

High-Fidelity Simulation versus Case-Based Discussion for Teaching Bradyarrhythmia to Emergency Medical Services Students

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Abstract

Introduction: Bradyarrhythmias are a common clinical finding yet can be life-threatening in certain situations. Accordingly, diagnosis and prompt intervention remain the cornerstone of effective management of bradyarrhythmia. The study compares the two methods by assessing improvement in knowledge acquisition using pretest, posttest, and satisfaction survey with the teaching pedagogy. **Materials and Methods:** A randomized control trial of simulation-based teaching compared with case-based discussion was conducted among Postgraduate Diploma in Emergency Medical Services students. The students anonymously filled out pretest, posttest, and a satisfaction questionnaire composed of six statements in three domains (quality of instruction, debriefing, and overall satisfaction). The statements were rated using a 10-point scale. Test results were compared using *t*-test for equality of means of independent samples. **Results and Discussion:** All 40 students selected completed all the steps of the study. Knowledge improvement from pretest to posttest was observed in both teaching methods derived using paired sample *t*-test ($P < 0.05$). However, no significant difference was observed while comparing improvement scores of posttest versus pretest between both the groups. Mean satisfaction score of simulation group was significantly higher at 8.40 compared to case-based group which was at 7.87. Satisfaction survey showed marked significance ($P = 0.03$) for simulation-based teaching. **Conclusion:** As a single intervention, simulation-based teaching is superior to case-based discussion in terms of student satisfaction but remains similarly effective in terms of knowledge acquisition.

Keywords: Bradyarrhythmias, debriefing, high fidelity, simulation

INTRODUCTION

Bradyarrhythmias are a common clinical finding yet can be life-threatening in certain situations. Clinical presentation varies from asymptomatic electrocardiogram finding to a wide range of symptoms such as syncope, dyspnea, or nonspecific symptoms such as dizziness or fatigue.

The Postgraduate Diploma in Emergency Medical Services (PGDEMS) trains medical professionals in the basics of emergency medical services (EMS) in line with the norms and standards of Los Angeles Paramedical Institute, USA.

These students are taught basic life support, airway management, intubation techniques, cardiac case scenarios, arrhythmia recognition, emergency drugs, use of defibrillator, spinal immobilization, triage, and other life-saving skills.

Timely provision of medical aid by such adequately trained and qualified personnel, even before the patient reaches the

safety of hospital, can spell the difference between life and death. Such trained personnel will be sent with ambulance to the site where EMS is required to provide in-transit life support.

The Advanced Cardiac Life Support (ACLS) course covers respiratory emergency, four types of cardiac arrest (ventricular fibrillation [VF]/ventricular tachycardia, pulseless electrical activity [PEA], and asystole), four types of prearrest emergencies (stable and unstable bradycardia, stable and unstable tachycardia, and acute coronary syndromes), and stroke. As much as practical in the small-group format, the

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cases follow a specific sequence so that each case reinforces the knowledge and skills learned in the preceding cases: respiratory arrest, simple VF, complex VF, PEA, asystole, acute coronary syndromes, tachycardias, and ischemic stroke.

PGDEMS students need to be well equipped in diagnosing and managing bradyarrhythmia as this is a common case profile that they shall encounter in their professional life. The American Heart Association (AHA), ACLS protocol for bradyarrhythmia, is an international standardized algorithm of management.

Accordingly, diagnosis and prompt intervention remain the cornerstone of effective management of bradyarrhythmia. Students of PGDEMS have been traditionally taught bradyarrhythmia by case-discussion method.

A high-fidelity manikin offers a greater degree of realism and allows for deliberate practice and better tools for real-time diagnosis and monitoring. High-fidelity simulators can be used to simulate real case scenarios, and the simulation process can proceed in certain flow depending on the intervention of the student. This IF-THEN approach provides a platform for the student to understand the consequence of misstep in real time.

