RESEARCH ARTICLE

Effectiveness of competency-based teaching and comparison to traditional teaching of Phase I MBBS students

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ABSTRACT

Background: During MBBS course, the students’ study about cardiovascular system (CVS) in physiology, pathology, pharmacology, preventive medicine, pediatrics, and medicine for the management and diagnosis of cardiovascular disorders. Blood pressure measurement is a common and a beneficial tool for the diagnosis of cardiovascular disorders (hypertension, hypotension, etc.) along with their treatment and management. Thus, knowing the proper technique of measuring blood pressure becomes an essential part of learning the course and management of cardiovascular disease. This study is designed to teach and train the first phase undergraduate students to measure blood pressure in a proper way so that they do not stumble on the first step of examination of CVS. Competency-based training is an outcome-based approach that involves identifying the skills acquired by Indian medical graduate. Competency-based teaching involves teaching of undergraduate students to support their achievement and assessment of the communication and technical skills and to develop their ability to interpret the results of blood pressure measurement for apt patient management.

Aim and Objectives: This study aims to assess and compare the effect of competency-based teaching and traditional teaching in learning the skill of blood pressure measurement. Materials and Methods: Two hundred students were taken from Phase I undergraduate medical students which were randomly divided in two Groups A and B. Competency-based teaching of blood pressure measurement was done in Group A in by teaching method of demonstrate, observe, assist, and perform and Group B was taught by traditional demonstration. Pre-test questionnaire was given to both the groups before beginning of the practical session. The students learning of skill to measure blood pressure was assessed by directly observed procedural skills (DOPS) checklist after which student feedback was provided along with filling up of the post-test questionnaire. Furthermore, feedback from both student and teacher was collected. Results: Highly significant difference was found between pre-test and post-test of both Group A and Group B. Significant difference was found between Group A and Group B post-test scores. It was found that Group A in which competency-based teaching was done scored higher post-test scores then Group B. Furthermore, highly significant difference was seen among the scores of DOPS checklist between Group A and Group B. Conclusion: In the present research study, it was found that the students who underwent competency-based training of the skill of blood pressure measurement showed significantly higher scores in learning and performing the skill. Furthermore, on feedback provided by the students, 96% of the students strongly agree that the competency-based teaching and learning is better than traditional teaching.

KEY WORDS: Competency-Based Medical Education; Competency-Based Learning; Demonstration, Observation, Assist, and Perform; Directly Observed Procedural Skills; Certifiable Competency
INTRODUCTION

The Indian medical graduate (IMG) training program is designed with a goal to create IMGs to possess the requisite knowledge, attitude, skill, responsiveness, and values so that IMG is competent enough to be the physician of first contact.[1] For this reason, to enhance the effectiveness and efficiency of IMG training program in August 2019, competency-based medical education (CBME) curriculum was implemented in all medical colleges all over India for MBBS students. CBME is based on competency-based learning which is student centered, outcome-based approach to develop skills so that the IMG is competent enough to perform requisite skills at community level. Competency-based learning is performance-based learning where a student must attain a certain competency (knowledge, attitude, and skill) before passing on to next level. This helps a student learn to attain higher equity and an environment for continuous learning and improvement.[2] On implementation of CBME curriculum in 2019, a module provided for all the phases of MBBS by National Medical Commission (NMC) which is the regulatory body for all the medical colleges of India. In this CBME module for Phase I, it was revealed that certain competencies were “must know” and these “must know” competencies needed to be certified by the faculty. Such competencies were called as certifiable competencies and the teaching-learning methods for teaching such competencies were “demonstrate, observe, assist, and perform (DOAP),” that is, demonstration, observation, assisted, and perform.[3]

Out of these certifiable competencies, one of an important certifiable competency for Phase I MBBS students is blood pressure measurement. In CBME curriculum, cardiovascular system (CVS) is taught with horizontal alignment as well as vertical integration in all phases of the MBBS course. In clinical examination of CVS learning, blood pressure measurement is a required certifiable competency.[3] Blood pressure is a gold standard diagnostic tool for hypertension which is the most common pathology related to CVS.[4] In CBME curriculum students are trained by DOAP while in traditional teaching, there is higher emphasis on demonstration and lesser on performance. Furthermore, in CBME, it is required for an IMG to accomplish certifiable competencies successfully, which is a prerequisite to pass the summative assessment. The purpose of this study was to compare the actual outcome of traditional teaching versus competency-based learning in measurement of blood pressure in first phase medical students.

