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Evaluating the effect of the prehospital trauma life support (PHTLS) course on emergency medical services students' knowledge.

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Abstract

Background: Trauma in Saudi Arabia is a major public health problem with increasing rates of mortality and morbidity. The purpose of this study was to evaluate the effect of the PHTLS course on Emergency Medical Service (EMS) students at Prince Sultan bin Abdulaziz College for Emergency Medical Services (PSCEMS)/King Saud University (KSU).

Method: A quasi-experimental, control group design with pretest-posttest was used to analyze the knowledge of EMS students. A convenience sample of 101 students was used, and the students were randomly (systematic) assigned into two groups, with 51 EMS students in the experimental group and 50 EMS students in the control group.

Results: The pretest PHTLS knowledge mean scores of the EMS students who participated in this study were high (mean for the experimental group I, M=80.55 comparing to the mean for control group II, M=71.52), with no significant difference between the experimental and control groups. While the post-PHTLS scores were higher in experimental group I (86.27) than in control group II (71.60). These results indicate that the two groups had a comparable level of PHTLS knowledge before the implementation of the PHTLS course, but significant improvement in the experimental group after the course at $p \leq 0.05$.

Conclusion: The study indicates positive support to the implementation of the PHTLS course for EMS providers, including students. Future research recommends investigating the effect of PHTLS skills on the EMS students.

Keywords: Prehospital Hospital Trauma Life Support (PHTLS), Paramedic, Emergency medical services (EMS).

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Introduction

Trauma is the leading cause of mortality and morbidity in young age groups in Saudi Arabia with RTAs accounting for 80% to 85% of this trauma. Trauma in Saudi Arabia is a major public health problem with increasing rates of mortality and morbidity. The socioeconomic burden, depletion of human resources, the emotional and psychological stress on families, and the strain on healthcare facilities are also increasing. To minimize this impact, a national multidisciplinary trauma system has to be developed and implemented before it is too late to manage the further complexities of trauma in the future [1]. In the late 1990s, Ali et al. showed that, in less developed emergency medical services (EMS) systems, PHTLS improves skills and procedures and leads to a significant reduction of mortality. However, these results cannot be transferred to current and developed EMS systems. A Scandinavian observational study showed that PHTLS training is associated with a small reduction in mortality (the mortality risk was 4.7% (36/763) without PHTLS training and 4.5% (94/2067) with PHTLS training [2,3].

Ministry of Higher education in the Kingdom of Saudia Arabia has worked to reduce the number of fatalities by encouraging EMS educational programs in the majority of government and private universities; one of the governmental colleges is Prince Sultan Bin Abdullaziz College for Emergency Medical Services (PSCEMS), which graduates a large number of paramedics. The PSCEMS provides a number of specialized EMS courses, in addition to the curriculum that is strengthened by international accredited courses such basic and advanced cardiovascular Life support courses (BLS and ACLS) as well as PHTLS course https://pscems.ksu.edu.sa/en/vision_mission_n_values. Many articles

have demonstrated the contribution of PHTLS to the cognitive knowledge and manual skills of medical students and young physicians [3-6]. Furthermore, other studies concluded a simulated trauma care team training, especially PHTLS, is still popular and has succeeded in creating confident and knowledgeable participants [7,8]. Green and Kreuter concluded the Improvement of health knowledge has been linked in improving PHTLS health behaviors and lifestyles. However, unless a person is strongly motivated, he or she may not act on this knowledge to change behaviors or attitudes, which are difficult to measure and do not usually, change immediately after participation in health programs. The need of improving trauma care is evident, where trauma is statistically ranked as the number one killer in Saudi Arabia. Road traffic accidents (RTAs) account for 80% to 85% of these traumas.

PHTLS courses are provided and interestingly increasing worldwide. Specially, PHTLS courses are available in KSA, but health care providers are still not up to the desired standards for local and national needs. Furthermore, the Saudi Commission for Health Specialties, the licensing body in KSA, requires all emergency health care specialists or technicians have a valid PHTLS-ACLS in order to be licensed as the healthcare provider. On the other hand, Frank et al. [9] concluded in his study that PHTLS should be integrated into the curriculum at medical schools in Germany. Unfortunately, there has not been a study assessed the impact of PHTLS on students. The goal of this study was to evaluate the effect of the PHTLS course on Emergency Medical Services (EMS) students at PSCEMS. The following evaluation frame was adopted to present the process of assessment of the program, that is, when the objects under study are the "target behaviors and their predisposing, enabling and reinforcing antecedents, or influential environmental factors.

