Evaluation of Effectiveness of Simulation-Based Basic Life Support Training Among the First Year Medical Students

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Abstract

Background: Cardiovascular disease is the first and foremost cause of morbidity and mortality worldwide. Cardiorespiratory arrest is fatal without resuscitation. BLS is the foundation for saving lives after cardiac arrest. An integral part of BLS is effective Cardiopulmonary resuscitation. In this regard, it is important for the medical students to learn and perform cardiopulmonary resuscitation effectively. For this student will undergo simulation-based CPR training. We conducted this study to know about the existing knowledge BLS among medical students and then evaluated the impact of simulation based BLS with the help of mobile application training by conducting written and practical tests.

Aim: The aim of the study was to evaluate the knowledge and technical skills of first year medical students in providing BLS, after undergoing the simulation based BLS training with the help of mobile application.

Methodology: A total of 150 first year undergraduate students of First year MBBS, of both sexes, were included in this experimental study. Patients were randomized into two groups with computer generated random allocation number, namely Group A-75 students (mobile application with traditional video-based learning) and Group B 75 students (traditional video-based learning). A self-administered, pre-tested questionnaire was given, a pre-test and post-test along with a practical skill assessment. The data were analyzed using the statistical package for the social sciences version 22.0 - paired *t*-test and multiple regression analysis. Feedback was collected from the participants whether BLS training was helpful with the help of 5-point Likert scale with rating.

Results: A total of 150 students were participated with 69 males and 81 females. There was a statistically significant difference between pre-test and post score in terms of compressions per cycle, average depth of compressions, compressions in 2minutes between two groups.

Conclusion: Introducing a mobile application in the traditional video-based learning with simulation training is an effective innovative and interesting teaching learning method.

Keywords: Cardiopulmonary Resuscitation, Cardiovascular Disease, Simulation Training, Questionnaire

Background

The primary objectives of teaching Basic life support (BLS) are learning the order of steps correctly in according to international guidelines and acquiring the necessary psychomotor skills for its proper application in cardiac arrest victims. Basic life support (BLS) is an important procedure given to the patients in severe life-threatening emergencies to keep them alive until the specialists arrive[1,2]. Administering BLS early enough increases the survival rate in cardiac arrest victims[3]. Cardiopulmonary resuscitation (CPR) also has a role, to restore partial flow of oxygen to the brain and heart[4].While CPR alone cannot restart the heart. In hospitals are supposed to have a doctors with highly competent in providing BLS and CPR, not leaving the medical students since they are going to become a medical experts in future[1]. However, this is not so as "many junior doctors and nurses are not competent in carrying out effective CPR," thus endangering the lives that they should be saving[1].With this background, we carried out this study, to assess the knowledge about BLS among medical students and whether if simulation-based BLS training with the help of mobile application can create an impact on improving their knowledge and skills.

Methodology

After getting approval from the institutional ethical committee, the study was conducted. This study was done in august 2021. This prospective randomized (pre and post-test evaluation study), comparative study included 150 first year MBBS students. Patients were randomized into two groups with computer generated random allocation number, namely Group A-75 students (mobile application with traditional video-based learning) and Group B75 students (traditional video-based learning). Before data collection, Informed written consent was obtained from every participant and confidentiality of all responses was maintained throughout the study. The enrolled students were coached prior to the sessions and given any additional educational resources. The students were asked to answer the pre-test questions followed which, BLS training was given using detailed power point lecture class, video demonstration followed by simulation using mannequins along with Q- CPR mobile application to Group -A and same methodology of teaching and training was given except mobile application to Group-B. Once the training and simulation over, the students were asked to write the post-test immediately along with OSCE. Data was collected using structured questionnaire with information regarding the basic demographic factors, knowledge regarding the BLS resuscitation algorithm,

Statistical Analysis

The entire data was collected and entered into Microsoft Excel sheet and analyzed using SPSS version 22.0. for description of data, we used frequency and percentages among descriptive statistics. Paired t-test has been used. For analysis paired t-test has been used. $P < 0.0001$ was considered to be statistically significant. Multiple regression analysis was performed to test the pre-test scores significantly predicted post-test scores. To assess the knowledge about BLS, a pre-tested questionnaire based on BLS was used. The scoring was done using 5 point Likert scale with rating, based on the options the student selected. Scores ranging from 1 to 5 were given based on the type of statement.

Feedback was collected from the participants as to whether the BLS Training was useful and whether mobile application along with traditional video based BLS hands-on training had improved their psychomotor skills. The scoring was done using 5 point Likert scale with rating.

Results

The objective assessment of students after both teaching methods with pre-test and post-test shows significant improvement in post score. It shows a significant improvement in mobile app with traditional group (A) when compared with traditional group (B)

Table 1: Objective Assessment of Students after both Teaching Methods

Group	Pre-Test	Post Test	P Value (Paired T Test)
A-MOBILE APP+TRADITIONAL	3.173±0.151	7.320±0.126	P<0.0001
B- TRADITIONAL	3.027±0.159	6.533±0.148	P<0.0001
P-VALUE (UNPAIRED T TEST)	P<0.0001	P<0.0001	

Table 2: Skill Assessment of Students after both Teaching Methods

Group	Compression Per Cycle	Average Depth of Compression	Total No of Compressions In 2 Minutes
A-MOBILE APP+TRADITIONAL	26.95±0.329	2.426±0.0279	223.5±1.577
B- TRADITIONAL	19.52±0.187	1.966±0.019	169.5±1.566
P-VALUE (UNPAIRED T TEST)	P<0.0001	P<0.0001	P<0.0001