MATERIALS AND METHODS

Observational cross-sectional study was conducted on 200 medical undergraduate students of Phase I, Government Medical College, Patiala, Punjab, India. The study was conducted in the month of September 2021. Ethical clearance from the Institutional Ethics Committee was taken before the start of the study. The inclusion and exclusion criteria were taken into consideration for selection of study subjects.

Inclusion Criteria
- MBBS 1st year students present on the days of conduction of study were included in the study.
- All MBBS 1st year students who gave consent to participate in the study were included in the study.

Exclusion Criteria
- MBBS 1st year students absent/on leave on the days of conduction of study were excluded from the study.
- Students who did not give their consent to participate in study were excluded from the study.
- Students who are no longer part of the regular batch were excluded from the study.
- All the students were thoroughly explained about the procedure and intent of the study and informed consent was taken. All selected students were given pre-test in the form of questionnaire. After completion of pre-test, the students were randomly divided into two groups (Group A and Group B). Group A was taught measurement of blood pressure using competency-based teaching in the form of DOAP, on the other hand, Group B was taught to measure blood pressure in the form of traditional demonstration. After completion of the DOAP and demonstration of the successive Groups A and B, the practical skills to perform blood pressure measurement were assessed by direct observation of procedural skills (DOPS) by the investigator using competency checklist for blood pressure measurement provided by Johns Hopkins University. After analyzing the students competency by competency checklist, student feedback was given by the investigator and post-test was taken by filling post-test questionnaire. After completion of the practical session, feedback from students was taken.

RESULTS

On comparison of Group A students in which competency-based teaching was practiced in the form of DOAP, it showed higher values of post-test [Table 1]. On comparison of Group B students in which traditional teaching was done by demonstration, it also showed significant higher values of post-test [Table 2]. Pre-test results of both Group A and Group B were comparable. However, on comparison of post-test of both Group A and Group B post-test, it was found that Group A students showed significant higher scores as compared to Group B undergraduate medical students. Further on assessing the competency levels by performing directly observed procedural skills, it was evident that competency level of students trained by DOAP session...
(Group A) was higher than the students trained in traditional method (Group B), as shown in Table 3.

**Feedback From Students**

Feedback from all undergraduate students was taken in the form of questionnaire, asking them about their learning experience and understanding of the blood pressure measurement. The feedback was taken through Likert scale, in which 0 – strongly disagree, 1 – disagree, 2 – neutral, 3 – agree, and 4 – strongly agree.

**Feedback From Group A Undergraduate Medical Students**

About 100% of students strongly agreed that they have learned to measure blood pressure correctly.

About 60% of students strongly agree and 40% agreed that there was increase in their knowledge with regard to the measurement of blood pressure.

All 100% of students strongly agreed that competency-based teaching is better than traditional teaching.

About 40% of students agreed and 60% were neutral about the time duration of DOAP is more than traditional demonstration.

About 90% of students strongly agree that CBME teaching should continue in undergraduate curriculum.

About 84% of students disagree that the certification of blood pressure measurement is not required in Phase I of MBBS training whereas 16% were neutral about it.

**Feedback From Group B Undergraduate Medical Students**

About 60% of students agreed that they have learned to measure blood pressure better after traditional teaching.

About 70% of students felt that there was increase in their knowledge with regard to measurement of blood pressure.

About 84% of students agree that competency-based teaching is better than traditional teaching.

About 96% of students strongly agree that CBME teaching should continue in undergraduate curriculum.

About 92% of students disagree that the certification of blood pressure measurement is not required in Phase I of MBBS training.

