Efficacy of the Basic Trauma Course in Family Medicine Resident Physicians in Southern Ecuador: It is Time to Innovate Education in Trauma

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ABSTRACT

Introduction: In Ecuador, as in other Latin American countries, trauma has become one of the main reasons to seek medical care in the country. According to data obtained from the National Institute of Statistics and Censuses (INEC), the rate of homicides, car accidents, suicides, and burns, grouped together, represent the main cause of morbidity and mortality in people aged between 18 years and 40 years, surpassing mortality due to cardiovascular causes or diabetes. Additionally, one study on geolocation of calls made to the emergency services (SIS-ECU 9-1-1) indicated that trauma in the country is becoming more and more frequent in marginal urban and rural areas, where health services are scarce. Due to this emerging situation, it is necessary to evaluate the short- and long-term effectiveness of the Basic Trauma Course (BTC), a course designed to educate students, general practitioners, prehospital staff and primary healthcare physicians.

Objective: To evaluate the effect of the BTC in family medicine residents who work in Health Centers in marginal urban and rural areas of the Azuay, Cañar, and Morona Santiago provinces in southern Ecuador.

Materials and methods: Quasi-experimental study in which knowledge is evaluated at three stages in time (before the course, at the end of the course and one year later) in 39 family medicine residents. Comparison of means of the test scores was made using formulas in SPSS of analysis of variance (ANOVA) and Tukey HSD.

Results: ANOVA brought significant differences between measurements ($F = 8.38$, $p < 0.0005$). The increase in the score between the pretest and the immediate posttest was significant ($p < 0.01$). The difference between pretest and late posttest was not significant. The comparison of the immediate and late posttest results showed a decrease in the mean, being statistically significant ($p < 0.01$).

Conclusion: The BTC, as a unique training course, does not guarantee the permanence of long-term knowledge in participants who do not regularly attend to the trauma patient, requiring constant training using spaced repetition methods, for adequate consolidation.

Keywords: Basic trauma course, Global surgery, Prevention, Trauma education.

INTRODUCTION

Trauma, grouped in all its possible etiologies, is the main cause of death in people younger than 40 years. According to statistics obtained from the Emergency Medical Services (EMS) of the city of Cuenca in 2011, it was found that 83% of those affected are young.
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In all, 84% of the trauma calls received to the SIS ECU 9-1-1 in Cuenca come from urban territories; however, 16% come from rural and urban areas, where healthcare centers are scarce and have limited resources, resulting in a possible deficient approach in the prehospital setting, which could be more effective with the training of first-level healthcare physicians in rural areas, such as in the Ecuadorian Amazon.3,4

Additionally, it must be taken into account that there are deficiencies in the communication and transfer systems to a more complex center, delaying the arrival to more prepared hospitals.3,4

In 2003, Aboutanos and Rodas evidenced a deficiency in trauma systems among healthcare personnel of the southern Amazon region of Ecuador and concluded that different factors could have influenced, the most important being lack of education. Trauma courses were held for 2 years in order to educate and strengthen knowledge in healthcare personnel.4

The Basic Trauma Course (BTC) is an educational program that covers different theoretical/practical topics of evaluation and initial management of the trauma patient in places, where resources are limited and the accessibility of courses such as Advanced Trauma Life Support (ATLS) is not possible, like the rural areas of our country, becoming a suitable course for low- and middle-income countries (LMIC).4

Nowadays, with the emerging situation and increase in trauma, it is necessary for the primary care physicians to receive adequate training in trauma, beyond first aid courses; at the same time, it is important to evaluate the efficacy of the training courses to analyze their results and identify their strengths and weaknesses.5–11

Materials and Methods

A quasi-experimental study was carried out with three evaluations separated in time: one test before the theoretical/practical course, a posttest immediately after concluding the course, and another test after 12 months.

The participants of this study were family medicine resident physicians (n = 39) who attended the BTC. The exclusion criteria were determined by lack of participation in any of the three tests of the course. One participant was excluded.

