

## Pre and Post Workshop Knowledge Assessment Regarding ECG and Arrhythmia Management in Medical Undergraduates

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### ABSTRACT:

**Objective:** To determine the effectiveness of ECG interpretation workshops as a useful tool in medical education for teaching the integrated cardiovascular module for undergraduate medical students.

**Study design and setting:** Cross sectional (pre and post workshop quiz) at Jinnah Medical and Dental College over four months from August–November 2019.

**Methodology:** Total 80 undergraduate medical students participated in the training session. Pre-workshop Quiz was conducted MCQs (single best answer) to determine the prior knowledge of participants on ECG interpretation and action of antiarrhythmic drugs. Interactive lectures were delivered by the cardiology consultant and faculty of pharmacology. Comprehensive hands-on skill session for 12-lead and ECG interpretation was organized by the physiology department. Post-Quiz included MCQs (single best answer). Feedback forms were filled at the end of the training and lecture sessions. Paired students T test was used on SPSS 21.

**Results:** Total Eighty 4<sup>th</sup> year MBBS participated in pre-workshop quiz (MCQs) and post MCQs Sixty (75%) students had an unsatisfactory score and only twenty (25%) had satisfactory scores in pre- training Quiz. Post-training and lecture sessions, Quiz (MCQs) scores had significant improvement. Seventy (87%) students had a satisfactory score of which five students were outstanding and only five (6%) scored unsatisfactory. Feedback form filled and the comments were recorded.

**Conclusions:** It was found by post workshop quiz scores and feedback regarding interdepartmental integrated activity results in a better teaching and learning outcomes. Post workshop Quiz scores indicated the improvement in ECG interpretation and skills.

**Keywords:** Cardiac arrhythmias, Electrocardiography, Integrated workshop, Pre- workshop, Post-workshop, Quiz.

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### INTRODUCTION:

Interactive teaching and learning such as tutorials, problem based learning, case-based sessions, workshops are all small group teaching and have supportive evidence as being useful and effective pedagogy. The formats may vary, but common strategy is that the students interact with the teacher and a large group may be divided into small subgroups. In tutorial session students get the set task to be achieved. In problem based learning the students follow specific process. On the other hand; workshops are planned for the students to gain active experiential learning focused on specific learning. The workshop is a short term teaching and learning which involves variety of learning activities.<sup>1-2</sup>

Electrocardiography (ECG) training in undergraduate and graduate medical students is one of most essential skills in medical practice. The Electrocardiogram (ECG) is an established technique in cardiology for the detection of cardiac diseases in patients. It is the electrical representation of the contractile activity of the heart and can be recorded easily by using surface electrodes on the limbs or chest of the patient. It is one of the most recognized and used signals in the medical practice.<sup>3</sup>Number of drugs are capable of precipitating arrhythmias which include antiarrhythmic,

anti-anginals, antiemetics, gastrointestinal stimulants, antibiotics, anti-malarials, narcotics, antipsychotics, inotropes, digoxin, general anesthetics, bronchodilators, and drugs that cause electrolyte imbalances<sup>4-10</sup>. These training sessions can improve important skills in undergraduate and graduate students<sup>11</sup>.

Comprehensive training for interpretation of ECG monitoring is very important for medical and dental graduates.<sup>4</sup> With the help of interdisciplinary experts, cardiologists, ECG experts and pharmacologist we can make the cognitive ability of students regarding diagnosis and treatment of cardiovascular diseases.<sup>6</sup> Most effective training is achieved by utilizing the basic sciences and clinical faculty thereby integrating the course.<sup>7</sup> Changes in ECG of critically ill patient on multiple drug therapy and due to drug-drug interaction is common cause of arrhythmias which can be avoided by proper knowledge and understanding of the pharmacokinetics and pharmacodynamics of drugs capable of producing arrhythmias.<sup>8-11</sup>

In order to have competency- based learning, assessment by multiple choice questions play an important role (Pugh et.al 2019).<sup>12</sup> Peer -review by independent members to make sure either to include or reject altogether<sup>13,14</sup> The goal is to have a diverse team for better knowledge achievements (Eva et al. 2019).<sup>14</sup> Medical curriculum should be including teaching and assessment strategies while planning and conducting courses for medical students. Assessment or pre-workshop quiz can evaluated the prior knowledge of the participants regarding electrocardiograph interpretation “normal” and “emergency” findings. The Pre- Workshop Quiz included 30 MCQs single best answer for each from any four answer options.

Therefore; this study was aimed to determine the effectiveness of ECG interpretation workshops as a useful tool in medical education for teaching the integrated cardiovascular module for undergraduate medical students. Its efficacy was assessed by undertaking a pre and post workshop quiz.