**Feedback From Faculty**

In feedback taken from the faculty, all faculty members strongly agree that competency-based teaching is more effective in skill development and active learning.

About 95% of faculties feel that competency-based learning is more motivating for the undergraduate student as there is more interaction between student and teacher.

About 80% of the faculties strongly agree that DOAP is more time consuming.

About 75% of the faculties strongly agree that it is easier to take class in traditional demonstration than DOAP session.

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**Table 1: Comparison of pre-test and post-test scores of Group A**

<table>
<thead>
<tr>
<th>Group A (DOAP)</th>
<th>Pre-test Mean (SD)</th>
<th>Post-test Mean (SD)</th>
<th>t-value</th>
<th>P-value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6.314±1.2071217</td>
<td>9.485 ± 0.8530716</td>
<td>1.656</td>
<td>8.89356E-46</td>
<td>HS</td>
</tr>
</tbody>
</table>

DOAP: Demonstrate, observe, assist, and perform

**Table 2: Comparison of pre-test and post-test scores of Group B**

<table>
<thead>
<tr>
<th>Group B (Traditional demonstration)</th>
<th>Pre-test Mean (SD)</th>
<th>Post-test Mean (SD)</th>
<th>t-value</th>
<th>P-value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6.085714±1.172514</td>
<td>8.4±0.913944264</td>
<td>1.690924198</td>
<td>3.16E-17</td>
<td>HS</td>
</tr>
</tbody>
</table>

**Table 3: Comparison of pre-test scores of Group A and Group B**

<table>
<thead>
<tr>
<th>Pre-test Mean (SD)</th>
<th>t-value</th>
<th>P-value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>Group B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.3142±1.207</td>
<td>6.085 ± 1.172</td>
<td>1.654</td>
<td>0.119</td>
</tr>
</tbody>
</table>
DISCUSSION

In the present study, 200 students taken from Phase I undergraduate medical students were randomly divided into two groups A and B. Competency-based teaching of blood pressure measurement was done in Group A by teaching method of DOAP and Group B was taught by traditional demonstration. Pre-test questionnaire was given to both the groups before beginning of the practical session. The students learning of skill to measure blood pressure was assessed by DOPS checklist after which student feedback was provided along with filling up of the post-test questionnaire. Furthermore, feedback from both student and teacher was collected. Significant difference was found between Group A and Group B post-test scores as shown in Table 4. It was found that Group A in which competency-based teaching was done scored higher post-test scores than Group B. Furthermore, highly significant difference was seen among the scores of DOPS checklist between Group A and Group B.

All undergraduate medical students from Group A and Group B scored similar pre-test scores. The post-test scores were higher in both Groups A and B. However, in comparison to Group B, Group A scored higher post-test scores which indicate higher level of learning. Our study shows competency-based learning helps increase cognition and helps achieve active learning. This is in agreement with the research study done by Mallilin et al. (2021) which also showed that there is a significant difference in the improved competency-based learning and quality of education as observed by the respondents. Their study supports that competency-based learning and programs are very flexible as to structure depending on the individual learners because students are guided in their learning process and control when and where they complete projects and assessments. The study done by Josephine and Nathira (2020) also proved the effectiveness of the competency-based learning and programs in improving the attentiveness and knowledge of the students.

Competency-based learning helps students to have more teacher-student interaction, where student is learner and teacher becomes facilitator, thus creating an environment which is focused on learning needs of the student. When the student is aware that a teacher is assessing the procedure through DOPS checklist, the learning of the student becomes more accurate, thus inclining to the statement of “Assessment derives learning.” Furthermore, during feedback provided to the student after directly observed procedural skills, student gets more clarity about his performance highlights and weaknesses. Definitely the student felt motivated to correct his mistake. On the 2nd and 3rd assisted performance, student understood better and performance was improved, as competency-based teaching involved DOAP session, in which facilitator will help the learner to learn by first demonstrating the procedure, then observing the student perform, assist him where the student needs help, until the student performs. Bray et al., (2020) also asserted that competency-based program outcome is that students are workplace ready and have expertise in their chosen fields. It develops a competency-based learning assessment that requires a program to measure and plan the process for successful implementation of a sustainable transformation in the educational setting. Programs are designed around competencies that are needed for a particular career ensuring that materials provided in the modules are relevant. Competency-based program is a direct path to a successful career of student’ competency graduates. On the other hand, traditional teaching is not student centered. It is time bound. Conventionally, practical taken by faculty is demonstration followed by correction. It is not aimed toward bringing the student toward competent stage, here competence being to measure blood pressure. This skill is only checked during consecutive assessment in the form of class test or summative examination (final exam). Furthermore, in traditional assessment, only marks are provided in the form of feedback. Student is clueless about his lacunae in learning and performing. This roots to one major limitation to traditional teaching, hence putting a way forward toward competency-based teaching and paradigm shift in curriculum.

