



A Comparative Study of Trauma Management Education Using Traditional and Combined Methods with Instructional Videos on the Knowledge and Skills of Medical Students

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Abstract

Background: Improving the knowledge and skills of medical students using new educational methods to deal with trauma can help reduce the mortality and morbidity of injured patients.

Objectives: This study aimed to compare the effect of traditional training with combined trauma management training using educational videos on the knowledge and skills of medical interns at Mashhad University in 2021.

Methods: This educational intervention study involved two groups during the academic year 2019 - 2020. Eighty-seven medical interns participated over a six-month period and were randomly assigned to either the intervention or control group. Data collection tools included a demographic questionnaire, a clinical skills checklist covering seven skills, and a pretest-posttest MCQ test. Statistical tests used included the independent univariate test and multiple linear regression, analyzed with Stata Ver 17 software. The significance level was set at 0.05.

Results: The average knowledge score of the intervention and control groups before the intervention was 12.09 ± 3.06 and 13.00 ± 3.01 , respectively. After the intervention, the average knowledge score was 14.84 ± 3.30 in the intervention group and 15 ± 2.98 in the control group. The average skill score of the students before the intervention in the intervention and control groups was 7.00 ± 2.67 and 7.56 ± 2.42 , respectively. After the intervention, the skill score was 10.67 ± 3.70 in the intervention group and 8.72 ± 3.46 in the control group.

Conclusions: Although the advanced trauma life support course in Iran is relatively new, its positive impact on increasing the skills of medical students suggests a need to review traditional teaching methods. Incorporating new combined methods could enhance the quality of education and improve the skill levels of young doctors.

Keywords: Trauma, Medical Students, Knowledge, Medical Education, Clinical Skills

1. Background

Nowadays, trauma is considered a major public health problem in any community, regardless of its healthcare, economic, and social conditions (1). Trauma has been identified as one of the leading causes of death and disability worldwide, ranking third after cardiovascular diseases and cancer as a major cause of

mortality across all age groups. It is the leading cause of death and morbidity in individuals aged 1 to 44 years, resulting in approximately 5.8 million deaths worldwide each year (2).

In Iran, road traffic accidents are the most significant cause of injuries, making trauma the second leading cause of death and the primary cause of disability, accounting for the highest proportion of years of

potential life lost (3). Trauma imposes significant economic and social costs on society, prompting policymakers in healthcare and medical systems to take fundamental measures in managing the care of these patients (4).

Advanced trauma management is an educational program initiated by the American College of Surgeons about 40 years ago to provide systematic and targeted training in trauma patient management. It is considered one of the most reputable educational programs for advanced trauma care (5). The primary objective of this course is to enhance the skills of healthcare providers in the initial assessment, resuscitation, stabilization, and determination of the next steps in caring for trauma patients (6).

In the advanced trauma management course, medical students learn how to quickly and accurately evaluate trauma patients, stabilize their condition based on the priority of injured body parts, address the most life-threatening factors while maintaining treatment priorities, identify patients who require referral to more specialized facilities, ensure that maximum medical services are provided to the patient, and ultimately perform therapeutic and diagnostic procedures in the most appropriate timeframe. They also learn to determine the subsequent steps in caring for the injured patient (7). Studies have shown that precise and guideline-based trauma care leads to stronger treatment pathways, reduced long-term disability, and decreased trauma-related mortality (8).

Advanced trauma life support (ATLS) in Iran is a relatively new field of knowledge. Although the approach to trauma patients has gradually been included in the medical curriculum, the level of awareness and performance in managing trauma patients among medical personnel is questionable. Despite ten years of conducting Advanced Trauma Management courses, course directors are not satisfied with the outcomes (9). Trauma patient care in Iran falls short of international standards, with concerns existing regarding all aspects of trauma patient care in emergency departments (10). This necessitates a critical review of continuous medical education and efforts to address deficiencies and improve the situation. Considering that the knowledge and skills of final-year medical students reflect the performance of medical education in the learning process, assessing these components can shed light on the students' competence in terms of their general abilities (11).

Clarifying the strengths and weaknesses of learners can provide evidence for revising the implementation process and interventions in medical education

programs (12). The nature and type of learning content in various medical science courses have made the use of multimedia facilities essential for facilitating learners' education (13). Various studies have shown that active learning and problem-solving abilities are better in students who use multimedia-based courses (14). The use of educational technology through multimedia has brought about a significant transformation in the field of medical education. The advantages of this approach compared to traditional methods include better learning outcomes for learners, prevention of time and cost wastage, the possibility of choosing teaching time, the ability to review educational content, and learner-centeredness (15).