The skill assessment of students shows a significant improvement in mobile app with traditional group (A) when compared with traditional group (B) in terms of compressions per cycle and average depth of compressions.
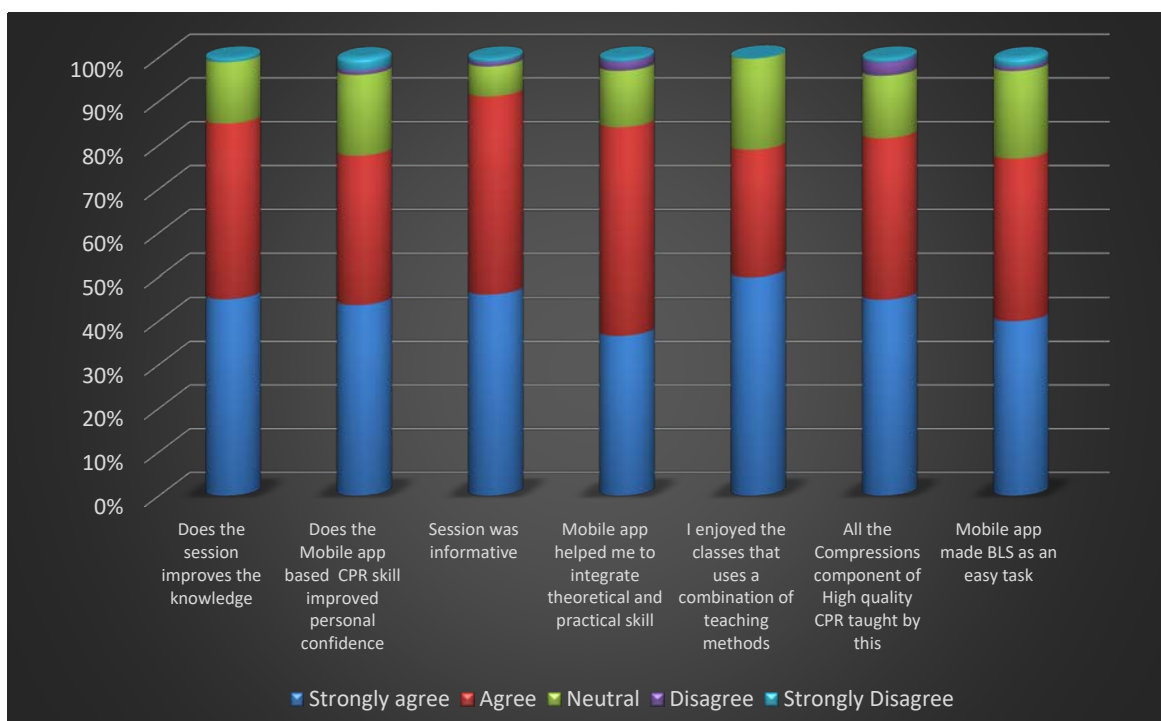

Figure 1: Feedback on Learners Perceptions about Teaching Method on 5 Point Likert Scale with Rating (% of Students)

Discussion

Our study involved 150 medical students, out which 69 male and 81 female belonging to first year MBBS, in the age group ranging between 18 and 21 years were participants. Pre-test and post-test BLS scores were analyzed along with practical skills, from which it was found that simulation-based teaching along with mobile application on BLS has an impact on improving the performance skills of the medical students. It was found that the training and simulation received was the same in both male and female medical students.

From the results it shows that when we introduce mobile application with traditional teaching method, the students were able to improve their performance in giving compression per cycle and also the average depth of compressions (table 2). This is because they were able to see the feedback immediately with mobile app. Hence in subsequent CPR cycle they were able to increase the compression rate and average depth of compressions significantly.

We did feedback on learner's perception about the introduction of mobile application in the teaching method using Likert 5 point scale (table 3). It also shows 70% to 80% of students perceived the mobile application was helpful in integrating the theoretical and practical skills effectively, and able to improve their knowledge.

Several studies have shown that medical students fall short of the required standards for successful resuscitation[5,6]. A recent study was assessing competence in BLS, found that more than half of the medical students did not know how to assess the airway, after checking for safety and calling for help[7]. In our study also, we found that the students did not know the correct steps to assess for airway, after checking for safety and calling for help. In a previous study, it was observed that the average compression rate of student participants in simulation was below the ideal BLS guidelines[8]. There could be several factors such as lack of adequate knowledge and poor training will result in incompetence. In our study also, we found the same scenario, but corrective steps were taken by the students based on the feedback indications given by the mannequins and also by the mobile application data there by helping in ensuring high-quality CPR which is crucial to resuscitation. It has been proven beyond doubt that ideal compression rates improve survival following resuscitation[9]. It has been seen that feedback devices, according to the CPR parameters led to vast improvement in CPR skills when compared with no feedback[10]. In our study, we had used mannequins with mobile applications which provided feedback during CPR training, and the students were able to give correct depth of compressions, which is vital in BLS. Studies have shown that medical students who taught BLS skills to others, had better practical skills compared to students who only underwent conventional training, in view of more interaction[11]. Repetition of these essential skills is done by the participants themselves, and this has shown to improve the retention of CPR skills[12].In one study they found that the critical role of CPR training in ensuring the students' progress to competent and confident responders in the event of a cardiac related emergency[13].

Hence innovative and interesting teaching BLS helps to acquire and retain the knowledge to perform the BLS Skills more effectively.

Conclusion

Introducing a mobile application in the traditional method of BLS training is an effective, innovative and interesting teaching learning method. It helps to retain the knowledge and able to perform the BLS

Skills more effectively than with the traditional method of learning BLS.

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