JRMI
Journal of Rehman Medical Institute
Volume 3, Nos. 3-4
July - December 2017
www.jrmi.rmi.edu.pk

ORIGINAL ARTICLE

Peer Tutoring With Simulations in Undergraduate Medical Students to Teach Basic Life Support: A Randomized Controlled Educational Trial

Afshan H Khattak, Farhat R Malik, Murtaza Rahman Khan, Khadija Noor, Fatima Noor, Jalwa Javed Farooqi, Owais Muddassir, Fariha Ali Khan, Zayed Naser

Submitted:
May 15, 2017
Accepted:
June 10, 2017

Author Information

From: Peshawar Medical College, Warsak Road, Peshawar 25160, Pakistan.

Dr. Afshan H Khattak, Chairperson, Society for Undergraduate Medical Research, Ex-Director, Medical Research at PRIME Foundation, Associate Professor of Pediatrics & Neonatology. (Corresponding Author) Email: palwasha.bibi@gmail.com

Dr. Farhat R Malik, Associate Professor of Community Health Sciences.

Medical Students: *Murtaza Rahman Khan, Khadija Noor, Fatima Noor, Jalwa Javed Farooqi, Owais Muddassir, Fariha Ali Khan, Zayed Naser*

Citation: Khattak AH, Malik FR, Khan MR, Noor K, Noor F, Farooqi JJ, et al. Peer tutoring with simulations in undergraduate medical students to teach basic life support: a randomized controlled educational trial. J Rehman Med Inst. 2017 Jul-Dec;3(3-4):5-10.

ABSTRACT

Introduction: Basic Life Support (BLS) is an important part of healthcare training conducted in small and interactive group format; however, hiring BLS instructors is costly. Peer tuition is an old technique, now being formalized to teach BLS. Role of junior peer tutors is not reported in the literature.

Materials & Methods: A single blind, randomized controlled educational trial to measure tutee performance after peer tuition versus conventional tuition in BLS was undertaken at Peshawar Medical College from December 2016 to March 2017. Pre-clinical students were trained as peer tutors. Students from all MBBS years were voluntarily enrolled in a course of BLS; 177 students were randomized into experimental, (n=87, peer tutors) and control, (n=90, conventional teaching). Pre and post-test, knowledge and skill scores were recorded for each group. SPSS Version 21 was used for descriptive statistics; paired samples t-test was applied to detect significant differences in performance, keeping $p \leq 0.05$ as significant.

Results: Pre-test scores were not significantly different between groups. Test group showed significant improvement in post-test scores over pre-test scores for both clinical and pre-clinical students, ($p<0.001$). Control group did not show improvement for pre-clinical students. Clinical students showed significant improvement in control group as well.

Conclusion: BLS can be safely and effectively taught to pre-clinical medical students in small groups by junior peer tutors having BLS training.

Keywords: Basic Life Support, Peer Tuition, Peer Assisted Learning, Undergraduate Medical Education.

The authors declared no conflict of interest. All authors contributed substantially to the planning of research, data collection, data analysis, and write-up of the article, and agreed to be accountable for all aspects of the work.

INTRODUCTION

Cardiac arrest is a leading global cause of out-of-hospital mortality. The most important determinant for survival is the presence of an individual to perform Cardio-Pulmonary Resuscitation (CPR).[1] Results from multiple global survival registries show that survival is dependent on availability of either a health professional, who can apply resuscitation skills adapted to different circumstances or lay people trained in Basic Life Support (BLS).[1,2] BLS is taught to all medical undergraduates during the orientation week in Peshawar Medical College. They go through refresher courses at regular intervals during pre-clinical and clinical years. The standard of American Heart Association, (AHA) is followed with format of short talk or video lectures, (developed by faculty), followed by hands-on practice on CPR dolls (Resusci-Annie QCPR or Resusci-Baby QCPR) in the Skill Lab. Hiring certified instructors to teach life support skills is expensive. Besides financial burden, sufficient time allocation to teach students in small group format is difficult with large number of students. These issues led educationists to search for alternatives to certified instructors.[3] Medical students form a willing and active group that is trainable and can further train their peers.[3,4]