In the field of trauma education, given the broad range of diseases and the lack of sufficient opportunities for in-person training, especially during recent pandemics, blended teaching methods have gained attention and popularity. Virtual educational programs, such as instructional videos on various examinations, radiographic evaluations, and trauma course exercises, can be utilized by medical students (16).

There have been limited studies comparing traditional trauma teaching methods with blended approaches (clinical training and the use of trauma instructional videos), and in cases where both are used, the examinations of virtual and traditional teaching methods have often been conducted separately (17). In this regard, Williams et al. conducted a study titled "Improved Trauma Management Through Simulation-Based Training: Evaluating Its Efficacy for Physicians," which examined the value of simulation-based training exercises in the performance of physicians. The results showed that physicians who received comprehensive ATLS training with supplementary methods had more effective simulation management (18). Furthermore, the study by Mohan et al. demonstrated that scenarios designed in the form of videos or software can engage physicians cognitively and emotionally in ways that go beyond traditional training methods, leading to better skilled reactions in handling trauma patients (19).

In a study by Hajizadeh and Akbari on dental students, a significant difference was observed in grades between the two groups (traditional teaching and film demonstration), with the film-trained students achieving higher grades and greater satisfaction (20). In research conducted by Kelly et al. on nursing students in Ireland, the use of instructional videos was recommended as complementary education due to its positive impact on learning (21).

Contrary to the aforementioned studies, Nanthakumar et al. conducted a study to investigate the effectiveness of film demonstration, interactive demonstration, and textbook instructions in learning suturing skills among medical students. They found that interactive demonstration was the most effective method for acquiring a new skill, followed by film-based learning and textbook instructions (22). Similarly, Karimi-Moneghi et al. discovered that video-based instruction does not generate the same level of learning as clinical demonstration. However, using videos for training purposes in situations where clinical demonstration is not feasible or cost-effective can be a suitable alternative (23). Furthermore, some studies have shown that relying solely on virtual education will not meet the educational needs in the clinical context. Instead, blended learning approaches in medical education are more successful than traditional or purely virtual education.

2. Objectives

Given the scarcity of similar studies, the contradictory results of existing research, and the importance of utilizing innovative technologies to enhance the quality of trauma education, the present research aimed to compare the effectiveness of traditional teaching methods and a blended approach using an instructional film (ATLS) on the knowledge and skills of medical students at Mashhad University of Medical Sciences.

3. Methods

The present research was an interventional study with a pre-test-post-test design. The study was conducted on 87 medical interns from Mashhad University of Medical Sciences using a census method. The inclusion criteria for participation in the study included willingness to participate, informed consent, selection of emergency department rotations for the first time, and no history of advanced trauma management training. The exclusion criteria included withdrawal from the study, previous training in advanced trauma management, incomplete questionnaire completion, or a distorted questionnaire.

This study was conducted over three consecutive periods spanning six months in 2021. The participants were randomly assigned to the intervention group (44 participants) and the control group (43 participants). The random allocation of eligible individuals was done by an independent person who was not involved in the research team and had no involvement in the training

process, participant follow-up, data collection, or recording. In the intervention group, in addition to traditional training, trauma management training was provided using an instructional film, while the control group received only traditional and conventional training. The inclusion criteria included willingness to participate, informed consent, selection of emergency department rotations for the first time. The exclusion criteria included withdrawal from the study, previous training in advanced trauma management, incomplete questionnaire completion, or distorted questionnaire.

The trauma emergency training course consisted of two parts: Theoretical and practical skills. The theoretical part was delivered through lectures, and the practical part included hands-on training with a mannequin. An instructional film was added as an intervention. After obtaining the research deputy's approval and receiving the ethical code for the study, the trauma management instructional film was prepared by a consultant professor and emergency medicine experts based on the key topics of advanced trauma management in the medical curriculum. The study setting was the educational-research-treatment center of Hashemi Nejad Hospital in Mashhad, which serves as the general physician training center and the trauma center for the east of Mashhad.

The data collection tools included a demographic information questionnaire consisting of name, age, gender, year of admission, marital status, residency status, GPA, and the number of emergency department rotations completed. The study objectives were explained to all participants, and written informed consent was obtained before collecting the data.

