CASE BASED LEARNING IN CARDIOVASCULAR PHYSIOLOGY FOR FIRST YEAR STUDENTS

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ABSTRACT

BACKGROUND
Active learning happens when students are given the opportunity to develop a more interactive relationship with subject matter of a course, encouraging them to generate, rather than simply receive knowledge. An active learning teacher facilitates student learning. The study is an effort to explore the use of CBL as an educational strategy for promoting active learning.

Aims and Objectives
1. To introduce CBL as an active learning approach.
2. To enable students to become self-directed learners.

METHODS
CBL was introduced in 1st year MBBS students after orientation program for both the students and the faculty. After intervention, student perception of CBL was recorded and average student score in CVS taught were compared with scores obtained in topics covered during didactic lectures. An attempt was also made to see the effect on academic performance by comparing scores of this batch with students of the previous batch in the same topic.

RESULTS
Initially a total of 125 MBBS students of 1st year were included in the study. The attitude of the students was recorded by student questionnaire and it was found that 91.2% of students felt that this method enabled them to apply the knowledge of basic science to clinical reasoning and 86.4% felt that these sessions helped them to develop analytical and critical thinking. On comparing scores of the students in the same topic taught to Batch 2012, the pass percentage of the students increased from 36% to 76%.

CONCLUSIONS
The student feedback and the scores obtained by the students in the topic encouraged them to use more interactive methods of teaching. And this eventually may lead to better learning.


CASE BASED LEARNING (CBL) has been used in the medical curriculum so as to inculcate the habit of self-learning. It helps them to integrate knowledge from different subjects to solve problems and finally develop analysing abilities with the application of knowledge. The better understanding of the text and its application help to develop the interest in the students. The cases used for learning have a real background, irritates or triggers willingness to discuss and also fulfils framed learning objectives. In case based learning approach the group dysfunction is less observed due to more teacher-dependent approach to learning. Other advantage of case based learning is that students analyse the clinical case understanding the disease on the basis of normal physiology whereas in Problem based learning, students jump directly to diagnostics and read medicine textbooks to find out the treatment protocol for the disorder. The study was done to introduce case based learning in Physiology in Adesh Institute of Medical Sciences & Research and record perceptions of the students regarding case based learning and improvement in academic performance if any.

Patient-centred learning and multiple-format sessions CBL is one method where students are motivated to learn on their own as to inculcate the habit of self-learning and integrating knowledge from different subjects to solve problems. It is a small-group method in which both students and faculty members contribute to discussion, learning issues are preidentified, and preparatory readings are assigned while student discussion and guided inquiry around clinical...
problems are still promoted. Our College, which is recognized by the Medical Council of India, also planned to introduce a new teaching-learning method in the form of CBL.

**Aim of The Study**

To introduce Case based learning as one of the active learning strategies for self-directed learning

**METHODS**

The project was carried out with 125 MBBS First Professional students of 2013 Batch of Adesh Institute of Medical Sciences & Research Bathinda who attended all the four sessions of CBL. An orientation program in CBL was conducted two weeks prior for familiarising students with CBL. The program introduced use of case study approach in Physiology, need for active learning in medical curriculum and issues related to case processes and group dynamics were discussed. During presentation the students were divided in 5 groups of 30 each. A total of four sessions each of 2 hr., duration was held in the paper cases with relevant findings were made available to students during commencement of each session. Students were given enough time to study the case. They discussed the case among themselves. During the first session, students were asked to frame learning objectives based on the cues, and a list of references (From physiology, anatomy, medicine, and surgery) was given to them so as to prepare for the next session. Being the only one as a facilitator my role was limited to keep the students focused on learning objectives and to ensure group dynamics. The students were provided a week’s time to discuss the case and provide physiological answers to the questions related with the case based on their previous acquired knowledge from the didactic lecture classes. The responses were in Likert scale and were linked to learning, analytical and communication skills. The questionnaire had both structured and open-ended questions. The questionnaire was validated by the Medical Education Faculty of the institute. Topics discussed in CBL session was evaluated by including in the centralized examination at the end of system. Academic performance of the students in topics covered during CBL and conventional lecture was compared by taking average scores obtained by the students for the CBL portions with their average scores obtained in lecture topics by taking a theory class test. The performance of scores in Nerve Muscle Physiology (NMP) topic of same level of difficulty thought by students was also compared which was taught only by didactic lectures.

**Implementation/Planning**

- Permission was taken from the Dean of the Institute and Head of Department to conduct this Project.
- The proposed study project was presented before the Adesh University Ethical Committee of the institute. Permission to carry out the project and ethical waiver was granted by it.
- Feedback questionnaires for students were designed and modified after pretesting with colleagues.

**Discussion with Faculty and Sensitization**

- The first session with the faculty members of department of Orthopaedics, Gynaecology and Pharmacology was a sensitization session wherein the faculty was introduced to the concept of CBL its assessment and possible utility to students and teachers. The proposed study plan was also discussed with the faculty.
- In the second session, they were appraised with the results of the students. The student feedback was also shared with them
- Discussion was held on how as teachers we can use active learning strategies to encourage students to try new methods of learning.

**Collection of Feedback**

Students’ feedback: Feedback was taken by questionnaire in structured and open-ended question (Annexure I).