Peer tuition or Peer Assisted Learning has been defined as "the development of knowledge and skill through active help and support among status equals or matched companions".[5] The mutual exchange of learning, among peer tutors and tutees, makes peer tuition a novel and attractive idea in medical education, especially learning of skills. Skill labs and simulated case scenarios are relatively newer and unexplored avenues in medical education. Such resources are used to teach skills at a comparatively better and efficient resource allocation compared with conventional trained instructor teaching groups of students in classrooms.[6]

Peer tutoring has been implemented and studied in medical education in the USA, for last several years.[5-7] Effectiveness and usefulness of peer tutoring is proven and well-described in the west.[5,6] Peer tutoring is known to positively associate with performance in practical and written examinations.[7] Besides improving exam performance, peer tutoring plays an effective role in lowering individual anxiety and increased understanding and satisfaction with subject content being taught.[8] Buddy groups, senior Mentors and near-Peer-Tutors help in establishing a mutual social support system.[9] Enhanced professional and personal development is the additional benefits of pairing of senior and junior undergraduate students.[10] Role modeling by near-peers constitutes an important part of the "affective" or "attitudinal" learning outcomes achieved through peer tuition.[11] Systematic reviews report that objective educational outcomes of peer tutoring in cognitive domain include expansion of clinical reasoning skills and clinical decision-making skills reflected by increased academic measurement scores.[12]

Peer tutoring is well studied with "Near-Peer Tutors" or "Senior-Peer Tutors"; however, no studies with junior peer tutors were found. Quantitative as well as qualitative data supports the notion that peer tutors benefit from peer tuition as much as their peer tutees.[13]

BLS is a subject area that is covered in most pre-medical courses and entry level medical students in our institution are also required to train and get certified as BLS Providers. The research question was "Can junior peer tutors perform as well as certified instructors in teaching BLS to senior peers?"

With this background in mind, a randomized controlled educational trial was designed to compare acquisition of knowledge and skills of BLS between undergraduate medical students tutored by junior peer tutors versus conventional BLS Instructors.

MATERIALS & METHODS

This was a single-blind randomized controlled trial conducted at Peshawar Medical College from December 2016 to March 2017. Trial protocol (Figure-1) was approved by Institutional Ethical Committee for Undergraduate Medical Research.

First year medical students were invited to volunteer for training to become peer tutors. They were briefed about peer tutoring lessons and BLS in a thirty-minute tutorial. Informed consent was obtained in writing and students were enrolled as trainee peer tutors. They were given direct hands-on training in Skills Lab by a certified instructor, supplemented by practice and feedback sessions. Peer tutors received thirty hours of training in Skills Lab over a one-month period (Table-1).

Table-1: Skill Stations for Peer Tutor Training in BLS, Adult & Pediatric.

Learning Outcomes	Visual Aids	Verbal Cue Cards	Simulations / Prop Material
Identifies need for CPR in an adult Calls for help Clears airway Performs rescue breaths on adult victim Performs effective CPR on adult victim Performs Heimlich maneuver on adult choking victim	BLS algorithms from American Heart Association Illustrations of Heimlich maneuver Compression number and depth in Effective CPR	Single-rescuer CPR Two-rescuer CPR Heimlich required	Laerdal Resusci Anne (Adult model) Compression
Identifies need for CPR in a child Calls for help Clears airway while maintaining C-spine stability Performs rescue breaths Performs effective CPR Uses two-finger technique in infant Performs back blows and chest thrusts maneuver on child/infant choking victim	Pediatric BLS algorithms from American Heart Association and American Academy of Pediatrics Illustrations of choking in child and back blow maneuver Compression number and depth in Effective child CPR	5-year-old child found in a park. Needs single-rescuer CPR Child seized in school and found unconscious. Two-rescuer child CPR Choking 2-year old requiring back blows 4-year-old victim of drowning	Laerdal Resusci Anne (Child model) Compression

The trained peer tutors were examined and cleared by a five member Skills Committee with senior medical teachers. These peer tutors taught BLS to pre-clinical and clinical students in a one-day event.

