Research Article

PREFERRED TEACHING METHOD OF ELECTROCARDIOGRAPH – INTERACTIVE LECTURE OR STUDY GROUP?

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ABSTRACT

The best instructional format for teaching moderate number of medical students about Electrocardiograph (ECG) analysis is not established. The aim is to identify the preferred method of teaching ECG analysis between teacher centered i.e. Interactive lecture (IL) and learner centered method i.e. small group teaching (SG) by studying their effect on short term and midterm knowledge retention. This prospective randomized study was conducted on III semester medical students with scanty knowledge of ECG analysis who attended a single session of IL or SG with identical educational principles and objectives. The content was based on six step methodology of analyzing ECG –RISWAC. Participants were administered pre-test before the session, posttest on completion of teaching session, and retention test 4 weeks later. The tests assessed identical educational objectives using 15 single answer type of questions with a value of one mark per question. Student's t test was used to analyses the test scores between groups. Ninety nine students participated in the study; fifty were randomized to IL group and the rest forty nine to SG cluster. Both the methods resulted in statistically significant improvement in post test scores (p<0.001).In the retention test, the corresponding mean scores decreased to 5.6 and3.61 in the IL and SG clusters. Higher scores in the posttest and retention test in IL group suggest that it is a better teaching method of ECG to moderate number of medical students with minimal knowledge of ECG.

INTRODUCTION

Electrocardiograph (ECG) conveys vast amount of information on structure, functioning and pathophysiology of the heart and its conducting system. With the increasing incidence of heart disease, ECG interpretation is indeed an essential skill for medical students, for detecting asymptomatic cardiovascular disease[1].Various studies have demonstrated the lack of proficiency of medical students in this critical area[2, 3]. The intricate nature of the theory of ECG and mind-numbing complex details of its interpretation makes it hard for the teachers to teach and students to learn[4, 5]. Learning to interpret ECG involves not only the acquisition of information (Knowledge category of cognitive domain), but also the ability to utilize the knowledge (Analysis category of cognitive domain). Presently, teacher centered techniques such as didactic lectures and clinical rounds are the commonly used teaching methods of this fundamental skill[6]. The best evidence based learning method of ECG analysis for moderate numbers of medical students with scanty knowledge of ECG analysis is not established and further research is needed to improve the currently available teaching methods[7, 8]. We hypothesized that the students' short-term and mid-term knowledge retention

following a learner centered teaching method will be better than teacher centered teaching method. The aim of this work is to identify the preferred method of teaching ECG analysis amid interactive lecture (IL), a teacher centered method and study group (SG), a learner centered technique of teaching by studying their effect on short term and midterm knowledge retention of ECG interpretation.

METHODOLOGY

This study was conducted among III semester MBBS students in a Government Medical College and was approved by the Institute ethics committee. Written consent was obtained from the participants prior to the study. Before enrolment, the baseline knowledge of the participating students was evaluated by a pretest questionnaire. Students who scored above 50% in the pretest were excluded from the study. The study population was randomized to attend a single session of IL or SG on ECG analysis with identical educational principles and objectives.

The content of the teaching session was based on a six step methodology of analyzing ECG – RISWAC (Rate & Rhythm, Interval, Segment, Wave, Axis, and Chamber)[9]. The interactive lecture was conducted using PowerPoint

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presentation and students were encouraged to ask questions during the session. In addition, students were administered quiz questions every 30 minutes. Duration of the lecture was about two hours with a break of 15 minutes.

In study group, students were split into five groups with each group containing ten members. The individual groups had a student as group leader and a resident doctor well versed in ECG analysis as facilitator. The groups were given pre-prepared material on ECG interpretation based on RISWAC six step methodology of analyzing ECG. The time given for the group study was 2 hours, along with a break of 15 minutes. At the end of the respective sessions, a posttest using 15 single answer type of questions with a value of one mark per question was administered. The questions cover the following areas: rhythm, PR-interval, QRS-complex, hypertrophy pattern, axis of the heart, ST-changes and wave changes. ECG was not reused. After one month, both the groups of students underwent an interpretation test on ECG analysis to assess their retention. The tests assessed the identical educational principles and objectives of ECG analysis. The students did not have access to the ECG modules between the posttest and the retention-test. The pre-test, posttest and retention scores of the two groups were analyzed by using Student's t-test. $P < 0.05$ was considered statistically significant. Microsoft Excel was used for statistical analysis.

Student Assessment of Learning and Teaching was performed by a Liker questionnaire covering Course Organization, Planning, Communication, Assignments, Graded Materials, Instructional methods and Outcomes (score of 1 to 10, with 1 being the worst and 10 being the best). This was studied to assess the students' perspectives of the learning methods and their learning experience.