#### **METHODOLOGY:**

It was a cross-sectional study design in which purposive sample technique was used. Integrated ECG interpretation work shop was planned over four months from August-November 2019 among Eighty MBBS undergraduate medical students. The ECG interpretation workshop was pre-planned and registration was confirmed for all the 4<sup>th</sup> year MBBS students and faculty. All the 4<sup>th</sup> year MBBS students attending the university participated and were included. All those absent were excluded from study. Ethical approval was taken by ERC of Jinnah Medical & Dental College; Protocol #: 000021/20. All the participating students filled a written consent form. Pre-Workshop Quiz (30 single best MCQ) was conducted MCQs (single best answer) to determine the prior knowledge of participants on ECG interpretation and action of antiarrhythmic drugs. Interactive lectures were

delivered by the cardiology consultant and the faculty of pharmacology. Comprehensive hands-on training skill session was organized for 12-lead and ECG interpretations. The faculty of department of pharmacology planned this integrated workshop with department of Cardiology and Physiology to improve the overall performance of medical students for interpretation of electrocardiogram and knowledge of actions of various groups of antiarrhythmic drugs. Students were provided with notebooks to note down important concepts of ECG.

Consultant cardiologist conducted a comprehensive and interactive lecture on ECG interpretation normal conductive system, rate, rhythm, axis, P -wave, ST- segment morphologies (Myocardial infarction) and QTc interval. Classification and interpretation of cardiac arrhythmias were taught. Images of patients ECG were included for interactive lecture session. Workshop may improve the clinical reasoning skills in the future clinicians. By improving clinical reasoning, the physician is able to diagnose the diseases inpatients having symptoms<sup>15</sup> The training and skills of 12 lead electrocardiogram (ECG) is one of the most essential and useful diagnostic, prognosis and management of patients that should be acquired in medical practitioners. It is highly essential skill to diagnose “common electrocardiographic emergencies” and “uncommon electrocardiographic emergencies” patterns.<sup>16</sup> Pharmacology, of antiarrhythmic drugs is the most volatile. In medical curriculum the drugs for arrhythmia, their action and adverse effects is one of the part which has always been the most difficult part to learn and retain by medical students. Due to polypharmacy there are cases of TdP (torsade de pointes) caused by drug-drug interactions.<sup>17</sup> Thus the understanding of pharmacology of these drugs is essential for a better patient care.<sup>18</sup> Post-training quiz was conducted with the same protocol as given in pre quiz (MCQs) to assess that sufficient knowledge had been attained by all the participants after the training sessions. Then comparison was done with the post training Quiz scores on a single best answer.<sup>19</sup>

The workshop was planned during cardiovascular module for medical students ECG hands skills. This was a full day workshop, pre-workshop quiz and ECG training lecture and hands in morning session and after a break the afternoon session included arrhythmia management lecture sessions and post-workshop Quiz. The ECG interpretation lecture session included identification of normal ECG (intervals, rate and rhythm) and identifying abnormal (ST-elevation, Supraventricular tachycardia, atrial flutter/fibrillation, AV block, TdP (*torsade de pointes*)). Hands on skills training included; application of all twelve limb leads at particular location, location and color of limb leads, chest leads and interpretation, interpreting normal/abnormal electrocardiogram, for the diagnosis of various cardiovascular diseases (myocardial infarction, atrial and ventricular arrhythmias). Post- training quiz included MCQs (30 single best answer). All the

participants were required to fill the feedback form for lectures and skill sessions at the end of the lectures and workshop. (Fig.1) Paired students T test was used on SPSS 21. P-value > 0.05 was considered a statistically significant.

**RESULTS:**

Eighty 4<sup>th</sup> year MBBS undergraduate medical students participated in this study. They were required to take a pre-quiz prepared by the pharmacology and cardiology faculty to judge their prior knowledge regarding the understanding of electrocardiogram interpretation, action of antiarrhythmic drugs and knowledge about management of arrhythmias. Comparison of pre training quiz score with post training quiz score was analyzed by applying paired t-test was significant (table1). Pre training quiz scores of 60 (75%) participants had unsatisfactory score whereas only 20 (25%) had satisfactory score. Post training Quiz 70 (87%) had satisfactory and only 5(6%) had unsatisfactory score. 5 (6%) obtained outstanding scores (table 2). Pre-training hands on skills 60 participants had unsatisfactory knowledge and skills regarding the matching the color and location of limb leads and interpreting the recorded ECG which improved to 100% satisfactory after the hands on training. Feedback significantly showed great positive response included visual/video, audio, handouts, ECG skills, interactive lectures (table 3) as excellent, very good, good and fair. Workshop had improved the understanding of ECG interpretation skills and pharmacology of antiarrhythmic drugs. With some good suggestions to improve were added. During the interactive lectures they recorded all the interpretation on the workbook provided. The ECG interpretation workshop added to cardiovascular course in curriculum facilitated better understanding and skills in medical undergraduates.

Figure 1: Steps of ECG interpretation & Arrhythmia management training session.

