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A Comparative Analysis of Self-Efficacy in Low Fidelity Vs High Fidelity Simulation Post Advanced Cardiac Life Support (ACLS) Sessions on Cardiac Arrest Algorithm amongst EMS Students of Pune, India

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Abstract

Background: Self-efficacy is a personal characteristic believed to increase an individual's abilities to be successful in a task. Self-efficacy, as defined by Albert Bandura is a "belief" that one possesses the requisite skills to do what is needed to reach a successful outcome."

Cardiac arrest is one of the most common emergencies encountered by EMTs in real clinical world, hence self-efficacy in such a situation is of paramount importance. Self-efficacy is composed of two key components i.e. satisfaction and confidence in one's own abilities.

Objective: The objective of the study is to compare self-efficacy reported by EMS students after

ACLS protocol on cardiac arrest algorithm using High fidelity vs low Fidelity simulation.

Methodology: Hundred PGDEMS students were chosen for the study by convenience sampling. The students were divided into two groups of fifty each after matching for age, sex and previous course grades.

Both groups were taught ACLS protocol on Cardiac Arrest Algorithm by classroom teaching over a four hour session conducted on two days.

The students were provided with a standardized and pretested "Student Satisfaction and Self- Confidence Learning Questionnaire consisting of 13 items (5 items on Satisfaction and 8 items on Self Confidence in learning). Each item was rated on a 5 point Likert Scale.

Discussion: The students in HFS group found the High Fidelity methodology to be more helpful and effective. Also the students reported greater enjoyment during the simulation activity on the High Fidelity manikin.

In terms of confidence, the HFS group reported statistically significant higher scores in 6 out of the 8 items on the questionnaire.

Conclusion: The findings of the study favor the use of High Fidelity Simulation (HFS) as the preferred methodology to teach cardiac arrest algorithm to EMS students.

Keywords: *High Fidelity Simulation (HFS), Low Fidelity Simulation (LFS), Emergency Medical Services (EMS)*

Background

Self-efficacy is a personal characteristic believed to increase an individual's abilities to be successful in a task. Self-efficacy, as defined by Albert Bandura is a "belief" that one possesses the requisite skills to do what is needed to reach a successful outcome."[1]

Self-efficacy is a very important trait required in Emergency medicine as Emergency Medical Technician

(EMT) has to respond to complex unpredictable situations in an extremely short period of time.[2]

The Post Graduate Diploma in Emergency Medical Services (PGDEMS) trains medical professionals in the basics of Emergency Medical Services (EMS).These students are taught life saving skills which help them provide medical aid even before the patient reaches the hospital. Currently EMS students are taught with the help of part-task trainers, a form of Low Fidelity Simulation (LFS) wherein students engage in problem based learning with the help of case studies. In recent years High Fidelity Simulation (HFS) using hi-tech manikins and dynamic clinical scenarios are being utilized to teach EMS students.[3]

A study by Massoth et.al[4] (2019) concluded that simulation based training has evolved into an indispensable tool in medical education. Simulation can nurture self-efficacy with the necessary motivation to create behavioral shifts that might positively influence the individual, team and patients. A study conducted by Hoadley Theresa et.al[5] (2009) showed a positive correlation between enhanced practice and learning using HFS but no significant correlation was found between the posttest and skills test scores obtained in the students of the two groups.

Another study conducted by Stellflug SM et.al6 (2017) concluded that HFS in critical emergencies increases Health Care Providers (HCPs') ability to recall valuable knowledge that can positively impact patient's outcomes.

A study by Cynthia A Blum et.al7 (2010) indicated an overall improvement in self-confidence and competence among nursing students trained on simulation. Another study by Morfoot et.al8 (2018) concluded that self-efficacy, or the belief in one's ability to succeed, is a commonly cited outcome of simulation training and can influence confidence, achievement and performance.

Cardiac arrest is one of the most common emergencies encountered by EMTs in real clinical world, hence self-efficacy in such a situation is of paramount importance. Self-efficacy is composed of two key components i.e satisfaction and confidence in one's own abilities.9

Objective

The objective of the study is to compare self-efficacy reported by EMS students after ACLS protocol on cardiac arrest algorithm using High fidelity vs low Fidelity simulation.