The feedback collected from Group A showed that they felt more motivated and confident to perform due to active interest of facilitator in the performance of the skill of measuring blood pressure. Hands-on training from the facilitator also helps then better recall of the clinical context to the measurement of blood pressure. Majority of students strongly agreed that competency-based teaching is better than traditional teaching and CBME teaching should continue in undergraduate curriculum. Similar results were obtained in study conducted by Raghunandana et al. who showed that students were inclined toward active learning methods than traditional learning. Lomer and Anthony-Okeke found that students are engaged in their module materials of teaching because they have ownership over their learning. Students are empowered because they have control over when, where, and how they learn in their modules. Further, it shows that competency-based programs promote individualized learning and accommodates a variety of learning styles, making it a truly personalized experience. It introduces the personalized effort of learning and shows that competency-based learning programs are very flexible as to structure depending on the individual learners because students are guided in their learning process and control when and where they complete projects and assessments. Self-paced competency-based learning shows that students feel that they can prove mastery, they can take an assessment, receive credit, and start on their learning process.

Consequently, feedback gathered from Group B showed that there was no active involvement of teacher and they did not feel motivated. The teacher interaction only occurred while
a student faced difficulty in understanding the procedure (mainly Korotkoff sounds) or interpretation of the result. The understanding to clinical correlation was similar to Group A which showed that cognition domain is not compromised in traditional teaching. Majority of students strongly agreed that CBME teaching should continue in undergraduate curriculum.

The feedback collected from faculty as shown in Table 5 that competency-based teaching is more effective in skill development and active learning and is more motivating for the undergraduate student as there is more interaction between student and teacher. However, many faculty members were of the view that DOAP is more time consuming and it is easier to take class in traditional demonstration than DOAP session. This may be due to the fact that CBME teaching is new and it will require time for faculty to adapt to this new CBME. Review of literature also shows that although it is well-established that active learning provides significant practical and theoretical advantages over passive learning, teachers/faculty are often seen reluctant to employ these active learning strategies in routing teaching practice.[17] The traditional lecture technique is preferred by many faculty members because it serves as safety net for teachers who may be unfamiliar with using other the active learning method methods. Barriers that prevent faculty from using active learning strategies include insufficient training, lack of self-confidence in personal skills and knowledge, fear of failure to cover course content in the time available, large class sizes, and lack of materials or equipment needed to support active learning approaches.[17]

**Strength and Limitation of Study**

In the present study, it was found that the students who underwent competency-based training of the skill of blood pressure measurement showed significantly better results in learning and performing the skill over those who learned by traditional way of teaching. Hence, this study showed that we are moving in right direction by introducing