Peer tutees were enrolled through purposive sampling and both pre-clinical as well as clinical students were enrolled after informed consent to participate in the training. They took a ten-item pre-test at the beginning of the study. Enrolled peer tutees were randomly (lottery method) allocated to "Control" group. They were taught by

certified instructors through conventional 30-minutes lecture tuition and demonstration videos along with one 30-minutes supervised Skills Lab session. "Test" group was taught by the peer tutors in skills lab for thirty minutes. Peer tutors taught in specially set up "Skills Stations" in "one to one" sessions. BLS Station included five sub-stations (Table-1). Each sub-station was manned by one peer tutor who taught the peer tutee for five minutes. Peer tutor demonstrated the skill on a CPR mannequin and observed the peer tutee performing the skill, as well. Both groups took a ten-item post-test at the end. They were observed by the Skills Committee performing BLS in Skills Lab. Skill Committee members were blinded to group allocations. BLS skill's performance was marked according to AHA Interim Tool-2015, Basic Life Support Checklists.[14] The 177 undergraduate medical students were randomized into experimental, (n=87) and control, (n=90) groups after name drawing. Ratio of pre-clinical to clinical was 60:40 in both groups. Trial protocol is shown in Figure-1.

Peer tutors were all first year medical students.

Data were analyzed by SPSS 21. Paired sample t-test was applied to compare mean pre-test and post-test scores for each group. Statistical significance was set at $p \leq 0.05$.

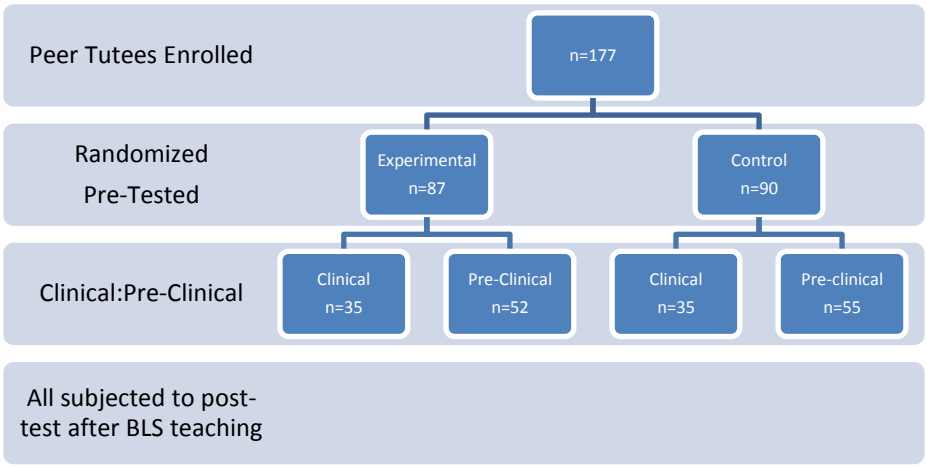

Figure 1: Organogram of Trial Protocol.

RESULTS

Demographic details of peer tutors for adult and child skill stations are shown in Table-2. The mean ages of the two groups are similar, though male:female ratios differ between adult and child skill stations. Almost all peers had a similar educational background and ethnicity; there were mild differences in peer tuition experiences, but most peers had no such previous experience.

Table- 2: Demographic details of peer tutors in adult and pediatric BLS

Skill Station	Male / Female (%)	Mean Age (Yrs)	Education F. Sc. / Cambridge (%)	Ethnicity	Peer Tuition Experience (%)
BLS- Adult	57.0 / 33.0	22 ± 2.1	99.0 / 1.0	Pashtoon	5.0
BLS- Child	30.0 / 60.0	21 ± 2.0	99.0 / 1.0	Pashtoon	3.0

Table-3 summarizes results of paired sample t-test for Pre- and Post-test scores of experimental and control groups. Pre-test scores were not significantly different within sub-groups. Test group showed significant improvement in Post-test scores over Pre-test scores for both clinical and pre-clinical students, ($p<0.001$). Control group did not show significant improvement for pre-clinical students.