Methodology

Hundred PGDEMS students were chosen for the study by convenience sampling. The students were divided into two groups of fifty each (Low Fidelity simulation group and High Fidelity Simulation group) after matching for age, sex and previous course grades.

Both groups were taught ACLS protocol on Cardiac Arrest Algorithm by classroom teaching over a four hour session conducted on two days.

On the day of simulation session, students of both groups were further divided into batches of ten each. The Low Fidelity Simulation group was given a case scenario of Cardiac arrest on a part task trainer (LFS) while the High Fidelity Simulation group was given a simulated case scenario of cardiac arrest designed on High Fidelity Manikin. Each simulation session lasted for fifteen minutes.

The students then underwent a focused debriefing of five minutes after each simulation session. On completion of debriefing, the students were provided with a standardized and pretested "Student Satisfaction and Self- Confidence Learning Questionnaire consisting of 13 items (5 items on Satisfaction and 8 items on Self Confidence in learning). Each item was rated on a 5 point Likert Scale. The questionnaire's Cronbach's alpha for Satisfaction is 0.94 and for self- confidence is 0.87

The data collected was tabulated and analyzed for significance in difference of means using two-tailed t - test on Statistical Package for Social Sciences (SPSS) v23.

Results

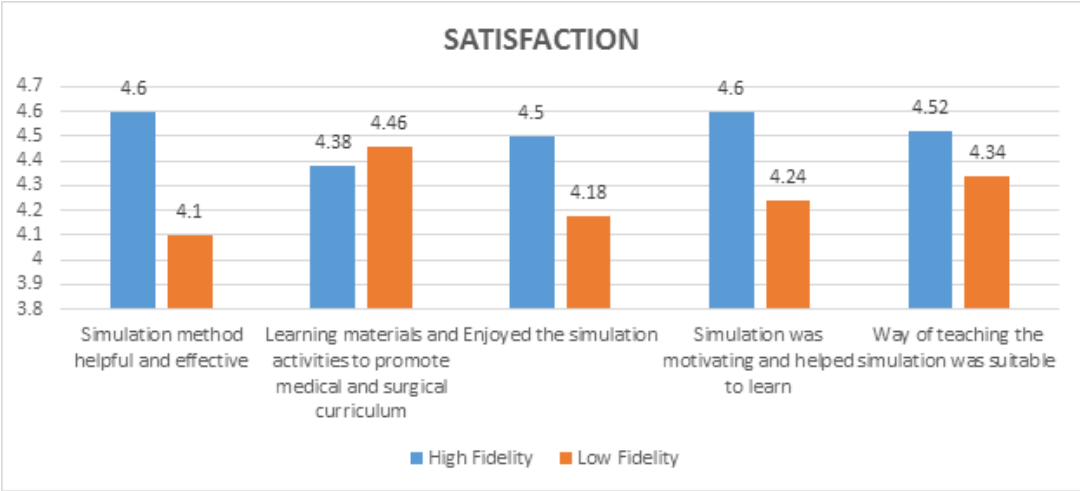

Figure 1.

The above Figure 1. depicts the comparative total mean scores obtained on the 5 items of satisfaction questionnaire by the two groups of students with High Fidelity vs low Fidelity simulation. The High Fidelity group gave higher satisfaction scores on all items except the one pertaining to the variety of learning materials and activities used during simulation.

