Does simulated training improve medical students' knowledge on cardiac life support? A study comparing simulated versus traditional teaching at the International Medical University

Thiruselvi Subramaniam[1], Rosalind Chi Neo Loo[2], Sangeetha Poovaneswaran[3]

Abstract

Background: At the International Medical University (IMU), a half day cardiac life support teaching session was provided to fourth year medical students which included training on the use of the defibrillator machine, how to handle cardiac or respiratory arrest and drugs used for resuscitation. A new CLS (cardiac life support) training session was introduced and increased to a one-day course where students were given practical training first, which included 5 stations (airway equipment, mega codes, drugs for resuscitation, defibrillator use and cardiac rhythm identification) , MCQ (multiple choice questions) test and a mega code (practical)assessment.
Objective: To evaluate the students' knowledge on cardiac resuscitation after a change in the delivery of the cardiac life support training (CLS).

Methodology: Group I, consisted of 82 students taught using the traditional teaching and Group II consisted of 77 students taught using hands on simulation. The students in both groups had an online manual to read prior to the session, were given an identical written exam six months after the CLS training. Group II, however, had an online pre-test.

Results: There was a statistical difference in the final mean marks between the two groups with group II scoring higher (67.3) than group 1 (62.1). No significant marks difference was noted between male and female students for both the cohorts.

Conclusion: There is a significant difference in medical students' knowledge when cardiac life support is taught using simulation. IMU has adopted the new teaching method with simulated training for the cardiac life support courses with plans to implement higher fidelity and technology to the existing simulated teaching in other areas of medicine.

IeJSME 2014 8(3): 4-8

Keywords: basic life support (BLS), cardiac life support (CLS), cardiac resuscitation, mega codes, simulation, manikins

Introduction

Cardiac Life Support (CLS) training is a critical component of undergraduate teaching. The training helps to develop an organized thinking process in the students. Most universities, including the International Medical University (IMU), conduct the basic life support course for the undergraduates during the early pre-clinical phase.[1] There are studies showing that there is lack of confidence among the junior doctors when resuscitating a collapsed patient that needs to be addressed.[2,3,4,5] Initially, at IMU during the fourth year, students used to participate in a half-day session on advanced life support which included training on the defibrillator machine, handling an arrest situation and drugs for resuscitation. The student number at each station was about eight to ten and a lecturer would teach and demonstrate over a thirty minute period. Students then practised on manikins under supervision. Not all students had the same level of learning or interest to participate and we did note in our case, that not all students actively participated and there appeared to be no drive to read and prepare for the course. This can probably be attributed to the absence of assessment at the end of the session.

Keeping this in mind, a new and more structured cardiac life support training (CLS) session was introduced. We made it a one day session where students were given practical training first, then underwent an assessment. The new session included an online pre-test, one lecture, a video demonstration followed by 4 skills stations (airway equipment, mega codes, drugs for resuscitation, defibrillator usage and rhythm identification). Students were then assessed on knowledge and clinical skills using a MCQ test consisting of 20 questions and a mega code session (practical application). The objective of the study was therefore to evaluate the students' knowledge of cardiac resuscitation after a change in delivery of the cardiac life support training (CLS) in the university.

[1]Department of Anaesthesia, Seremban Clinical School, International Medical University , Jalan Rasah, Seremban, 70300, Negeri Sembilan, MALAYSIA, [2]Clinical Skills Unit, Seremban Clinical School, International Medical University , Jalan Rasah, Seremban, 70300, Negeri Sembilan, MALAYSIA, [3]Department of Internal Medicine, Seremban Clinical School, International Medical University , Jalan Rasah, Seremban, 70300 Negeri Sembilan, MALAYSIA

Address for Correspondence:

Dr Thiruselvi Subramaniam, 334, Bukit Rasah, 70300, Seremban, Negeri Sembilan, MALAYSIA.

Email: thiruselvi_subramaniam@imu.edu.my

Methods

This is a cross-sectional comparative study conducted on two groups of semester 9 (final year) students belonging to 2 different batches (one semester apart) that had completed cardiac life support training in the 8th semester (Year 4). Each group went through training in semester 8 and was assessed six months later in semester 9.

Group I consisted of students who were exposed to the older, more traditional teaching techniques over half a day. Group II included students who went through a structured one day training using a high fidelity manikin. Though the skills stations were similar for both groups, delivery of the training was different for group II. Group I never had any assessment but it was introduced in the form of MCQ and mega code for Group II. Group II had to pass 20 MCQ questions and the mega code. The mega code consisted of clinical scenarios on cardiac emergencies (cardiac arrest, bradyarrhythmia and tachyarrhythmia). Assessment for mega code was made using a checklist based on the algorithm in the American Heart Association guidelines, advanced cardiac life support (ACLS).