With the advent of high-fidelity simulation, a new pedagogy is available for teaching. The study compares the two methods by assessing improvement in knowledge acquisition using pretest, posttest, and satisfaction survey with the teaching pedagogy.

A review article published by Zigmont *et al.*^[1] in April 2011 provided a theoretical foundation for using simulation to change practice and improve patient outcomes. Several international studies have attempted to compare simulation-based teaching versus traditional instruction in medicine.

A randomized control trial by Gordon *et al.*^[2] in 2006 on simulation-based teaching versus lecturing concluded that difference in clinical performance cannot be established by a single instructional session.

A study by Lo *et al.*^[3] in 2011 concluded that students demonstrated greater ACLS knowledge initially with high-fidelity training compared to traditional training. However, both the groups performed similarly after a period of 1 year.

However, a systematic review and meta-analysis by Cook *et al.*^[4] in 2012 reported that although simulation was more expensive than nonsimulation instruction for health professional learners, yet it was associated with small-to-moderate positive effects in terms of knowledge and skill acquisition. Very few studies have explored student satisfaction for both modalities of instruction. Ten Eyck *et al.*^[5] and Couto *et al.*^[6] in separate studies in 2009 and 2015 respectively concluded that simulation-based instruction was associated with greater student satisfaction.

The present study aims to explore the impact of single intervention high-fidelity simulation versus case-based discussion on knowledge acquisition and student satisfaction.

Objective

The objective of this study was to compare high-fidelity simulation versus case-based discussion for teaching bradyarrhythmia as per the ACLS protocol of AHA for PGDEMS students as assessed by a knowledge-based pretest, posttest, and survey of satisfaction with the two methods.

MATERIALS AND METHODS

Simulation-based teaching was compared with case-based discussion among the 40 students of PGDEMS using a pretest, posttest, and satisfaction survey.

The pretest was composed of 10 multiple choice questions (MCQs) to test the knowledge of students on the theme of bradyarrhythmias. Based on the result of the pretest, the students were divided into two groups with each group having students with same scores as that of the other group. Group 1 students experienced simulation-based teaching of bradyarrhythmias and Group 2 students experienced case-based discussion of bradyarrhythmias. The teaching activity lasted 45 min for each group and was conducted by the same trainer to avoid trainer bias. The activity was followed by posttest of the same 10 MCQs. The students also anonymously filled out a satisfaction questionnaire composed of six statements in three domains (quality of instruction, debriefing, and overall satisfaction). The statements were rated using a 10-point scale with a score of 1 indicating least satisfaction and 10 indicating maximum satisfaction.

Test results were compared using *t*-test for equality of means of independent samples.

The mean results were specifically compared in each group for the improvement in posttest versus pretest. The satisfaction survey results were analyzed for each statement as well as overall satisfaction score using the paired samples *t*-test. The models used for analysis were present in the Statistical Package for the Social Sciences (SPSS) version 23 (IBM, Bengaluru, Karnataka India).

RESULTS AND DISCUSSION

All the 40 students selected completed all the steps of the study.

- i. As shown above in Figure 1, knowledge improvement from pretest to posttest was observed in both simulated-based teaching and case-based discussion, derived using paired sample *t*-test. However, no significant difference was observed while comparing the improvement scores of posttest between both the groups ($P = 0.08$).
- ii. As shown in Figure 2, a high degree of satisfaction was reached with both methods. Mean satisfaction score of simulation-based teaching group was significantly higher at 8.40 compared to case-based discussion which was at 7.87. Satisfaction survey showed marked significance ($P = 0.03$) for simulation-based teaching which was derived using paired *t*-test.
- iii. As shown in Figure 3, within the individual domains

