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Peer-assisted teaching method to foster learning physiological basis of electrocardiography among 1st year medical graduate students: An interventional study

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Abstract:

INTRODUCTION: In peer-assisted teaching (PAT) method, students are encouraged to prepare, organize, and construct their learning program under the guidance of a teacher. The objective of the present study is to assess the benefits and outcome of PAT on students' understanding and knowledge of one of the important and difficult topics, "physiological basis of electrocardiography (ECG)."

METHODS: A nonrandomized, interventional study was carried out in the department of physiology. Five peer tutors were selected and trained in the basics of ECG by a senior faculty of physiology for 12–14 h sessions over the 6-week period. These peer tutors then conducted a day-long workshop on five different subtopics of ECG, which was attended by 184 1st year medical students. Evaluation of the workshop was done through pre/posttest 20-item questionnaire score analysis and feedback questionnaire using a 5-point Likert scale items.

RESULTS: The average pre- and posttest scores were 6.6 ± 2.73 and 13.3 ± 4.73, respectively. The average posttest scores were higher and statistically significant compared to pretest (R^2 = 0.4275; $P < 0.05$). The class average normalized gain (g) for a posttest score was 101.5%. Of 184 students, 9.7% of students had >70% improvement from the pretest score, and 44.78% had more than 50% improvement in their posttest scores.

CONCLUSION: We received a predominantly positive feedback for the usefulness of peer teaching as a learning method. Thus, PAT was found to be a feasible and effective way of teaching the difficult concepts in physiology.

Keywords:

Learning, medical education technology, peer-assisted teaching program, peer tutors, physiology teaching

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Introduction

Peer-assisted teaching (PAT) can be described as the process of instructing and helping fellow students to gain knowledge, understanding, or skills in a way that is beneficial to both the peer tutors and the students. It is an efficacious method to encourage learning. PAT provides a structured and flexible approach to teaching practice in a sympathetic and friendly environment.[1,2] PAT has shown better utilization of existing resources and has proved more beneficial for students than traditional teching methods.[3] In this method, students are encouraged to prepare, organize, and construct their own learning program under the guidance of a

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teacher/faculty. Then, few students (peer tutors) explain the same topic to the fellow learners.[4] Peer teaching helps students to increase their confidence, oral presentation skills, communication skills, and teaching skills. Basic teaching methodology has been barely reformed in India. This has resulted in lesser quality of doctors produced than in developed countries such as UK, USA, and Germany.[5] PAT is useful in the Indian setting of medical education because there is very low teacher–student ratio, and PAT allows to overcome low teacher–student ratio as students become teacher for their peers. Implementation of modern techniques in medical education requires expensive infrastructure, and with limited availability of resources in India, PAT is the cost-effective and much-needed medical education reform in India. It is an active learning process which increases the collaboration among peers. As the peer tutors and students share a similar knowledge base and use the same language, students do not hesitate to ask questions.

Although it has existed for many years and is highly valued as a resource for teaching, it has not been utilized much. We found that electrocardiography (ECG) is one of the most challenging topics in medicine and students often have difficulty in understanding the basic physiological concepts associated with it. We usually discuss ECG in a didactic lecture and then a small group discussion with teachers. Small group discussion exercise simplifies the learning of ECG, but still, there is a communication gap between student and teacher. Hence, we thought that probably PAT method would be the best method for learning ECG. Hence, we planned and started our study with the following objectives.

Objectives

The aims of our study were to investigate: (i) the practicality of using a PAT method for ECG learning of 1st year medical graduate students; (ii) the acceptability and usefulness of PAT among 1st year medical graduate students; (iii) the benefits experienced by peer tutors; and (iv) feedback from the 1st year medical students about PAT.

Methods

An interventional study was conducted in the Department of Physiology, BJGMC, Pune, from November 2016 to January 2017. The peer tutors were selected among 1st year medical graduate students admitted in the academic year 2016–2017. The criteria for selection of peer tutors were voluntary participation, formal interview, and auditioning of all the volunteers by faculty members of physiology department. Fifteen students volunteered to participate in the peer teaching; however, only six students were selected for training; of which, five students participated as peer tutors and one coordinated the program.

Inclusion criteria

All 1st year medical graduate students ($n = 200$) admitted in 1st year MBBS in B. J. Medical College included in the study as learners. They were informed that they will be trained by peers under supervision of the faculty from the department of physiology.

Exclusion

Peer tutors ($n = 5$), coordinator ($n = 1$), and 10 students not present on the day of teaching were not included in the learner's group.