The knowledge assessment tool was a four-option questionnaire (ATLS) based on the latest 2018 guidelines. The questionnaire consisted of 20 multiple-choice questions designed to assess the interns' knowledge level based on the standardized content of the trauma management course. The scoring ranged from 0 to 20, with one point assigned to each correct answer, resulting in a total score of 20.

To assess the inclusion of ATLS skills as part of the evaluation process and to enhance validity and reliability as a novel method of student assessment, an OSCE (Objective Structured Clinical Examination) based on KFP rules was designed at Mashhad Medical School. So far, this comprehensive assessment method has not been implemented at the national level in the field of trauma management. A list of all important skills based on the ATLS reference book and the medical curriculum was prepared by the Emergency Medicine Committee and made available to all instructors and specialists at

Hashemi Nejad Hospital. After reaching a consensus, seven skills were selected as assessment stations for the OSCE.

Three consecutive groups of medical intern students from Mehr to Esfand 1400 (September 2021 to February 2022) were included in this research. Initially, an orientation session was held to introduce the research plan and obtain informed consent. For each group, consisting of intervention and control groups, a multiple-choice written test was administered to assess knowledge, and an OSCE was conducted to evaluate skills before the intervention. After completing a one-month training course with standardized teaching methods and faculty members for both groups, a post-test was conducted to evaluate knowledge and skills. The difference was that the intervention group was shown a trauma management instructional video one day before the exams. The results were then compared. To ensure educational fairness, the trauma management instructional video was made available to all students on DVD after the research was completed.

The quantitative and qualitative findings and results related to the variables were reported and described using central indices such as mean, standard deviation, and frequency percentage, as well as by subgroup analysis (intervention and control groups). The statistical tests used included the independent *t*-test, paired *t*-test, chi-square test, and multiple linear regression. Data management and analysis were performed using Stata 17 software, considering a significance level of $\alpha = 0.05$.

4. Results

In this study, a total of 87 medical intern students participated, with 44 randomly assigned to the intervention group (traditional training along with trauma management course in the emergency department using instructional videos) and 43 in the control group (receiving only traditional and conventional training). The majority of participants were female, accounting for 56.3% of the total. The mean age of the students was 21.52 ± 1.25 years. The two groups, intervention and control, were similar in terms of most demographic variables, with no significant differences observed. However, in the intervention group, there were more married students, with 31.70% being married, compared to 11.90% in the control group (P -Value = 0.04). The demographic characteristics are presented in [Table 1](#).

Prior to the intervention, no significant difference was observed in the mean ATLS knowledge scores

between the intervention group (12.09 ± 3.06) and the control group (13.01 ± 3.01), as determined by an independent *t*-test. This lack of significant difference was also observed in the mean ATLS skill scores between the two groups. The similar knowledge and skill scores before the intervention indicate the successful randomization and allocation of participants to the intervention and control groups ([Table 2](#)).

Data analysis using paired *t*-tests showed that the mean total knowledge and skill scores of all students improved after the intervention, regardless of the training method (conventional or enhanced with instructional videos), and this difference was statistically significant. This indicates the impact of trauma management training on the overall knowledge and skill scores of students, irrespective of the type of instructional method used. Specifically, the mean total knowledge score of students increased from 12.55 ± 3.06 before the intervention to 14.92 ± 3.14 after the intervention. Similarly, the mean skill score increased, with the population mean rising from 7.37 ± 2.54 to 9.69 ± 3.72 after the intervention ([Table 3](#)).

Analysis and comparison of the mean knowledge scores between the intervention and control groups after the implementation of the instructional methods (use of enhanced videos as a new intervention and conventional training method) showed no significant difference. In other words, the use of the new instructional method (videos) did not lead to a significant difference in the mean awareness and knowledge scores between the two groups. However, a significant difference was observed in the mean skill scores of the two groups after the intervention and training. The average skill score of the intervention group (using instructional videos) was approximately 2 points higher than the mean skill score of the students who received only conventional training for ATLS skills.

5. Discussion

This study aimed to determine the impact of an educational video on emergency trauma management (ATLS) on the knowledge and skills of medical students at Mashhad University of Medical Sciences in the years 2021 - 2022. The examination of results and data analysis indicated no significant difference in the average knowledge scores between the two groups; the use of the educational video did not lead to an increase in knowledge among the intervention group. This finding is consistent with the results of the study by Nourozi et al. (24), which showed that the educational video did not increase students' knowledge. However, it contradicts the findings of the research by Zare et al.