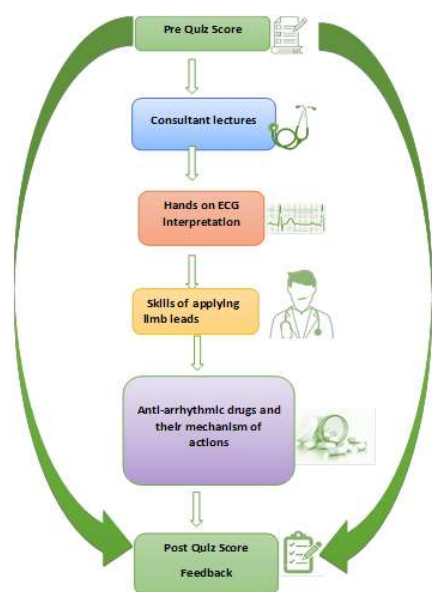


Table 1: Comparison of Pre and Post workshop quiz scores

Total Score (30)	Pre-Work Quiz Scores	Post-Workshop Quiz Scores	Pvalue
Range	2- 17	15- 30	0.000
Mean	10.17	19.76	
SD	4.19	4.62	

Table 2: Satisfactory & Unsatisfactory Scores in Pre and Post-workshop quiz

Total Marks (30)	Pre- Training Quiz (No. of Students-80)	Post-training Quiz (No. of Students-80)
0-14 (Unsatisfactory score)	60 (75%)	5 (6%)
15-30 (Satisfactory score)	20 (25%)	70 (87%)
Score 25 -30 (Outstanding score)		5 (6%)

Table 3: Students Feedback and Rating

	Excellent	Very Good	Good	Fair	Poor
Visual	28	25	20	4	0
Acoustics	33	27	20	0	0
Handouts	29	31	20	0	0
Skill Sessions	30	27	20	3	0
Interactive Lectures	34	22	22	2	0

**DISCUSSION:**

Interdisciplinary collaborative teaching is more effective in improving the cognitive and psychomotor ability of medical students by lectures and hands on skill sessions<sup>6-7</sup>. In the ECG interpretation workshop interdisciplinary teaching was given by cardiology, physiology and pharmacology departments for horizontal and vertical integration. ECG interpretation lecture taken by cardiology consultant, hands on ECG skill session by trained physiology lecturer, explaining students’ exact position of limb leads and pharmacology faculty delivered a lecture on action and therapeutic uses of antiarrhythmic drugs for atrial and ventricular arrhythmias. Planning a workshop on ECG interpretation and management of arrhythmias by the faculty of pharmacology and cardiology have tried to create more clear concepts of interpretation of ECG normal and identification of abnormalities like myocardial infarction and arrhythmias which have the most serious outcome and highest morbidity and mortality.<sup>8-11</sup>

The training was conducted by Cardiac consultants, pharmacology professors and ECG limb lead technique by physiology and pharmacology lecturer. Clinical reasoning skills are the requirement of future clinicians, which involve

teaching symptoms of particular diseases, workshops and clinical skill sessions.<sup>12</sup> The undergraduate students were trained to essential skill of interpreting electrocardiographic changes myocardial infarction as being one of most common and life threatening cardiac condition the physician has to deal in everyday practice. Electrocardiograms of patients with STEMI (ST- elevation myocardial infarction) and NON-STEMI myocardial infarction were assessed in interactive lectures and Quiz. As a number of studies have shown very high percentage of senior medical student and interns misinterpreted or missed ST-elevation in patients ECG with acute myocardial infarction.<sup>15</sup> *Thus it is most essential to train* interpretation of myocardial infarction in ECG to undergraduate medical students.

It is evident from literature that in interdisciplinary classes, students learned more about cardiac arrhythmias presented by faculty members having extensive experience related to the pharmacology and pharmacotherapy of cardiac arrhythmias.<sup>17-19</sup> Similarly, in our study the interactive lectures on antiarrhythmic integrated lecture sessions were highly appreciated in feedback by medical students in understanding the difficult topic of antiarrhythmic drugs and arrhythmia management.

Outcome of the training workshop was evaluated by pre and post-workshop Quiz which was assessed via multiple-choice questions (MCQs). Pre-workshop unsatisfactory were students who got score below 14 were 60 (75%), satisfactory were 20 (25%). Post – training got satisfactory score were 70(87%) and outstanding scores above 25 were (6%). A study conducted in UK on interactive ECG teaching workshop shown a significant pretest and post test scores.<sup>20</sup>

It is beneficial to engage students during planning, managing and getting feedback regarding curriculum and other institutional activities to increase their ownership interest and therefore; beneficial for institutions.<sup>21</sup> The feedback from students and the faculty had a mutual-advantage for both the teachers conducting the workshop and those attending. In addition; suggestions and discussions can improve the quality of medical education. As in medical education feedback not only establishes positive learning environment by removing negativity, improves practical knowledge and enhances professional growth. In addition to lecture and skill training sessions, feedback is effective strategy to communicate with students and faculty. It can be obtained by evaluation form or email them to provide comments which will further improve the curriculum.<sup>22-23</sup>

## CONCLUSIONS:

It was found by post workshop quiz scores and feedback regarding interdepartmental integrated activity results in a better teaching and learning outcomes. Post work shop Quiz scores indicated the improvement in ECG interpretation and skills.

## Author Contribution:

Samia Perwaiz Khan: Article writing / research design/ data collection  
Sahar Tariq: Research data / study design / protocol  
Rabea Rizwan: Data collection / study design  
Muslim Abbas: Data collection / study design  
Zohra Jivani: Data collection  
Amna Adeel: Data collection  
Yahya Peracha: Data collection  
Mohammad Sultan: Data collection

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