Training of peer tutors

Peer tutors ($n = 6$) were selected and received 6 weeks of training sessions from the senior faculty of department of physiology on the principles, concepts, and theories of basic ECG and regarding skills related to teaching. Then, peer tutors set the objectives of the teaching sessions and practiced how to teach and assess the students formatively. They divided the topic of the ECG into five subtopics: basic electrophysiology, basic ECG waves, genesis of ECG, ECG axis determination, and abnormal ECG. Then, they prepared their handouts and PowerPoint presentations for their teaching sessions.

Of 200 1st year medical graduate students, 184 students attended the PAT program. All the students were taught ECG in didactics lectures and in small groups before PAT sessions. Before the teaching session, all the students were given the pretest questionnaire related to the concepts in basic ECG. Then, the 3-h session, which consisted of five lectures presented by peer tutors, was carried out. The senior and junior faculties of the department of physiology were present during the sessions to take care of administrative problems and to observe teaching–learning experience. The teaching was conducted using the blackboard, PowerPoint presentations, and the handout booklet provided to the students. At the end of the teaching session, posttest questionnaire and the 5-point Likert scale questionnaire scale (from strongly disagree = 1 to strongly agree = 5) was given to all the students. Furthermore, a separate 5-point Likert scale questionnaire was given to the peer tutors to assess their peer teaching experience. Pre- and posttest questionnaire consisted of 20 questions of various formats such as multiple-choice questions, true or false, calculations of heart rate, axis determination, and identifying the ECG waves and its abnormalities. Different sets of questions were used in pre and posttest questionnaires, but of the same difficulty level. The questionnaire was tested and validated by ten senior teaching faculties of the department of physiology and ten students of second professional MBBS of B. J. Medical College.

Data analysis

Online Software GraphPad Prism version 7.1 was used to analyze the data. All values of pre- and posttest results were expressed as mean ± standard deviation. Then, the statistical difference was calculated using paired *t*-test. $P < 0.05$ was considered statistically significant. The scores of 5-point Likert scale were calculated and expressed as percentages to indicate agreement or disagreement of tutors and tutees with regard to the statements in the questionnaires.

Results

Of the total 200 students of 1st MBBS, 184 (92%) attended the PAT program and responded to the pretest, posttest, and questionnaire of the student's perceptions. Ten (5%) students were absent. All six peer tutors who participated in the study responded to the postintervention questionnaire. The peer teaching program was successfully implemented, all five scheduled sessions on ECG were conducted, and fellow tutors, fellow learners, and faculty members were very enthusiastic.

The average pretest score was 6.6 ± 2.73, and the posttest score was 13.3 ± 4.73. The difference between the two was statistically significant $P < 0.05$ [Table 1].

The overall percentage improvement in the score after the PAT program was 101.5%. Of 184 participants, 18 (9.7%) had more than 70% improvement in their posttest score as compared to pretest score. However, 64/184 (34.78%) students had 50%–70% improvement and 101/184 students (54.89%) had 10%–50% improvement in their posttest scores. Only one student had deteriorated in the posttest score after attending the peer teaching activity [Table 2].

Peer learners who participated in the program accepted the usefulness and benefits of peer teaching [Table 3 and Figures 1, 2].

Out of those who think that such activities should be conducted in the future, the average frequency of such activities should be 12 activities per year, depending on the difficulty level and its applicability to clinical scenarios.

To an open-ended question "Any suggestions for the future betterment of such activities?" following were the responses as shown in Table 4.

In the present study, we have also assessed the response of peer tutor's response regarding PAT experience as shown in Table 5.

Table 1: Showing the result of pre- and posttest

Test	Mean score (mean±SD)	R^2	*P*
Pretest	6.6±2.73	0.4275	<0.05 (significant)
Posttest	13.3±4.73		

SD=Standard deviation

Table 2: The percentage improvement in the test score after peer-assisted teaching program

Total participants (*n*=184)	Number of students (%)
71%-85% improvement in score	18/184 (9.7)
51%-70% improvement in score	64/184 (34.78)
Below 50% improvement in the score	101/184 (54.89)
No improvement/degradation in the score	1/184 (0.54)

Table 3: The mean Likert scale of participating students in the present study

Question	Mean rating
Do you think this peer-assisted teaching activity was useful in improving your knowledge about ECG?	4.2±0.76
Do you think this peer-assisted teaching activity was useful in understanding the difficult concepts in ECG such as vector analysis, axis determination, and the genesis of ECG?	4.1±0.81
Do you think the "peer being a teacher" nature of this activity was a useful way of learning and understanding?	4.2±0.69
Do you think peer-assisted teaching activity will be useful in preparing for your 1st MBBS examination?	4.1±1.03
Did you find yourself wanting to learn more about ECG?	4.2±0.83

ECG=Electrocardiography

Discussion

An interventional study was conducted with an objective to study (i) the practicality of using a peer teaching method for ECG learning by 1st year medical graduate students; (ii) the acceptability and usefulness of 1st year medical graduate students toward peer learning; (iii) the benefits experienced by peer tutors; and (iv) feedback from the 1st year medical students about PAT.

