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Utility of High Fidelity Simulation Training in Improving Adherence to Critical Actions During Cardiopulmonary Arrest

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Abstract

Introduction: Cardiopulmonary resuscitation (CPR) is emerging as a viable rescue strategy for refractory out-of-hospital cardiac arrest. Effective CPR implementation requires intensive and repetitive training foe Emergency Medical Service (EMS) providers. Adherence to ACLS protocols throughout an event is associated with increased revival rate of cardiac arrest patients. Using high fidelity simulation for BLS ACLS training improves the quality and confidence of EMS providers, students to abide by the AHA guidelines.

Objective: To utilize high fidelity simulation training in improving adherence to critical actions during cardiopulmonary arrest.

Methodology: A high fidelity manikin was utilized to create four unique clinical simulation scenarios based on cardiac arrest. 80 students of the Post Graduate Diploma in Emergency Medical Services (PGDEMS) program participated.

Each simulation session lasted for approximately 10 minutes followed by structured debriefing lasting for 20 minutes. The video recorded sessions were analyzed by two independent facilitators to avoid bias.

At the end of 8 week period, the students underwent post intervention simulation session structured in the same format as the pre-intervention session.

Result: The study focused on critical performance steps to be followed as per AHA 2015 guidelines.

Discussion: As per AHA 2015 guidelines, there are some critical performance steps to be followed while giving Basic Life Support (BLS) to a cardiac arrest patient. These steps if followed correctly, not only provide help to the patient immediately but also increase the chance of survival of the patient.

The drastic increase in the total score obtained from pre-intervention to post-intervention underscores the importance of regular simulation sessions, to inculcate better assessment practices in a safe and non-threatening environment.

Conclusion: Though participants performed the critical actions and managed the scenarios as per AHA 2015 guidelines, few actions, which superficially seemed to be insignificant were not performed.

Keywords: *cardiac arrest, critical actions, performance measures, CPR*

Introduction

Cardiopulmonary resuscitation (CPR) is emerging as a viable rescue strategy for refractory out-of-hospital cardiac arrest. Effective CPR implementation requires intensive and repetitive training foe Emergency Medical Service (EMS) providers. A study in the U.S. has shown that limited training of emergency medicine providers is a barrier to widespread implementation.[1]

EMS providers and resident doctors do not always apply proper resuscitation guidelines in hospitals.

Hence, there is a need for continuing training in basic and advanced resuscitation for all according to the guidelines.[2]

The American Heart Association (AHA) Advanced Cardiac Life Support (ACLS) algorithms are the standard of care for patients suffering from cardiac arrest. Adherence to ACLS protocols throughout an event is associated with increased revival rate of cardiac arrest patients.[3]

Correctly following ACLS protocol has improved post – code mortality but institutions should train EMS providers in implementing ACLS protocols to improve revival of patient.[4]

Along with proper implementation of ACLS protocols and guidelines, non-technical skills including leadership, communication skills, adaptability, handling stress etc. are responsible for successful and effective resuscitation.[5]

For improving and developing updated guidelines regularly, it is necessary to conduct research on resuscitation, based on cases who were treated as per the existing AHA guidelines.[6]

As a result, the lack of organized simulation practice results in deficient knowledge and skills because of deliberate practice. Using high fidelity simulation for BLS ACLS training, improves the quality and confidence of EMS providers and students to abide by the AHA guidelines. Numerous studies have shown that high fidelity simulation should be utilized for deliberate practice of students.[7]

Objective

To utilize high fidelity simulation training in improving adherence to critical actions during cardiopulmonary arrest.

Methodology

A high fidelity manikin was utilized to create four unique clinical simulation scenarios based on cardiac arrest i.e. Ventricular Fibrillation (VF), pulseless Ventricular Tachycardia (pVT), Asystole and Pulseless Electrical Activity (PEA). The scenarios underwent dry run by facilitators before the student sessions. 80 students of the Post Graduate Diploma in Emergency Medical Services (PGDEMS) program participated in the study. The students were initially taught the assessment and management of cardiac arrest through didactic lecture method and case study discussions. For the pre-intervention simulation session, the students were divided into eight groups and prebriefed on the features of high fidelity simulation manikin and the background of their respective cases. Informed consent was taken from students to record the sessions.

Each simulation session lasted for approximately 10 minutes followed by structured debriefing lasting for 20 minutes. The video recorded sessions were analyzed by two independent facilitators to avoid bias. The student groups were rated on 15 assessment parameters as per AHA 2015 guidelines. The maximum score that could be obtained by a group was 15. The shortcomings of these students were discussed during debrief.

Over the next 8 weeks, students were trained on various cardiac arrest scenarios using High fidelity simulation. Each simulation training session lasted for four hours and the students were provided real time feedback on their performance on various critical actions to be taken in a cardiac arrest scenario. At the end of 8 week period, the students underwent post intervention simulation session structured in the same format as the pre-intervention session. Critical actions performed were again recorded for the 4 case scenarios during the test. The pre-intervention vs post-intervention data was tabulated and analyzed for difference in means.

Result

The study focused on critical performance steps to be followed as per AHA 2015 guidelines.