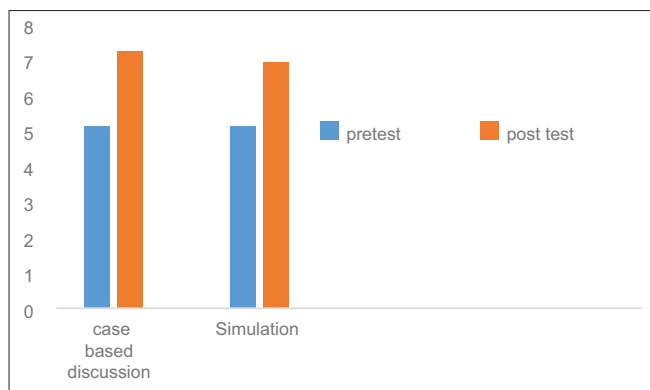


Figure 1: Knowledge improvement (pretest vs. posttest)

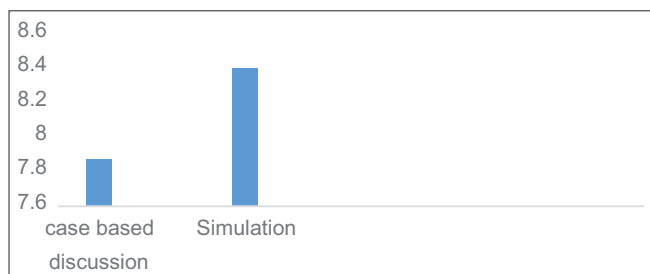


Figure 2: Satisfaction survey (simulation vs. case-based discussion)

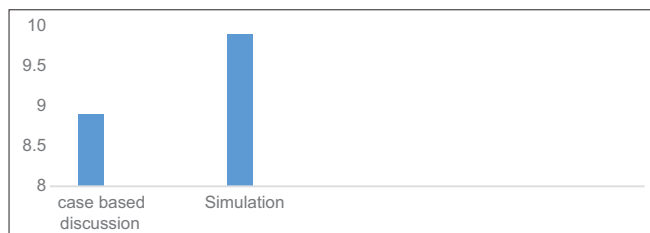


Figure 3: Satisfaction survey for debriefing

of satisfaction, the satisfaction score was found to be significantly higher in the domain of debriefing in simulation-based teaching as derived by a paired

t-test ($P = 0.008$). This finding holds significance because debriefing is the keystone of high-fidelity simulation.

CONCLUSION

As a single intervention, simulation-based teaching is superior to case-based discussion in terms of student satisfaction but remains similarly effective in terms of knowledge acquisition. Simulation-based teaching showed a higher satisfaction score in the domain of debriefing as compared to that of case-based discussion. Studies measuring the impact of multiple interventions of simulation need to be carried out to better understand the difference in knowledge acquisition.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Zigmont JJ, Kappus LJ, Sudikoff SN. Theoretical foundations of learning through simulation. *Semin Perinatol* 2011;35:47-51.
2. Gordon JA, Shaffer DW, Raemer DB, Pawlowski J, Hurford WE, Cooper JB, *et al.* A randomized controlled trial of simulation-based teaching versus traditional instruction in medicine: A pilot study among clinical medical students. *Adv Health Sci Educ Theory Pract* 2006;11:33-9.
3. Lo BM, Devine AS, Evans DP, Byars DV, Lamm OY, Lee RJ, *et al.* Comparison of traditional versus high-fidelity simulation in the retention of ACLS knowledge. *Resuscitation* 2011;82:1440-3.
4. Cook DA, Brydges R, Hamstra SJ, Zendejas B, Szostek JH, Wang AT, *et al.* Comparative effectiveness of technology-enhanced simulation versus other instructional methods: A systematic review and meta-analysis. *Simul Healthc* 2012;7:308-20.
5. Ten Eyck RP, Tews M, Ballester JM. Improved medical student satisfaction and test performance with a simulation-based emergency medicine curriculum: A randomized controlled trial. *Ann Emerg Med* 2009;54:684-91.
6. Couto TB, Farhat SC, Geis GL, Olsen O, Schwartsman C. High-fidelity simulation versus case-based discussion for teaching medical students in Brazil about pediatric emergencies. *Clinics (Sao Paulo)* 2015;70:393-9.