Our study demonstrated that a peer-teaching method was practicable and acceptable to learners, if it is well organized and the peer tutors are properly trained under supervision. Weyrich *et al*. in 2008[6] demonstrated similar findings in undergraduate technical skills training using the peer teaching method giving more emphasis on the process of training the peer tutors and supervision. Our selected peer tutors were all well trained for a period of 6 weeks before commencement of teaching. They all were briefed about the teaching skills and the ECG topic. In the last decade, few studies have demonstrated the feasibility and effectiveness of PAT in medical education.[1,2,7-9] In PAT peer tutor and peer learner have the same background understanding and knowledge of subject thus allows better understanding by peer learners as compared to the same topic taught by senior faculties of the department. Our results add further proof of its suitability as a medical undergraduate teaching especially for important and difficult topics such as ECG.

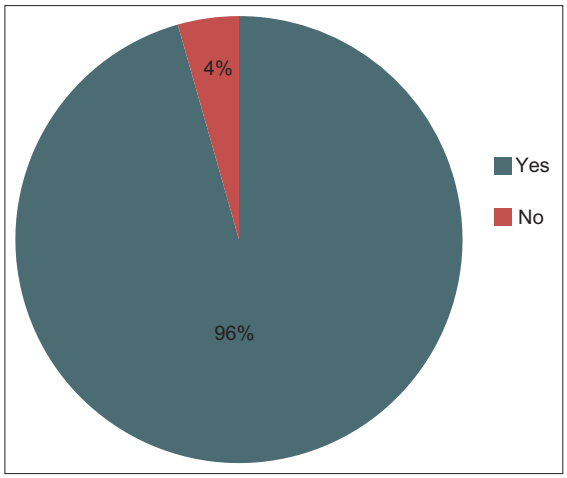

Figure 1: A pie chart showing the percent response of students to a question "Do you prefer learning electrocardiography by this peer-assisted teaching method?" About 96% of students (173/184) thought that they will prefer learning electrocardiography by this peer-assisted teaching method

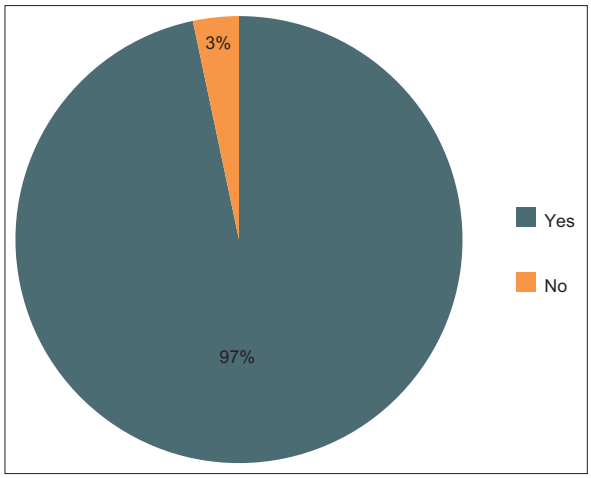

Figure 2: A pie diagram showing the percent response of students to a question "Do you think such teaching activities should be conducted in future?" About 97% of the peer learners (175/181) thought that such peer-assisted teaching programs should be conducted in the future

Table 4: The percentage of responses and their suggestion for the future betterment of peer-assisted teaching activity

Percentage of students responding	Student's response regarding the future betterment of peer-assisted teaching activity
63%	The PAT was very useful
	Presentations of speakers were excellent
	More activities of such sort should be conducted in the future
	Frequency of such activities should be more
	Application-based topics such as ECG should be included
6.3%	For these activities, small groups should be made
	More students should be included as presenters
	The presenter should give more illustrations and interactions
	He should use more animations, mnemonics, and videos
2%	Senior students (2nd/3rd year/interns) should be involved. Because they have had more exposure than peers

ECG=Electrocardiography, PAT=Peer-assisted teaching

The results of feedback from the students demonstrated that 1st year medical students favorably received peer teaching. Peer teaching program helped them understand difficult concepts better, gain new knowledge, and acquire skills of interpreting ECG.