Methods

A quasi-experiment was used to study the EMS student groups. The experiment was set in one main classroom and four labs at PSCEMS at King Saud University in Riyadh, Saudi Arabia. There were a total of 101 subjects all of them males. A random (systematic) sample consisted of two groups with 51 EMS students in the experimental group and 50 EMS students in the control group.

The PHTLS was implemented in a 16-hour classroom course for the EMS students. Upon successful completion of the course, students receive a certificate of completion recognizing them as PHTLS providers for four years. The program is based on a philosophy that stresses treating the multi-system trauma patient as a unique entity with specific needs. PHTLS promotes critical thinking as the foundation for providing quality care. It is based on the belief that, given a good fund of knowledge and key principles, EMS practitioners are capable of making reasonable decisions regarding patient care. The course utilizes the internationally-recognized PHTLS textbook and covers the following topics: physiology of life and death, scene assessment, patient assessment, airway, breathing, ventilation and oxygenation, circulation, haemorrhage and shock, patients with disabilities and patient simulations.

Setting

PSCEMS is considered to be the first college that was established in the EMS field, and it is supposed to be one of the first specialized colleges in both the KSA and the Middle East to meet the growing need for EMS specialists. College of Prince Sultan Bin Abdulaziz for EMS at KSU aims to be a world-class college and a leader in promoting EMS. It also strives to meet the increasing demand for graduating EMS specialists with high standards and a high level of training. The PSCEMS also aims to contribute to the high standards in the EMS education. The program enables students to have access to specialized courses that are internationally accredited. They include Basic Life Support (BLS), Pediatric Advanced Life Support (PALS), Advanced Cardiac Life Support (ACLS), Advanced Medical Life Support (AMLS), Prehospital Trauma Life Support (PHTLS) and other courses in addition to instructor courses that enrich the students' skills so that they are prepared for the labor market. The setting was one main classroom and four labs at PSCEMS/KSU.

Study design

The pretest-posttest was used to evaluate the effectiveness of a PHTLS program on the EMS students. The control group was tested on the same day as the experimental group, and each group was given 45 minutes to complete the PHTLS written exam (a 50-item multiple choice questions). The permission to utilize this tool was granted from the tool's source. The 51 subjects who completed the standard PHTLS course (group I) were compared to a matched group who did not complete the PHTLS program (group II). Then the cognitive performance was reassessed by the 50-item multiple choice examinations. Knowledge scores were calculated by giving one mark for each correct response.

Data analysis

Data analysis was performed using SPSS software, Version 9.4. Descriptive statistics were performed first to summarize students, including summary tables. Then, a Pair t-test was used to compare the two groups. Difference at α=0.05 level were considered statistically significant.

Results

The results showed that Mean (stand. Dev. For control group was 1.746), and for experimental group was 1.372. More statistics (t-test) was done. The results was addressed that t-test (3.588, df, 49, sig 0.001), so it was interested to use more statistics like (Pearson test) (Tables 1-3).

Table 1. *Descriptive statistics.*

	N	Range	Minimum	Maximum	Sum	Mean		Std. Deviation	Variance
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic
Control Pretest	50	52	42	94	3576	71.52	1.746	12.346	152.418
Experimental	51	36	60	96	4108	80.55	1.372	9.799	96.013
Valid N (listwise)	50								

t-test

Table 2. *Paired samples statistics.*

		Mean	N	Std. Deviation	Std. Mean Error
Pair 1	Control Pretest	71.52	50	12.346	1.746
	Experimental	80.4	50	9.84	1.392

Table 3. *Paired samples correlations.*

		N	Correlation	Sig.
Pair 1	Control Pretest and Experimental	50	-0.235	0.101

The results showed that no significant correlation between both control and experimental groups before implemented the PHTLS subjects (pre-test) (Tables 4 and 5).

Table 4. *Paired samples test.*

Paired Differences							
Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
			Lower	Upper			
8.880	17.502	2.475	-13.854	-3.906	-3.588	49	0.001

Table 5. *Correlations.*

		Control pretest	Experimental
Control Pretest	Pearson Correlation	1	-0.235
	Sig. (2-tailed)		0.101
	Sum of Squares and Cross-products	7468.48	-1398.4
	Covariance	152.418	-28.539
	N	50	50
Experimental	Pearson Correlation	-0.235	1
	Sig. (2-tailed)	0.101	
	Sum of Squares and Cross-products	-1398.4	4800.627
	Covariance	-28.539	96.013
	N	50	51

The results showed that no significant correlation between both control and experimental groups before implemented the PHTLS subjects (pre-test).