Table 3: Comparison of mean pre and post-test scores between control and experimental groups to measure variation within study groups (n=177).

Study Group & Variables	Experimental / Control (n)	Groups (Mean ± SD)		p-value
		Control	Experimental	
Pre-Clinical Pre-Test	52 / 55	4.05 ± 1.4680	3.8701 ± 1.4081	0.827
Pre-Clinical Post-Test	52 / 55	5.60 ± 1.0463	6.7922 ± .9912	<0.001
Clinical Pre-Test	35 / 35	5.84 ± 1.5433	5.6000 ±1.0370	0.910
Clinical Post-Test	35 / 35	7.63 ± 0.9994	7.8500 ± 1.0894	0.106

Table-4 shows the computed p-values to measure the significance of differences in mean Pre- and Post-test scores for control and experimental groups. Pre-clinical students in experimental group showed the most significant improvement in Post-test scores after peer tuition. Clinical students showed improvement both in control and experimental groups.

Table 4: Comparison of pre and post-test scores between control and experimental groups to measure score improvement after tuition (n=177).

Study Group & Variables	n	Pre-Test	Post-Test	p-value
Pre-Clinical Control	55	4.0500 ± 1.4680	5.6000 ± 1.0463	0.051
Pre-Clinical Experimental	52	3.8701 ± 1.4081	6.7922 ± 0.9912	<0.001
Clinical Control	35	5.8400 ± 1.5433	7.6333 ± 0.9994	0.003
Clinical Experimental	35	5.6000 ± 1.0370	7.8500 ± 1.0894	0.001

DISCUSSION

The study showed that peer tutoring by first year medical students who were trained to teach BLS enabled pre-clinical students to learn and perform BLS better than a conventionally taught group.

The study groups did not differ significantly in pre-test scores. This is reflective of other studies in this area. Most studies on peer tuition report very little to no differences in baseline data between experimental and control groups.[3,4,6,7]

Perkins et al,[3] a study that is very similar to the current study in design, also concluded that peer tuition by second year medical students was as effective in training first-year students in BLS as that by conventional clinical instructors. Peer tuition in BLS is included in undergraduate curricula in several medical schools in west.[3]

A novel aspect of this study is the inclusion of first year medical students as peer tutors, something that was not found in past literature. Clinical students in the study did significantly well both in control and in experimental group. Peer tuition did little to add to their pre-existing knowledge about BLS. A true "control" group with no knowledge about BLS is really not possible, given the ethical and institutional constraints for such an endeavour. Ebbert et al,[8] and Escovitz et al,[10] report successful experiments using senior medical students to teach clinical skills as teacher's assistants.

Hughes et al,[15] used a peer tutor group to teach Advanced Cardiac Resuscitation and compared their results with an expert led group. Although, advanced cardiac care is more complex and technically more difficult to teach, they concluded that main components of advanced cardiac resuscitation can be safely and successfully taught to medical students in small groups by peer tutors who have undergone basic medical education training.

Yu et al,[16] in their excellent systematic review of peer teaching in medical education concluded that peer tutoring is comparable to conventional teaching when applied in selected contexts. Available evidence suggests that peer tutors benefit academically and professionally.

Long-term effects of peer tutoring remain poorly understood, both on tutors as well as tutees. This aspect needs evaluation for long term (one year) retention of knowledge and skills taught to them in this trial. Retention of resuscitation skills, more than the knowledge part, has been shown to be poor among healthcare teams, doctors as well as nurses.[17,18] While peer tutors may not perform the skills successfully after a period of time, the experience of teaching lifesaving skills has several other benefits that are reported in literature. Peer tutoring is practiced more frequently and since a longer time in nursing education. Secomb J, (2008)[19] in a systematic review, reports many benefits of peer tutoring. Subjective educational outcomes associated with peer tutoring include better levels of student satisfaction with the curriculum being taught, student preference towards peer tuition, student reports of better learning opportunities, significantly higher level of student participation, endorsement of desired qualities such as student leadership, and improved confidence.[16,19]