The course was given by members of the Panamerican Trauma Society (PTS) and students of the local trauma league of Ecuador. The curriculum was fragmented in:

- Twenty four hours of lectures (initial evaluation and management of the trauma patient, triage and team approach, airway management, chest trauma, shock and resuscitation, abdominal and pelvic trauma, skeletal muscle trauma, neurotrauma, thermal injuries, pediatric trauma, geriatric trauma, and obstetric trauma)
- Four hours of clinical simulations and moulage (airway management, initial management in chest trauma, initial management of multi-trauma patients in critical situations such as penetrating injuries, falls, burns and traffic accidents.
- Two hours for tests.

The test was endorsed by the PTS and consisted of 3 prehospital management (PH) questions, 24 primary survey questions, and 3 secondary review (SR) questions, for a total of 30 points. In order to pass the test, the minimum score is 60% (18/30).

Data collection was processed and analyzed with SPSS 22 software. The means were compared using analysis of variance (ANOVA) and Tukey HSD.

Results

In all, 39 participants who were family medicine residents received the course and took different tests.

At the time of the pretest, the mean score was 80% (23.9/30). One student failed the test with 56% (17/30), while in both posttests all students passed with more than 60% of the score, with a mean of 85% (25.5/30) in the immediate posttest and 79.5% (23.8/30) after 1 year (Table 1).

When performing the ANOVA of repeated measures, a statistically significant difference between the measurements was demonstrated ($F_{(2.76)} = 8.38$, $p < 0.0005$).

To assess the specific differences between the groups, the Tukey HSD post hoc test was used; a significant difference was found between the first and second moment (HSD 1.14, $p < 0.01$) and between the second and third moment (HSD 1.43, $p < 0.01$). In the first case, the result showed a higher level and, in the second, the difference was in favor of the deterioration of knowledge. The comparison between the mean of the pretest and the posttest 12 months later did not show significant differences.

The percentage distribution of correct answers was identified at the three different moments of the evaluation (Table 2).

Segments D (neurological deficit), E (exposure), and PH (prehospital) in the late posttest maintained a higher level than the pretest.

Table 1: Results of statistical analysis with ANOVA and Tukey HSD in repeated measures

| Test               | N  | Mean | SD  | Min | Max | ANOVA repeated measures | $p$  |
|--------------------|----|------|-----|-----|-----|-------------------------|------|
| Pretest            | 39 | 23.97| 2.59| 17  | 28  | $F_{(2.76)} = 8.38$     | <0.001|
| Immediate posttest | 39 | 25.53| 1.86| 20  | 28  | Tukey HSD               |      |
| Posttest 12 m later| 39 | 23.87| 2.05| 20  | 28  | P1 vs P2                | <0.01 |
|                   |    |      |     |     |     | P1 vs P3                | NS   |
|                   |    |      |     |     |     | P2 vs P3                | <0.01 |
The family medicine resident physicians demonstrated an adequate knowledge in trauma before the course with a mean of 79%, with only one student failing the test, which could have been associated with the constant learning curriculum of their career.12,13

After taking the course, the students were able to maximize their knowledge, and their test scores increased to a mean of 85% of correct answers, proving the short-term effectiveness of the course despite the complexity and the high workload in a restricted period of time.

We could determine that presenting the same topics in different learning models like lectures, videos, and clinical case simulations could be helpful to enhance the consolidation in the short-term, turning into a remarkable strength of the course.12,13

Nonetheless, when we evaluated the long-term effect after 1 year, we found that there was a cognitive decline with similar results as before the course reflecting a main weakness.12–17 Some studies have found similar data with the ATLS course, where cognitive decline became evident at 6 months in physicians who work in a clinical specialty, compared to surgeons where cognitive decline became evident 2 years later after the course.18–21

As the BTC’s main audience are nonsurgical-related healthcare workers, it is important to innovate the learning techniques to promote maintenance of knowledge by using method of spaced repetition, such as Anki App, Journal Clubs, multimedia, questionnaires, or continuous medical education courses.22

**Discussion**

When analyzing the results obtained in this work, we can conclude that training in trauma with the BTC has a statistically significant result, improving their knowledge immediately but limited to the short-term only.

It is necessary to promote a change in the curriculum in order to encourage continuous education or the use of spaced repetition tools to obtain better results in education.11,22

Further studies are required to obtain a broader sample, which allows us to avoid limitations such as type B error, by strengthening the statistical power. In addition, it is necessary to evaluate other groups of students to improve the external validity of the study.

**Conclusions**

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