Experimental Group/PHTLS

Number of participants: A total 51 males are taken and experiment is conducted (Table 6).

The Pearson's Skewness Coefficient for the pretest was 0.06, and the Pearson's Skewness Coefficient for the posttest was -0.2. The histogram illustrates that the two variables were normally distributed. We used a paired t-test to analyze the pre-posttest results because both variables (pretest, posttest) were calculated on a ratio scale and were normally distributed (Figure 1).

Table 6. *Group I statistics.*

Statistics			
		Pretest scores	Post test scores
N	Valid	51	51
	Missing	0	0
Mean (%)		80.55	86.27
Median 9%)		80	88
Std. Deviation		9.799	8.149
Minimum (%)		60	62
Maximum (%)		96	100

The results lead to the conclusion that knowledge scores after taking PHTLS were significantly higher than knowledge scores before taking PHTLS. The students gained an average of 5.725 points after completing the program. This gain is statistically significant at $p \leq 0.05$, where the p value was 0.009 (Table 7).

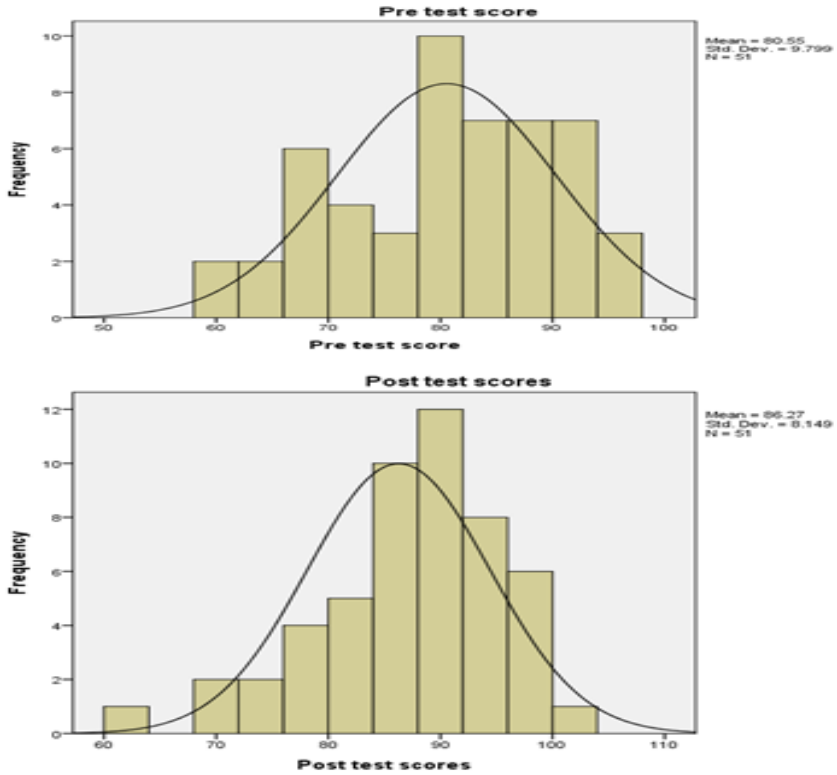

Figure 1. *Group I.*

Table 7. *Paired samples test for group I.*

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pair-test scores	-5.725	15.121	2.117	-9.978	-1.473	-2.7	50	0.009

Control Group/PHTLS

Number of participants: 50 males

The Pearson's Skewness Coefficient for the pretest was -0.04, and the Pearson's Skewness Coefficient for the posttest was -0.04. As the above histogram shows, the two variables were normally distributed (Figure 2). We used a paired t-test to analyze the pre-and posttest results because both variables (pretest, posttest) were calculated on a ratio scale and were normally distributed. It can be concluded that the knowledge score without taking the PHTLS educational program was not statistically significant at $p \leq 0.05$. The p value was 0.888 (Tables 8 and 9).

Table 8. *Control group*

		Control pretest PHTLS	Control posttest PHTLS
N	Valid	50	50
	Missing	5	5
Mean (%)		71.52	71.6
Median (%)		72	72
Std. Deviation		12.346	11.285
Minimum		42	44
Maximum		94	92

An analysis of the results indicated that there was no difference in the mean pretest and posttest knowledge scores for students who did not complete the PHTLS course.