The pre and post intervention values have been tabulated below:

Table 1: Critical actions performed (Pre-intervention vs Post-intervention)

Cardiac rhythm	Mean of Number of Critical actions performed (Pre-intervention)	Mean of Number of Critical actions performed (Post-intervention)
Ventricular fibrillation	8.5	13
Pulseless Ventricular tachycardia	8.5	14
Pulseless Electrical Activity	6.5	11
Asystole	7.5	11.5

Table 2: Mean Score

	Mean Score obtained
Pre intervention	5.2
Post intervention	12.3

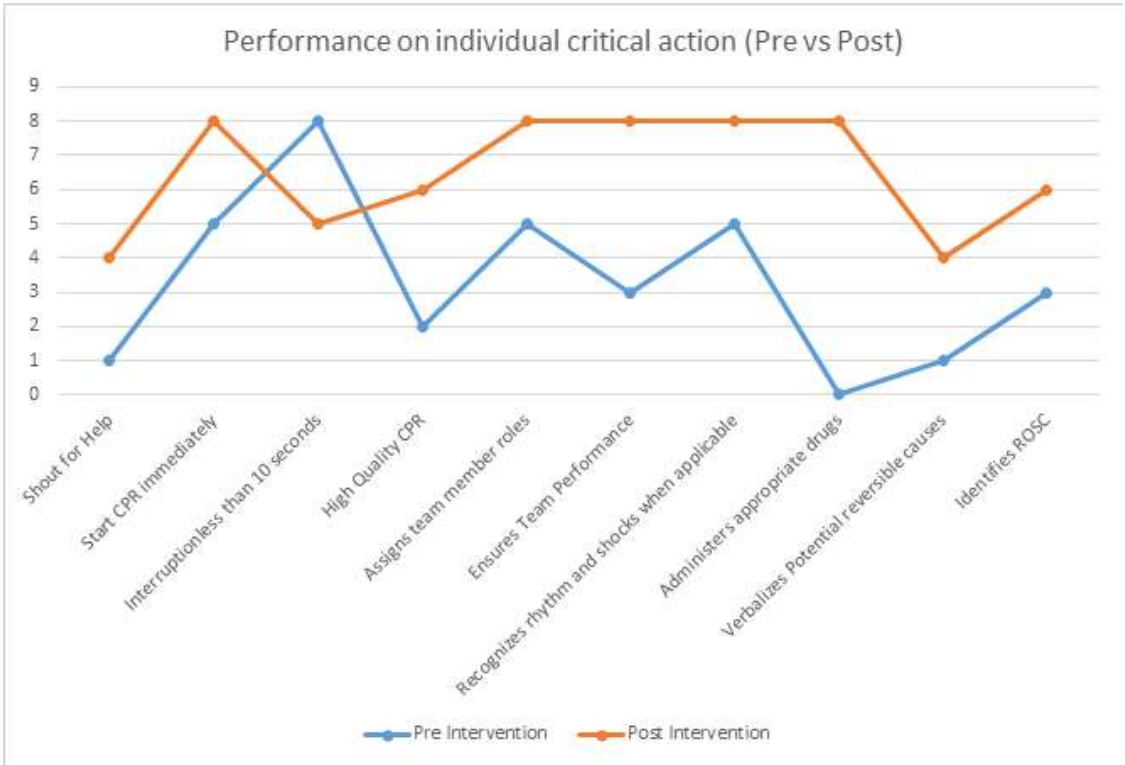

Figure 1: Performance on individual critical action

Discussion

As per AHA 2015 guidelines, there are some critical performance steps to be followed while giving Basic Life Support (BLS) to a cardiac arrest patient. These steps if followed correctly, not only provide help to the patient immediately but also increase the chance of survival of the patient.

The critical steps have been categorized under Assessment, Team Leader and Management.

During pre-intervention session, during assessment of clinical simulation scenario majority of the groups failed to perform "shout for help" step when cardiac arrest was recognized. But for post intervention four groups out of eight performed the step. It is important to perform this step to initiate chain of survival and for additional help to arrive.

For a Team Leader, steps like ensuring high quality CPR at all times, assigning team member roles and ensuring that team members perform well are critical. During pre-intervention session, only two out of eight groups ensured high quality CPR at all times, but improvement was observed in the post intervention sessions. The team leader from all groups assigned team member roles in pre –intervention as well as post – intervention test. During pre-intervention session, 5 out of 8 groups did not monitor the team members' performance but significant improvement was seen in post intervention session.

During the pre-intervention session the students performed poorly in areas of intervention including maintaining appropriate cycles of drug-rhythm check/ shock CPR, administrating appropriate drugs and doses, verbalizing potential reversible causes (H's and T's). This was found to be corrected in the post intervention session. The drastic increase in the total score obtained from pre-intervention to post-intervention underscores the importance of regular simulation sessions, to inculcate better assessment practices in a safe and non-threatening environment. High Fidelity Simulation sessions offer a chance to provide real time feedback on the critical actions that are required to be preferred during cardiac arrest. Simulation also allows to create a variety of clinical scenarios on cardiac arrest to acclimatize students to possible real clinical simulation.

Conclusion

Though participants performed the critical actions and managed the scenarios as per AHA 2015 guidelines, few actions which superficially seemed to be insignificant were not performed.

EMS students should have proper understanding and knowledge regarding each critical action to be performed in a cardiac arrest. There is a need for more research to study the Human Factor in case of cardiac arrest using High fidelity simulation.

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