Group I's training was such that they went through three stations (drugs, arrhythmia interpretation and mega code demonstration) with a lecturer at each station. The lecturer would teach and demonstrate first, and then the students would practise under the lecturer's supervision. Student participation at the stations were limited with more teacher oriented learning. The whole training session took two and a half hours.

Group II had, as an introduction, a lecture and a video demonstration followed by 30 minutes skills stations; (airway and ventilation, defibrillator, drugs and mega code) that had a lecturer who demonstrated and then guided the students' with hands-on practice. The sessions were followed by a demonstration on the right and wrong way of managing cardio respiratory collapse using high fidelity manikin, with the lecturers and nurses playing the role of patients and health care workers. The details of the difference between the two groups are tabulated in Table 1.

The students in both groups had an online manual to read prior to attending the training session but Group II had an online MCQ pre-test (10 questions) prior to attending the training session. Both groups were given a written exam with 20 MCQ six months after the CLS training (end of semester 9). The questions were identical for both the groups. The results were analyzed using Chi square test.

Results

Table 1 summarizes the differences in delivery between Groups I and II while Table 2 shows the comparison of mean marks between the 2 groups. There was a statistical significant difference in the final mean marks between groups I and II whereby Group II which underwent the new revised programme had a higher score ($p=0.031$, CI -10.04 to -0.49).

Table 3 shows the comparison of mean marks between male and female students. There was no significant difference in the mean marks between male and female students for both the groups ($p > 0.01$).

Table 1: Differences in delivery between Groups I and II

Group	Class C	Total
Read Manual on CLS prior to course	Yes	Yes
Lecture	No	Yes
Online Pre-course test	No	Yes
Video	American Heart Association (AHA) ACLS guidelines	American Heart Association (AHA) ACLS guidelines
Stations	3 (drugs, manikin & ECG interpretation)	4 (drugs, manikin, defibrillator use with ECG interpretation & airway management)
Demonstration	No	Yes
Duration	Half day	One day
Assessment	None	Yes (mega code & MCQ)

Table 2: Comparison of mean marks between Groups I and II

Group Final Marks	N	Mean	Std. Deviation	95% Confidence Interval	P value
I	82	62.1	14.9	-10.04 to -0.49	0.031*
II	77	67.3	15.6		

Table 3: Comparison of mean marks between gender.

Group	Gender	N	Mean	Std. Deviation	95% Confidence Interval	P value
I	Male	43	59.8	15.5	-11.36 to 1.67	0.143
	Female	39	64.6	14.0		
II	Male	36	70.7	13.8	-0.67 to 13.28	0.076
	Female	41	64.4	16.6		

Discussion

Most universities in our country, including ours, conduct basic life support (BLS) training during the undergraduate training.[7] When students undergo training for the first time during their pre-clinical period it is a new learning experience and most tend to forget the experience. A repeat of the exposure is definitely necessary as they enter the clinical phase of medical learning to reinforce and conceptualize what they have learnt before. The question we ask ourselves is how much training do the students need at undergraduate level? Will they be able to process the more advanced knowledge, interpretation and management components of advanced life support training? It does not seem daunting if we build on what has already been taught in the pre-clinical period. Perhaps introduction of the learning in a spiral manner, always there but with increasing complexities will help to enforce and maintain competency in resuscitation by the time students graduate. The best teaching delivery to enhance learning is important and hands-on training has been shown to be more effective in improving BLS skills and knowledge.[6]

There are many problems when it comes to learning to manage an acute condition in a real life patient. A patient suffering in pain will not look kindly upon students taking turns to examine and learn at the expense of their discomfort, what more a cardiac crisis. What better way to learn and develop clinical skills without distressing a patient than using simulation? Students are able to gain competence, confidence and learn to integrate their clinical skills in a safe environment. They can afford to make mistakes and have the luxury of repeating as many times as it takes to achieve desired competency.[7] Simulation using high and low fidelity manikins was used considerably while teaching Group II. They had to perform resuscitation on the manikins based on the scenarios provided and were assessed individually as well as a team. The assessment component introduced in the course for Group II motivated them to read and practise before coming for the mega code assessment. The assessment we believe played a major role in the improved outcome rather than the teaching stations alone.