The peer teaching program was effective probably because the communication was better between learners and peer tutors, as they shared similar previous knowledge, almost similar cognitive domains and social resemblance.[4,10] The results of our study are in agreement with those of previous studies documenting the benefits of peer teaching in medical education.[7,9-11] In the similar study, Williams *et al*.[12] reported the benefits of PAT and confidence in peer tutors and peers learners. They also proposed the importance of PAT in medical education. Peer learners agreed on the importance of continuation of this program, and some of the participants requested to increase the frequency of such activities and the inclusion of this model as a formal method in the curriculum. PAT would be a better method of teaching, especially in a scenario where there is an increased number of medical students and limited time availability among clinical teaching staff.[3,8] On the other hand, two big systemic reviews done by Sevenhuysen *et al*.[13] and Tai *et al*.[14] have not reported high confidence on PAT system. They have suggested more interventional studies to gain confidence in the new PAT system. They reported that many studies have not described the methodology of PAT and have suggested a detailed description of the study design in future studies.

The participating students commented that there were a limited number of peer tutors for the relatively large number of learners. However, this issue can be solved by allocating 5–6 learners per tutor.

Peer tutors benefited by improving their knowledge and acquiring the skill of teaching, without affecting their own learning programs as 1st year medical students. Similar findings were depicted by Ten Cate and Durning 2007[15] and Nestel and Kidd 2005.[16] One student who scores lower in posttest questionnaire than pretest questionnaire was interviewed to enquire the reason for decline in the score. He was asked the difficulty he had in following and understanding the concepts. The student confessed that he did not pay attention to the teaching and was occupied in his smartphone. He liked the PAT methodology, but was inattentive during the teaching sessions.

Table 5: A mean Likert scale of participating tutors in the present study

Question	Mean Likert's scale rating
Peer teaching affected with my learning as a 1st year medical graduate student?	1.2±0.22
Participating in PAT improved my skill regarding ECG	4.4±0.75
Peer teaching facilitated better understanding and knowledge regarding ECG	4.6±0.64
I enjoyed participating in teaching and evaluating peers	4.0±0.93
I think trained peer tutors can participate effectively in teaching	4.2±0.91
My overall rating to peer teaching activity (out of 10)	7.4±1.17

ECG=Electrocardiography, PAT=Peer assisted teaching

Effective implementation of PAT in the present study does not rule out the role of trained teachers in the teaching of medical graduates. They also have an important role in training and guiding peer tutors, keep a close eye on their performance and giving them suggestions for better improvement. PAT is a new study methodology, which can be implicated in modern medical education system. The PAT does not put any financial burden on the existing system, but combats various problems of our education system such as low teacher–student ratio, better understanding of knowledge gap between educator and learner, infusion of confidence in peer tutors to perform in public, and more friendly relationship between educator and learner. Introduction of new PAT system into modern medical education curriculum will help us build better future doctors. PAT will help build our academic medical curriculum for better understanding and benefit of our future doctors. Introduction of PAT to medical curriculum has the advantages of minimal burden on limited financial resources, friendly classroom environment, and making of future doctors who are confident in public speaking. This PAT has few disadvantages as well, such as limited knowledge delivery by experienced and learned faculty members, less of faculty–student interaction, and different levels of teaching skills of peer tutors leads to uneven delivery of knowledge to different groups of peer learners. PAT also makes the teaching and knowledge delivery to students slow as compared to normal traditional lecture teaching. PAT can be implicated as a teaching tool for difficult topic in medical curriculum but not for full course.

Limitations of the study

- To increase the benefits of our peer-teaching experience, the number of skills and tutors should be increased
- The learner's group should be smaller
- To check whether learners retained the knowledge and skills of ECG acquired, there should be a follow-up evaluation of the students' performance after a few months
- Randomization of learners is an important issue
- Inclusion of controls for comparison is also difficult
- Students taught by PAT should be compared to the other student taught by standard teaching methods, but ethically comparison group cannot be denied to newer teaching in medical college. Comparison to MBBS 2nd year batch was not done as they studied the same topic almost a year back and most did not retain the details of topic taught in MBBS 1st year.

Conclusion

Our study demonstrated that a PAT program for teaching basic concepts and skills of ECG to 1st year medical graduates can be an effective tool for teaching. The results of our study suggested that PAT can be useful for teaching difficult concepts and skills. This method is incorporated into the curriculum to improve knowledge, skills, and attitude of students.

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Conflicts of interest

There are no conflicts of interest.

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