Table 1. Distribution of Demographic Variables of Participating Students in the Study, by Intervention and Control Groups^a

Variables	Control Group	Intervention Group	P-Value
Age	25.89 ± 9.0	25.56 ± 20.1	0.24
Cumulative GPA	16.79 ± 11.4	17.18 ± 24.3	0.65
Gender			0.19
Female	28 (63.6)	22 (51.2)	
Male	16 (36.4)	21 (48.8)	
Emergency units completed			0.24
< 4 units	6 (14.0)	10 (24.4)	
≥ 4 units	36 (86.0)	31 (75.6)	
Marital status			0.04
Single	37 (88.1)	28 (68.3)	
Married	5 (11.9)	13 (31.7)	
Residence status			0.81
Native (Mashhad)	28 (66.7)	29 (70.7)	
Non-native	14 (33.3)	12 (29.3)	

Abbreviation: SD, standard deviation.

^a Values are expressed as mean ± SD or No. (%).

Table 2. Comparison of the Average Scores of Students' Knowledge and Skills About Trauma Management in the Emergency Department Before and After the Intervention and Separately for the Intervention/Examination and Control Groups^a

Variables	Control Group	Intervention Group	P-Value
Average knowledge score	13.13 ± 1.3	12.12 ± 0.6	0.17
Average skill score	49.56 ± 2.2	50.07 ± 6.7	0.81
Average knowledge score (post)	81.15 ± 2.9	80.84 ± 3.3	0.01
Average skill score (post)	71.28 ± 3.3	67.10 ± 3.7	0.01

Abbreviation: SD, standard deviation.

^a Values are expressed as mean ± SD.

(25) regarding the impact of video-based education on students' learning outcomes.

Regarding the skill of trauma management in emergencies, the average scores of both groups of students showed a significant increase after the intervention, whether using the traditional method or the video. However, this increase was greater in the intervention group, with the average skill score of the intervention group (using the educational video) being approximately two points higher than the average skill score of the control group (traditional education). These results are consistent with the study by Ahmadi et al. (6) on the performance of nurses after ATLS training on a trauma simulator patient. Ghaffari Nejad et al. (26) also obtained similar results when investigating the role of video usage in teaching psychiatric symptoms to students in Kerman. On the other hand, Karimi-Moneghi et al. (23) demonstrated that watching a film is not as

effective as having a trainer in skill learning, although they did not use a combined approach in their study.

Various studies have shown that practical skills training during live and clinical sessions may present challenges, such as students not having sufficient visibility of the patient, differences between patients and environmental conditions, and the lack of uniformity in training among different groups of students. Therefore, for live training, conditions need to be provided to ensure equal learning opportunities for all students. The repeatability of videos prevents distraction and increases focus on the steps of the procedure, significantly enhancing individuals' performance and efficiency during work. It is considered one of the advantages of blended learning (27). Additionally, with less energy expenditure, a larger number of students can receive quality education. In contrast, in clinical demonstrations, due to overcrowding, long-standing periods, and fatigue, there

Table 3. The Relationship Between the Average Score of Knowledge and Skills with Demographic Variables of Students ^a

Variables	Knowledge Score	P-Value	Skill Score	P-Value
Gender		0.49		0.84
Female	71.14 ± 24.3		60.9 ± 40.3	
Male	18.15 ± 1.3		70.9 ± 90.3	
Marital status		0.21		0.90
Single	15.15 ± 21.3		70.9 ± 9.3	
Married	11.14 ± 93.2		47.9 ± 89.3	
Residence status		0.15		0.41
Native (Mashhad)	65.15 ± 96.2		21.10 ± 59.3	
Non-native	59.14 ± 21.3		47.9 ± 89.3	

^a Values are expressed as mean ± SD.

is undeniably a decline in enthusiasm and concentration. This issue contributes to students' boredom, lack of interest in the subject, and lack of focus (28).

Therefore, in the field of clinical education, the use of instructional videos appears to be effective even in the absence of an experienced instructor, facilitating the learning process and serving as a complement to traditional teaching methods. Additionally, this method can help reduce the high costs associated with practical classes, especially in underserved areas, and contribute to the equitable distribution of education among students, preventing disappointment and frustration (29).

A study conducted by Monjamed et al. suggested that, due to the shortage of mannequins in nursing schools and hospitals, CPR training can also be provided through instructional videos as an alternative method instead of practicing on mannequins (30). Therefore, another positive aspect of instructional videos is their accessibility, which is a significant advantage as it improves clinical skills even years after graduation (28).