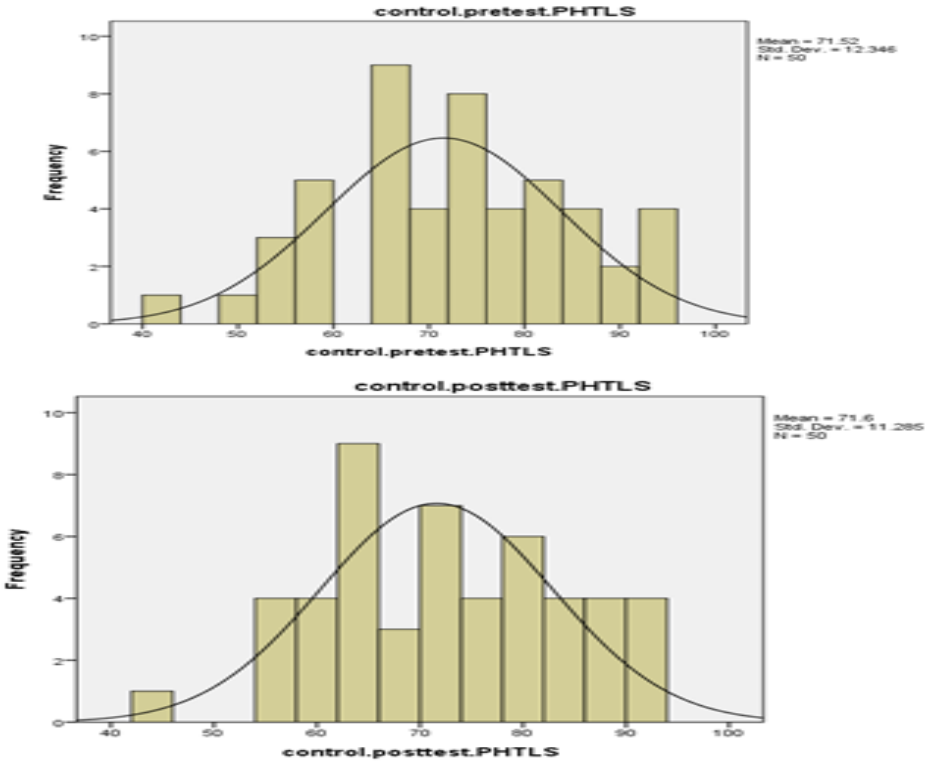

Figure 2. *Group 2.*

Table 9. *Paired samples test.*

Paired Differences							
Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		T	df	Sig. (2-tailed)
			Lower	Upper			
-0.080	3.999	.566	-1.217	1.057	-0.141	49	0.888

Discussion

EMS providers face different types of response, including trauma cases and therefore it is necessary to provide high quality of services to patient. This study was to evaluate the effect of the PHTLS course on EMS students. The study specifically was used a summative evaluation to assess the effect of the PHTLS course on EMS students' knowledge at college level. The study can help to emphysize the need of such a course to improve the quality of prehospital trauma services and to determine the better possible approaches to apply to prehsopital services. The study concluded that the students who participated in the courses were significantly higher knowledge than before participating the course and even then those who did not join the course from other group. The results showed that no significant correlation between both control and experimental groups before implemented the PHTLS subjects (pre-test). Sig. (2-tailed) for control andexperimental groups was 0.101.

The students gained an average of 5.725 points after completing the program. This gain is statistically significant at $p \leq 0.05$, where the p value was 0.009. It can be concluded that the knowledge score without taking the PHTLS educational program was not statistically significant at $p \leq 0.05$. The p

value was 0.888. The study emphasizes the positive differences that the course can be added to students' knowledge in terms of dealing with pre-hospital trauma services. The study result is consistent with other studies that show the importance of taking the PHTLS course for health care providers, where participants became confident and more knowledgeable treating trauma patients. But what make the study unique was offering opportunity for EMS students to participate in the study.

The PHTLS course is mainly designed to provide well-structured procedures to save and decrease any further damage to trauma patients in the field of the pre-hospital services. This study can be great indication to succeed and advance the quality of pre-hospital trauma service. Specially, the students showed the progressive difference before and after participating in the course and also with those who did not join the course. The example of Swedish ambulance provides a great support to our study as Swedish ambulance providers help decrease in mortality rates in out of hospital medical care after joining the PHTLS courses [10]. High rates of RTAs have appeared as an important public health issue in KSA [11]. This indicates this study lend positive support to the implementation of the PHTLS course for healthcare providers. New thing in the study was including EMS students in the course. In additional, the PHTLS courses are highly needed in KSA as it is not applied in many health institutions and places.

Conclusion

The study indicates positive support to the implementation of the PHTLS course for EMS students. Future research recommends investigating the effect of PHTLS skills on the EMS students.

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