<table>
<thead>
<tr>
<th>Table 4: Comparison of post-test scores of Group A and Group B</th>
<th>Post-test</th>
<th>t-value</th>
<th>P-value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A Mean (SD)</td>
<td>8.9296875±1.0131699</td>
<td>8.4±0.913944264</td>
<td>2.796388</td>
<td>0.006</td>
</tr>
<tr>
<td>Post-test Group B Mean (SD)</td>
<td>Significance: P&lt;0.05, Highly significant: P&lt;0.005</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Significance</td>
<td>S</td>
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<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 5: Faculty feedback by DOPS</th>
<th>Checklist headings</th>
<th>Group A Mean (SD)</th>
<th>Group B Mean (SD)</th>
<th>t-value</th>
<th>P-value</th>
<th>Significance: P&lt;0.05, Highly significant: P&lt;0.005</th>
</tr>
</thead>
<tbody>
<tr>
<td>General guidelines for vital signs</td>
<td>1.992±0.0883</td>
<td>1.0571±0.23550</td>
<td>-36.6651</td>
<td>4.7E-80</td>
<td>HS</td>
<td></td>
</tr>
<tr>
<td>Cuff size</td>
<td>2±0</td>
<td>2±0</td>
<td>-</td>
<td>-</td>
<td>NS</td>
<td></td>
</tr>
<tr>
<td>Arm position adult</td>
<td>1.843±0.365</td>
<td>1.4857±0.507</td>
<td>-4.70558</td>
<td>5.42E-06</td>
<td>HS</td>
<td></td>
</tr>
<tr>
<td>Remove clothing as necessary to explore extremity</td>
<td>1.554±0.4989</td>
<td>1.343±0.4816</td>
<td>-2.10768</td>
<td>0.036617</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>Place correct size cuff around the extremity with the center of the cuff over the artery</td>
<td>1.594±0.493</td>
<td>1.257±0.443</td>
<td>-3.86389</td>
<td>0.000162</td>
<td>HS</td>
<td></td>
</tr>
<tr>
<td>Locate the artery by palpation</td>
<td>1.789±0.4096</td>
<td>1.5142±0.562</td>
<td>-3.2288</td>
<td>0.001507</td>
<td>HS</td>
<td></td>
</tr>
<tr>
<td>Obtain reading by palpatory method</td>
<td>1.625±0.486</td>
<td>1.1143±0.529</td>
<td>-5.40259</td>
<td>2.33E-07</td>
<td>HS</td>
<td></td>
</tr>
<tr>
<td>Opens valve and slowly releases the air, does not reinflate the cuff without totally deflating it</td>
<td>1.7968±0.404</td>
<td>1.228±0.426</td>
<td>-7.29024</td>
<td>1.32E-11</td>
<td>HS</td>
<td></td>
</tr>
<tr>
<td>Obtains a blood pressure reading by auscultation</td>
<td>2.303±0.636</td>
<td>1.6±0.553</td>
<td>-6.72645</td>
<td>2.88E-10</td>
<td>HS</td>
<td></td>
</tr>
<tr>
<td>Do not leave cuff inflated for prolonged period</td>
<td>1.875±0.332</td>
<td>1.742±0.443</td>
<td>-1.93271</td>
<td>0.055027</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>Deflates cuff rapidly and completely and removes from arm</td>
<td>1.6875±0.4653</td>
<td>1.171±0.382</td>
<td>-6.02445</td>
<td>1.11E-08</td>
<td>HS</td>
<td></td>
</tr>
<tr>
<td>Waits 2 min before taking another BP</td>
<td>1.7890625</td>
<td>1.314286</td>
<td>-5.88021</td>
<td>2.3E-08</td>
<td>HS</td>
<td></td>
</tr>
<tr>
<td>Total score</td>
<td>24.0312±1.783</td>
<td>18.171±1.271</td>
<td>18.19738</td>
<td>6.59E-41</td>
<td>HS</td>
<td></td>
</tr>
</tbody>
</table>

DOPS: Directly observed procedural skills
competency-based learning in undergraduate students. The limitation of the study was that it was conducted on a small sample size and that too from a single medical college. A larger sample including other medical colleges in Punjab and all over India should also be explored for a better comparison. Further expanded research is advised in relation to the findings of the current study.

CONCLUSION

The present research study concluded that the students who underwent competency-based training of the skill of blood pressure measurement showed significantly better results in learning and performing the skill. The current study and the existing literature support the fact that CBME introduced by NMC has an edge over traditional teaching methods. It is assessment tool which is inexpensive, mutually beneficial, easy to use, and instant assessment means.

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REFERENCES


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