Various studies have shown that without repetition and practice, confidence and proficiency in acquired skills are not sustainable (31). Alshafi et al. (32) stated in a systematic review that advanced trauma life support (ATLS) training significantly enhances trauma management knowledge, practical skills, trauma management organization, and identification of management priorities. However, the acquired knowledge and skills gradually decline after about six months and reach their lowest point after two years. Therefore, to ensure appropriate clinical decision-making by physicians in accidents and trauma cases, it is necessary to develop regular refresher courses to maintain ATLS knowledge and skills. It is recommended to provide instructional videos on the principles of

managing trauma to students and physicians across the country to facilitate access, considering the content relevant to trauma courses and to establish a unified approach in all universities.

One of the strengths of this study compared to similar studies was the creation of useful educational content in the form of an instructional video titled "ATLS" for the first time at Mashhad University of Medical Sciences. The positive impact of the instructional video as a complementary educational tool on the significant improvement of students' skills was demonstrated. Producing educational content in the field of trauma management saves time and provides easy access for learners and educators.

Another strength was the design of an OSCE exam with KFP rules to assess both the skills and clinical decision-making sequence of students in the Advanced Trauma Management course, which was implemented for the first time in the field of trauma in the country.

Among the limitations of this research, we can mention the small sample size due to the low number of students, the lack of internet access in all conditions, the need for electronic devices such as smartphones or laptops, and the requirement of additional time allocation for video viewing before the final exam.

Although no teaching method is absolutely superior to others, and each method may strengthen specific objectives while not fulfilling others, appropriately combining various teaching methods and revising existing methods utilizing updated educational technologies can help achieve and realize the goals of medical education.

5.1. Conclusions

The results of this study demonstrate that targeted multimedia educational interventions can effectively

enhance the clinical skills of medical students. Although ATLS is a recent development in Iran, there is a need to revisit traditional teaching methods and incorporate new integrated approaches to improve the skills of young physicians in medical education. Regular refresher courses can also be effective in maintaining their knowledge and skills.

Considering that the trauma team is involved in trauma patient care in medical training centers, a comprehensive and integrated educational program in advanced trauma management can significantly improve the performance of medical students, ultimately leading to better patient outcomes and reduced trauma-related complications. Additionally, the findings of this study can serve as a basis for further research on the implementation and evaluation of complementary educational methods.

5.2. Highlights

In the evolving landscape of medical education, the need for innovative teaching methods is paramount to equip future doctors with the skills required to manage complex medical scenarios effectively. This study includes several important points:

- Skill Enhancement: Implementing video-based trauma management training alongside traditional methods significantly improves the clinical skills of medical students, leading to better patient outcomes.
- Curriculum Development: Encouraging medical institutions to incorporate combined educational approaches ensures that future doctors are well-equipped with both theoretical knowledge and practical skills.
- Educational Innovation: Highlighting the importance of revising traditional teaching methods in favor of modern, evidence-based approaches to meet the evolving demands of medical education and improve the competency of new healthcare professionals.

5.3. Lay Summary

This study explored how to better train medical students to handle trauma cases, which are emergencies requiring quick, skilled action. We compared traditional classroom learning with a new method that combines classroom lessons with educational videos. Eighty-seven medical students participated and were split into two groups. We measured their knowledge and skills before and after the training. The group using the combined method showed greater improvement in their skills. This suggests that adding educational videos to traditional teaching methods can better prepare future

doctors for real-life emergencies, highlighting the need for modernizing medical education.

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Footnotes

Authors' Contribution: Study concept and design: F.R. Acquisition of data: F.R. AND B.R.K. AND M.H.F. Analysis and interpretation of data: M.S. Drafting of the manuscript: F.R. Critical revision of the manuscript for important intellectual content: F.R. AND S.A. AND A.M. Statistical analysis: M.S. Administrative, technical, and material support: S.A. AND A.M. Study supervision: S.A.

Conflict of Interests Statement: The authors have no conflict of interest.

Data Availability: The datasets used in this study can be obtained by contacting the corresponding author during the submission process or after the publication. Due to research ethics, the data are not publicly accessible.

Ethical Approval: The authors were committed to observe all ethical considerations in writing and performing. This study is approved under the ethical approval code of [IR.SBMU.SME.REC.1400.001](#).

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