A study carried out on teaching induction of anaesthesia to medical students, comparing between full scale simulation and supervised teaching in the operating theatre showed that students performed better when tested after simulated teaching than traditional teaching. The simulation group performed better in 25% of the tasks. Furthermore, with the same time and number of teaching personnel, five or six students are being trained on the simulator compared with one student in the operating theatre.[8, 9]

Cardiac life support (CLS) is just one of the many skills that can be taught in this manner. Students can learn to perform routine technical procedures using low to high fidelity simulation. After having learnt these techniques, the same students can be tested on their skills after a period of time.[10] Competency assessment is an important part of outcome based learning and simulation technology is a good tool. Competence in multiple domains; patient safety, patient care, medical knowledge, professionalism, communication skills and system based practice can be evaluated.[11]

The Best Evidence Medical Education (BEME) group did a systematic review on features and uses of high-fidelity medical simulations that lead to effective learning, reviewing data over a span of 34 years (1969 to 2003). They concluded that though improvements are needed, high - fidelity medical simulations are educationally effective and simulation–based education complements medical education in patient care settings.[12]

Another study, similar to ours was carried out on trauma patient management where final year students were randomly assigned to two groups, one group exposed to simulated trauma patient models and the other to an older programme without simulated teaching. Post-test scores were found to be increased after both the old and new programmes but the increase for the new programme was statistically significant, clearly indicating that

simulated trauma patient models improved both trauma skills and knowledge.[13] These results were similar to our study where Group II did better in their MCQ assessment six months after they were exposed to the new teaching delivery using high fidelity simulation.

We found no significant difference in mean marks between male and female students for both the cohorts ($p > 0.01$) suggesting that there is no relationship between gender and knowledge acquired after a change in teaching delivery.

A limitation with our study is that the students assessed with the new programme (Group II) were not from the same group as the old programme (Group I) though the MCQ questions attempted were the same. Another limitation is the varied learning experiences students have had over the six months after their course and this may also influence the study outcome as well.

Conclusion

There is an improvement in medical students' knowledge when cardiac life support is taught after the restructuring of the teaching delivery, using simulation and introducing end of course assessment. As a result, our university has adopted the new teaching method using simulation for the cardiac life support courses with plans to implement higher fidelity and technology to the existing simulated teaching in other areas of medical teaching.

A feedback from the students who have graduated and joined the workforce will provide added information about the effectiveness of providing the cardiac life support during the clinical phase of medical education.

REFERENCES

1. Osman A, Norsidah AM. Teaching of Basic Life Support in the undergraduate medical curriculum. Med J Malaysia Dec 1997; 52(4): 399-401.
2. Chew KS, Mohd Hashairi F, Ida Zarina Z, Shaik Farid AW, Abu Yazid MN, Nik Hisamuddin NAR. A Survey on The Knowledge, Attitude and Confidence Level of Adult Cardiopulmonary Resuscitation Among Junior Doctors in Hospital Universiti Sains Malaysia and Hospital Raja Perempuan Zainab II, Kota Bharu, Kelantan, Malaysia. Med J Malaysia 2011; 66 (1): 56-9.
3. Price CS, Bell SF, Janes SE, Ardagh M. Cardio-pulmonary resuscitation training, knowledge and attitudes of newly-qualified doctors in New Zealand in 2003. Resuscitation 2006; 68: 295-9.
4. Sachithanandan A. Cardiopulmonary Resuscitation: An Essential Skill not only for Junior Doctors but Medical Undergraduates and Para Medical Staff. Med J Malaysia 2011; 66(3): 282.
5. Avabratha KS, Bhagyalakshmi K, Ganapathy P, Varadaraj SK and Sanjeeva RB. A study of the knowledge of resuscitation among interns. Al Ameen J Med Sci 2012; 5(2): 152-6.
6. Chaudhary A, Parikh H, Dave V. Current Scenario: Knowledge of basic life support in medical college. National Journal of Medical Research Oct – Dec 2011; 1(2): 80-2.
7. Ziv A, Wolpe P, Small S, Glick S. Simulation – based medical education: an ethical imperative. Acad Med 2003; 78: 783-8.
8. Hallikainen J, Vaisanen O, Randell T, *et al*. Teaching anaesthesia induction to medical students: comparison between full scale simulation and supervised teaching in the operating theatre. European J Anaesth 2009; 26 (2): 101-4.
9. O'Flynn S; George S. Simulation in undergraduate medical education. European J Anaesth 2009; 26 (2): 93-5.
10. Lachapelle K. Teaching technical skills using medical simulation: a new frontier. Malaysian J Med 2007; 10 (2):149-51.
11. Scalese RJ, Vivian T, and Issenberg SB. Simulation technology for skills training and competency assessment in medical education. J Gen Intern Med 2007; 23 (Suppl 1): 46-9.
12. Issenberg SB, McGaghie WC, Petrusa ER. Features and uses of high-fidelity medical simulations that lead to effective learning: a BEME systematic review. Medical Teacher 2005; 27 (1): 10–28.
13. Ali J, Adam RU, Sammy I *et al*. The simulated trauma patient module – Does it improve student performance? J Trauma 2007; 62: 1416–20.
14. Phillips PS, Nolan JP. Training in basic and advanced life support in UK medical schools: questionnaire survey. BMJ 2001; 323: 22-3.