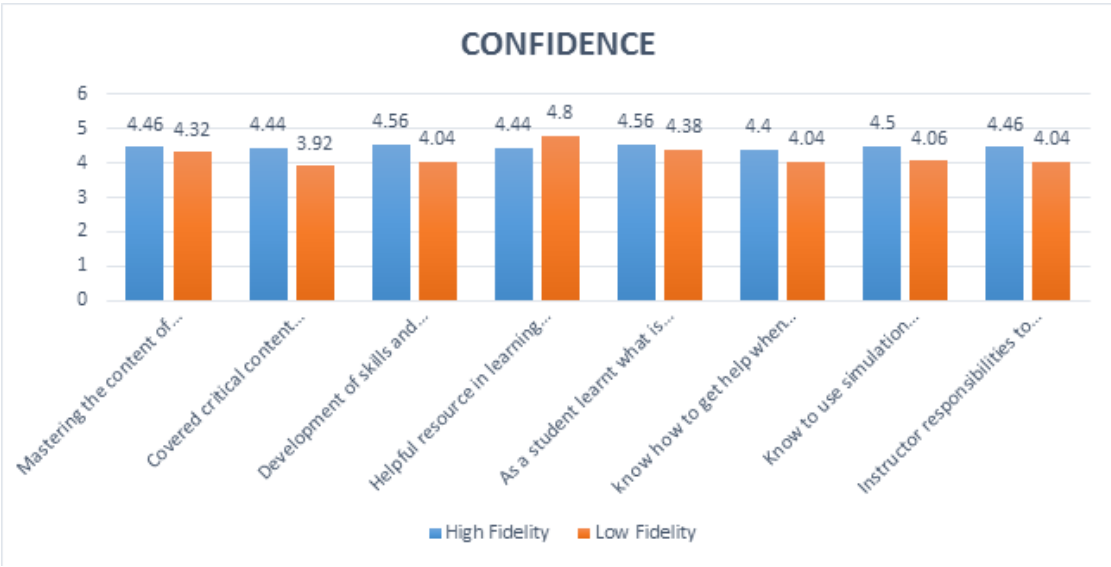

Figure 2.

The above Figure 2. depicts the comparative mean score obtained in the 8 items of self -confidence questionnaire by the two groups of students. The High Fidelity Simulation (HFS) group exuded greater confidence in all parameters except the one pertaining to the resourcefulness of the techniques in learning simulation.

Table No 1: p value for 13 items of Student Satisfaction and Self Confidence in Learning Questionnaire:

Satisfaction	**p Value**
Teaching methods used in simulation helpful and effective	0.00004*
Promote learning the medical and surgical curriculum	0.59
Enjoyed the simulation	0.006*
Teaching materials used in simulation was helpful and effective	0.14
Way the simulation taught was suitable	0.24
Confidence	
Mastering the content of simulation activity	0.00002*
Simulation covered critical content necessary for the mastery of medical and surgical curriculum	0.00002*
Developed skills and obtained required knowledge from simulation to perform necessary task in clinical settings	0.00002*
helpful resource to teach the simulation	0.0001*
Responsibility as a student to learn what is needed to know from simulation activity	0.09
To get help when didn't understand the concepts covered in simulation	0.002*
To use simulation activities to learn critical aspects of these skills	0.0001*
Instructor responsibilities to tell what is needed to learn out of simulation content	0.0008*

*indicates significance

Discussion:

The study aimed to compare the self-efficacy after a cardiac arrest reported by EMS students after a cardia arrest algorithm on Low Fidelity Simulation (LFS) vs High Fidelity Simulation (HFS). In terms of satisfaction, 2 items on the questionnaire showed statistical difference between the two groups.

The students in HFS group found the High Fidelity methodology to be more helpful and effective. Also the students reported greater enjoyment during the simulation activity on the High Fidelity manikin. It is essential that students enjoy a learning activity in order to increase the retention of knowledge and to motivate the students to participate in further learning activities.

In terms of confidence, the HFS group reported statistically significant higher scores in 6 out of the 8 items on the questionnaire. The students agreed that coverage of critical content necessary for mastering the topic of cardiac arrest algorithm was achieved better with high Fidelity technique. The HFS group considered High Fidelity as a better alternative for developing skills and obtaining knowledge on the subject. The students also felt more confident regarding the utility of simulation activities in learning, role of facilitation and instructor's responsibilities in HFS.

Interestingly the LFS group reported greater confidence in attributing simulation as a helpful resource in learning.

This finding indicates greater comfort zone shown by students to LFS as they are routinely exposed to the technique during the course. HFS being a new technique shall need more frequent exposure to be considered as a truly precise and helpful resource.

Conclusion

The findings of the study favor the use of High Fidelity Simulation (HFS) as the preferred methodology to teach cardiac arrest algorithm to EMS students. A single session positively impacted confidence and satisfaction thereby boosting the self-efficacy of EMS students. Repeated sessions of HFS for various emergencies can further augment self-efficacy among students. This can be explored in future research.

Ethical Clearance – IEC, SIU

Source of Funding - Nil

Conflict of Interest - Nil

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