Peer tutors in the study engaged in one to one tuition with peer tutees. This is a novel technique, to our knowledge. Mahling et al.,[20] compared BLS performance of student groups comprised of one tutor to three, five and eight medical students. They concluded that smaller groups were able to avail a longer practicing time, had more interaction with tutors and engaged in less unrelated conversations. They further speculated that smaller groups may be advantageous for more complex skills. We could not find studies with one to one tuition between tutors and tutees. Rezmer et al.,[21] used group sizes of two, three and four students. Their results showed that there were no significant differences in student perception of the helpfulness or practicality of the simulation because of group size. There were no significant differences in performance on the post-simulation exam as a function of group size. Rezmer used a retrospective design to assess the level of confidence and knowledge about resuscitation among participant students. This makes the study design somewhat weaker compared with a prospective design.

The present results strongly reflect and confirm results of previous studies done on peer tutoring in teaching of life saving skills, specifically, BLS. Having said that, it is of concern that educational trials and prospective studies done on pre-clinical students imparting lifesaving skills, from Pakistan or the SAARC region are quite few and hard to find.

It was possible to demonstrate that successful peer tutoring is possible irrespective of academic level of peer tutor when teaching lifesaving skills. This is an unprecedented finding, since local studies mostly rely on enrolling distinction level students as peer tutors. Manzoor et al.,[22] showed that there was no significant difference between scores of vetted exams with multiple choice questions for peer-tutored versus expert-tutored students. They enrolled distinction level students as peer tutors, which limits the usefulness of their design in larger groups of peer tutors, especially at pre-clinical level. They taught fourth year MBBS students about "Prevention of Disease"; local studies about peer tutoring of life saving skills were not found.

Peer tutoring has a long way to go, in terms of standardization and implementation. Once initiated, it has great potential to be used as an efficient and cost effective technique to teach lifesaving skills. The German model is something that is easy to replicate and use in effective dissemination of BLS training. German University task group ''First aid and emergency knowledge for medical students'' was established in 1996. Its main aim was to improve the training of medical students in emergency medicine.[23] Medical students in this task group teach their peers in first aid and emergency techniques. Members get involved with different other activities. A homogeneous first aid course for school children emphasizing BLS was instituted in affiliation with the German Heart Foundation. These courses are repeated at regular intervals for school children, since then.

CONCLUSION

Peer tutoring for life saving skills by first year MBBS students effectively imparted satisfactory standardized skills to their peer group and senior pre-clinical and clinical tutees of a medical college, as compared to the traditional teaching of lifesaving skills, thereby obviating the need for costly, specialist tutors traditionally employed for such purposes.

LIMITATIONS

Randomized trials are hard to conduct in educational research.[24] This is a relatively new area of research and it was difficult to convince college authorities to permit this exercise.

The control group was randomly assigned, but in true research, the control group should have been completely unaware of any medical knowledge. This is not possible in real life, especially when dealing with lifesaving skills. Future studies may overcome some of these limitations.

Students from a single medical college were enrolled, which may be one reason for uniformity in pre-tests. Further extension of this trial to include more medical institutions as well as from diverse healthcare professions is planned for future studies.