RESULTS

Ninety Nine students took the pretest. Fifty nine of them were females and the rest were males. None of them scored above 50% and hence all were included in the study. Fifty participants were randomized to IL group and the rest (49) took part in SG cluster. The mean pre test score in the IL and SG was 2.06and 2.05 respectively. After the teaching session, the scores improved to 8.29 and 6.78 in the IL and SG respectively with p value of <0.001 suggesting that both the methods were effective in improving the knowledge of the students. Performance of the students was better in the IL than SG (p=0.006). Sex based mean scores and p values are given in table 1. Eighty nine students took part in the retention test and their scores were considered for the analysis. In the retention test, the corresponding mean scores decreased to 5.6and 3.61 in the IL and SG clusters. The mean scores in both groups had decreased significantly suggesting that a single session of teaching alone is not sufficient to ensure mid-term memory retention (p<0.001). However, scores from the IL group was significantly better than SG cluster (p < 0.001). Students' reaction to the teaching methods and their assessment of the learning experience was assessed using standardized feedback questionnaire, and it revealed that individual preference and satisfaction was better in the IL group when compared to SG cluster (table 2).

Table 1 Pretest, Posttest and Retention scores of the study population

	Pretest		Posttest		Retention	
	Interactive Lecture	Study group	Interactive Lecture	Study group	Interactive Lecture	Study group
TOTAL						
Number	48	41	48	41	48	41
Mean	2.06	2.05	8.29	6.78	5.60	3.61
P value between groups	0.964		0.006 **		0.000 **	
FEMALE						
Number	27	28	27	28	27	28
Mean	1.81	2.32	7.85	6.68	5.11	3.82
P value between groups	0.194		0.071		0.013 **	
MALE						
Number	21	13	21	13	21	13
Mean	2.38	1.46	8.86	7.00	6.24	3.15
P value between groups	0.071		0.082		0.000 **	

1.** (p < 0.05)

Table 2 Feedback scores of students

	Mean feedback		
	Teaching methods	Learning experience	Overall
Interactive Lecture	31.7	35.0	84.5
Study group	27.5	32.8	77.2
P value	0.0001	0.0096	0.0003

DISCUSSION

ECG analysis, an indispensable skill for medical students is taught predominantly using teacher centered techniques such as didactic lectures and clinical rounds. Given the intricate nature of ECG analysis, which embroils 'Knowledge' and 'Analysis' category of cognitive domains, it is important to use an appropriate teaching method which will foster the engagement of the learners. Currently employed teaching methods of ECG analysis fail to achieve lasting learning.

Westwood emphasizes that the selection of a teaching method should take into consideration the characteristic of the learner and the type of expected educational transformation[10]. The most appropriate teaching method of a topic is thus determined by the content to be taught and the nature of the learner and can be either teacher centered or student centered. In Teacher centered model, teachers are the main authority. Students passively receive information and the primary role of teachers to pass knowledge and information to their students. In Student centered approach to learning, teachers and students play an equally active role in the learning process. The teacher's primary role is to facilitate student learning and overall comprehension of material.

ECG interpretation is primarily taught to medical students by traditional lecture, a teacher centered teaching method. Traditional lecture is a time-honored, proficient teaching method and an efficient way of transmitting large amounts of information in a relatively small amount of time. However, traditional lectures rely on rote learning and fail to promote active engagement. Active learning i.e. learning through reasoning prepares the student to understand better. Interactive lecture is a strategy designed to accentuate assets of traditional lecture and minimize its liabilities[11]. Study groups, on the other hand, is a learner centered technique and the tutor plays the role of facilitator[12, 13]. Study group promotes attitudes and feeling towards learning, increases comprehension, problem solving and the transfer of knowledge. Although the positive effect of active learning on knowledge acquisition is widely accepted, there is still a need to know its effect on retention of

knowledge. In our study, students in the IL group had scored better than SG cluster in posttest. Both the teaching methods were effective in improving the interpretation skills of the students. However, interactive lecture was more efficient than study group. This counterintuitive result has been noted in other studies on teaching methodology. It has been postulated that learning in SG cluster was poorer than expected due to factors such as content, learning style, and cultural background. Studies have shown that study group may not be a method of choice to transmit new information but will motivate the students to understand better of the previously acquired knowledge[14, 15].

Single sessions of both the teaching methods were not hugely successful in promoting midterm retention of the ECG interpretation, a newly acquired skill. Retention test marks scored by students reveal that newly acquired information is lost, though both teaching methods were effective in teaching ECG interpretation skills. Spitzer, who described a de-learning curve with a very rapid initial knowledge loss and a subsequent steady state starting around 3 weeks and extending to at least 9 weeks, supports this assertion[16].Thus, teachers should be aware that maintenance of newly acquired knowledge requires continuous engagement of both teacher and student. A relook at the scores also suggests that midterm retention is better with interactive lecture than study group.

Student feedback can help to understand the factors that facilitates and difficulties, which hamper learning. In this study, participant's perspectives were solicited by obtaining their feedback and this gave them an opportunity to reflect upon the learning methodology and rationally choose an appropriate teaching methodology of ECG analysis. Interestingly, individual preference and satisfaction was better in the IL group and not in the SG cluster. Similar findings have been reported by other studies, which have compared the role of interactive lecture in teaching[17].

The major limitation of this study is relatively small sample comprising III semester students with limited knowledge of ECG interpretation. In addition, this study was performed on a single group of medical students while application in other areas in medical training such nurses and residents might yield different results.

In conclusion, both interactive lecturing and study group were effective in improving the student's knowledge of ECG. However, significantly higher scores in the post and retention tests in the interactive lecture group suggest that it is a better teaching method of ECG to medical students with limited knowledge.

Acknowledgement

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