a standard deviation (SD) of 6.⁹ If the true difference in the experimental and control means was 3, we would need to study 64 exposed participants and 64 control participants to be able to reject the null hypothesis that the population means of the experimental and control groups are equal with probability (power) 0.8. The type I error probability associated with this test of this null hypothesis is 0.05.

Statistical analysis

We used frequencies and absolute numbers for categorical variables, and mean (and SD) and median (and interquartile range) for continuous variables. We assessed between-groups difference in 2 categorical variables (the number of participants who passed and failed the trauma knowledge test) using the χ^2 test. We examined between-group difference in continuous variables using the Student *t* test for unpaired samples or one-way analysis of variance when there were more than 2 groups. For all statistical tests, a

p value of < 0.05 was defined as the level of significance. We used SPSS version 21 for data analysis. We used linear regression for continuous outcomes and logistic regression for binary outcomes to estimate the differences between the TEAM module and control groups in trauma-related knowledge scores and scores of 70% or higher, respectively.

RESULTS

Of the 150 students invited, 136 (90.7%) (68 in the TEAM module group and 68 in the control group) gave their consent and participated in the study. All participants in the TEAM module group completed the module. Across all participants, the mean score for trauma-related knowledge was 59.9% (SD 21.05%) and the median score was 60.0% (interquartile range 35%–33.10%). The mean scores for the TEAM module group and the control group were 68.4% (SD 15.63%) and 45.4% (SD 19.52%), respectively (Table 1). Overall, 45 participants (33.1%) scored 70% or higher; the values for the exposed and control groups were 34 (50%) and 11 (16%), respectively.

Scores were significantly higher among TEAM module participants than in the control group ($p < 0.001$). There was a significant association between completing the TEAM module and passing the knowledge test with a score of 70% or higher ($p < 0.001$) (Table 1). Linear regression showed that participants in the TEAM module scored 23% higher on the test than control group participants ($\beta = 22.94\%$, 95% confidence interval 16.94%–28.94%). Logistic regression showed that TEAM module participants had a fivefold higher probability of passing the test than the control group (odds ratio 5.18, 95% confidence interval 2.33–11.55).

DISCUSSION

One of the advantages of the TEAM module is that it provides a real scenario in which a trauma case is being managed, showing the errors that might happen and demonstrating the correct way to manage a patient with multiple injuries. Exposure to a simulated scenario of a

Table 1. Differences in test scores between participants who completed the TEAM module and the control group

Variable	TEAM module group <i>n</i> = 68	Control group <i>n</i> = 68	<i>p</i> value
Mean score \pm SD, %	68.38 \pm 15.63	45.44 \pm 19.52	< 0.001
Median score (IQR), %	67.50 (20.00)	42.50 (30.00)	< 0.001
Passed,* no. (%) of participants	34 (50)	11 (16)	< 0.001

IQR = interquartile range; SD = standard deviation; TEAM = Trauma Evaluation and Management.
*Score of 70% or higher.

trauma case and conducting full trauma assessment and management of different cases prepares students in many aspects of trauma care and management. We found the TEAM module to be of considerable benefit in improving trauma knowledge of senior medical students at King Abdulaziz University. Mean test scores were significantly higher for those who completed the module than for those who did not. Our study also showed that the TEAM module group was 5 times more likely to pass the test than the control group. This is in agreement with previous studies.^{9,11-13}

In a study from the University of Toronto, the mean score of senior medical students in the TEAM group was 80.7% (SD 11.5%).¹¹ A study from Australia showed the mean posttest score in the TEAM module group to be 77.4% (SD 6.50%).¹⁰ In both studies, the mean posttest scores were higher than those observed in the current study. This may reflect a serious deficiency in undergraduate trauma education at King Abdulaziz University. This also supports the importance of incorporating the TEAM course into the King Abdulaziz University medical school curriculum. However, the difference in the mean posttest scores between the TEAM module group and the control group in our study is concordant with the mean posttest results in previous studies.^{14-16,18} Our results are also in line with a recent US study showing highest student confidence in trauma assessment and management among students who had training in both clinical trauma and a TEAM course.¹⁹ These results emphasize the importance of multiple teaching methods including the TEAM module and simulation to add to the clinical experience. A recent article from Singapore called for a task force to oversee trauma training and to plan trauma teaching in a systematic and progressive manner across medical schools.²⁰ The authors proposed that the task force be engaged in assessing existing curricula in order to decide which trauma curriculum to use and integrate, and to identify the perceptions of key stakeholders.

Strengths and limitations

Our study has several strengths. The sample was relatively large. Furthermore, our study's population was selected from the same medical school, the same academic year and at the same academic level, which enhanced the comparability of the study groups and reduced selection bias. None of the participating students had previous exposure to trauma courses other than what they had experienced in their surgical rotation. This helped to minimize the difference between the groups at the start of the study. One of the study's limitations is its observational nature, which rendered it susceptible to confounding selection bias. Moreover, we did not conduct a baseline assessment of the participants using the same test.

CONCLUSION

The TEAM module provides a more practical experience than formal trauma lectures or teaching sessions, with time to discuss the case with the tutor and to discuss different cases with different presentations. Unlike other studies, our study did not assess students' perceptions of and attitudes toward the TEAM module. However, we expect that our participants would recommend the module as a mandatory part of medical school curriculum. Considering the lack of formal trauma education in Saudi universities and the high incidence of motor vehicle collisions and associated mortality rates in the country, we strongly recommend incorporating the TEAM module into the formal medical curriculum at King Abdulaziz University and other Saudi universities.

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Competing interests: None declared.

Contributors: Y. Almarhabi designed the study and acquired the data, which all authors analyzed. All authors wrote and reviewed the article, approved the final version to be published and can certify that no other individuals not listed as authors have made substantial contributions to the paper.

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