REFERENCES

1. Perkins GD, Jacobs IG, Nadkarni VM, Berg RA, Bhanji F, Biarent D, et al. Cardiac arrest and cardiopulmonary resuscitation outcome reports: update of the Utstein Resuscitation Registry Templates for Out-of-Hospital Cardiac Arrest: a statement for healthcare professionals from a task force of the International Liaison Committee on Resuscitation 2015;132(13):1286-300.
2. Grasner JT, Lefering R, Koster RW, Masterson S, Bottiger BW, Herlitz J, et al. EuReCa ONE-27 Nations, ONE Europe, ONE Registry: A prospective one month analysis of out-of-hospital cardiac arrest outcomes in 27 countries in Europe. Resuscitation. 2016;105:188-95.
3. Perkins, GD, Hulme, J, Bion, JF. Peer-led resuscitation training for healthcare students: a randomised controlled study. Intensive Care Med. 2002;28(6):698-700.
4. Bucknall V, Sobic EM, Wood HL, Howlett SC, Taylor R, Perkins GD. Peer assessment of resuscitation skills. Resuscitation. 2008;77(2):211-5.
5. Topping KJ. The effectiveness of peer tutoring in further and higher education: A typology and review of the literature. Higher Education. 1996;32(3):321-45.
6. Nestel D, Kidd J. Peer tutoring in patient-centered interviewing skills: experience of a project for first-year students. Med Teach. 2003;25(4):398-403.
7. Trevino FM, Eiland DC Jr. Evaluation of a basic science, peer tutorial program for first- and second-year medical students. J Med Educ. 1980;55(11):952-3.
8. Ebbert MR, Morgan PM, Harris IB. A comprehensive student peer-teaching program. Acad Med. 1999;74(5):583-4.
9. Fantuzzo JW, Dimeff LA, Fox SL. Reciprocal peer tutoring: a multimodal assessment of effectiveness with college students. Teaching of Psychology. 1989;16(3):133-5.
10. Escovitz ES. Using senior students as clinical skills teaching assistants. Acad Med. 1990;65(12):733-4.
11. Parr JM, Townsend MAR. Environments, processes, and mechanisms in peer learning. International Journal of Educational Research. 2002;37(5):403-23.
12. Secomb J. A systematic review of peer teaching and learning in clinical education. J Clin Nurs. 2008;17(6):703–16.
13. Clarke AJ, Burgess A, Menezes A, Mellis C. Senior students' experience as tutors of their junior peers in the hospital setting. BMC Research Notes. 2015;8:743.
14. BLS Provider Manual 2015. Available from: https://www.onlineaha.org/system/scidea/learning_resources/268/original/2015_Interim_Resources_for_online_BLS_courses_12-18-15.pdf.
15. Hughes TC, Jiwaji Z, Lally K, et al. Advanced Cardiac Resuscitation

Evaluation (ACRE): a randomized single-blind controlled trial of peer-led vs. expert-led advanced resuscitation training. Scand J Trauma Resusc Emerg Med. 2010;18:3-8.

16. Yu TC, Wilson NC, Singh PP, Lemanu DP, Hawken SJ, Hill AG. Medical students as teachers: a systematic review of peer-assisted teaching during medical school. Adv Med Educ Pract. 2011;2:157-72.
17. Sternbach GL, Kiskaddon RT, Fossel M, Eliastam M. The retention of cardiopulmonary resuscitation skills. The Journal of Emergency Medicine. 1984;2(1):33-6.
18. Smith KK, Gilcreast D, Pierce K. Evaluation of staff's retention of ACLS and BLS skills. Resuscitation. 2008;78(1):59-65.
19. Secomb J. A systematic review of peer teaching and learning in clinical education. JCN. 2008 Mar;17(6):703-16.
20. Mahling M, Münch A, Schenk S, Volkert S, Rein A, Teichner U, et al. Basic life support is effectively taught in groups of three, five and eight medical students: a prospective, randomized study. BMC Medical Education. 2014;14(1):185-92.
21. Rezmer J, Begaz T, Treat R, Tews M. Impact of group size on the effectiveness of a resuscitation simulation curriculum for medical students. Teach Learn Med. 2011;23:251-5.
22. Manzoor I. Peer-assisted versus expert-assisted learning: a comparison of effectiveness in terms of academic scores. J Coll Physicians Surg Pak. Nov 2014;24(11):825-9.
23. Breckwoldt J, Beetz D, Schnitzer L, Waskow C, Arntz HR, Weimann J. Medical students teaching basic life support to school children as a required element of medical education: a randomized controlled study comparing three different approaches to fifth year medical training in emergency medicine. Resuscitation. 2007;74(1):158-65.
24. Torgerson CJ. Educational research and randomized trials. Med Educ. 2002;36(11):1002-3.