**RESULTS**

<table>
<thead>
<tr>
<th>Sl No.</th>
<th>Questions</th>
<th>% of Positive Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>The discussion in CBL help me better understand the learning objectives</td>
<td>96</td>
</tr>
<tr>
<td>2.</td>
<td>This resource session help me to understand difficult/complex topics</td>
<td>89.6</td>
</tr>
<tr>
<td>3.</td>
<td>CBL has enhanced my communication skills</td>
<td>64.8</td>
</tr>
<tr>
<td>4.</td>
<td>The course increased my interest in the topic taught</td>
<td>95.2</td>
</tr>
<tr>
<td>5.</td>
<td>This methodology has helped to improve my retention of knowledge of human physiology</td>
<td>95.2</td>
</tr>
<tr>
<td>6.</td>
<td>The course method helped me to integrate different aspects of the topic</td>
<td>90.4</td>
</tr>
<tr>
<td>7.</td>
<td>CBL facilitates a better and healthy teacher-student relationship</td>
<td>92.8</td>
</tr>
<tr>
<td>8.</td>
<td>The learning acquired through these sessions allowed me to appreciate human body function in integrated manner</td>
<td>91.2</td>
</tr>
<tr>
<td>9.</td>
<td>This course method help in promoting self-study and problem solving abilities</td>
<td>88</td>
</tr>
<tr>
<td>10.</td>
<td>The method will help me in recall and application basic sciences to the clinical scenario</td>
<td>86.4</td>
</tr>
<tr>
<td>11.</td>
<td>The case studies posed challenging questions that helped me develop analytical and critical thinking</td>
<td>58.2</td>
</tr>
<tr>
<td>12.</td>
<td>CBL helps in understanding the principles of group dynamics.</td>
<td>93.6</td>
</tr>
<tr>
<td>13.</td>
<td>CBL is a better method of teaching/learning than the conventional one.</td>
<td>91.2</td>
</tr>
<tr>
<td>14.</td>
<td>There are some gaps in knowledge after completing my study of this course</td>
<td>55.2</td>
</tr>
<tr>
<td>15.</td>
<td>Overall I am satisfied with the course methodology used during session</td>
<td>88.8</td>
</tr>
</tbody>
</table>

*Table I. Showing Pass Percentage of Students in CVS Topic in Both The Batches*
Scores reflected an improvement in the learning preference awareness, efforts to try new and mixed methods of learning, overall satisfaction with self-study session and satisfaction with preparation for the examinations.

The responses to questions directed at attitude towards CBL sessions these were closed ended questions using a different 5 point Likert scale.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Questions</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>The discussion in CBL help me better understand the learning objectives</td>
<td>4.39</td>
<td>0.73</td>
</tr>
<tr>
<td>17</td>
<td>This resource session helps me to understand difficult/complex topics</td>
<td>4.26</td>
<td>0.95</td>
</tr>
<tr>
<td>18</td>
<td>CBL has enhanced my communication skills</td>
<td>3.48</td>
<td>1.53</td>
</tr>
<tr>
<td>19</td>
<td>The course increased my interest in the topic taught</td>
<td>4.38</td>
<td>1.18</td>
</tr>
<tr>
<td>20</td>
<td>This methodology has helped to improve my retention of knowledge of human physiology</td>
<td>4.21</td>
<td>1.28</td>
</tr>
<tr>
<td>21</td>
<td>The course method helped me to integrate different aspects of the topic</td>
<td>4.3</td>
<td>1.22</td>
</tr>
<tr>
<td>22</td>
<td>CBL facilitates a better and healthy teacher-student relationship.</td>
<td>4.33</td>
<td>1.21</td>
</tr>
<tr>
<td>23</td>
<td>The learning acquired through these sessions allowed me to appreciate human body function in integrated manner</td>
<td>4.21</td>
<td>1.28</td>
</tr>
<tr>
<td>24</td>
<td>This course method helps in promoting self – study and problem-solving abilities</td>
<td>4.22</td>
<td>1.26</td>
</tr>
<tr>
<td>25</td>
<td>The method will help me in recall and application basic sciences to the clinical scenario</td>
<td>4.29</td>
<td>1.23</td>
</tr>
<tr>
<td>26</td>
<td>The case studies posed challenging questions that helped me develop analytical and critical thinking</td>
<td>4.18</td>
<td>1.29</td>
</tr>
<tr>
<td>27</td>
<td>CBL helps in understanding the principles of group dynamics.</td>
<td>4.34</td>
<td>1.19</td>
</tr>
<tr>
<td>28</td>
<td>CBL is a better method of teaching/learning than the conventional one.</td>
<td>4.29</td>
<td>1.24</td>
</tr>
<tr>
<td>29</td>
<td>There are some gaps in knowledge after completing my study of this course</td>
<td>3.71</td>
<td>1.41</td>
</tr>
<tr>
<td>30</td>
<td>Overall, I am satisfied with the course methodology used during session</td>
<td>4.25</td>
<td>1.24</td>
</tr>
</tbody>
</table>

Table 2. Responses on Attitude Towards Counseling Sessions and Practice Change on a 5 Point Likert Scale

The following are some of the responses to the open-ended question in the student feedback questionnaire that asked them to specify the changes they had made in their studying method and the effect (beneficial or otherwise) that they perceived:
1. This improved our knowledge.
2. We started reading more books from the library and tried to gather information from net.
3. We had a feeling that we are going to be doctors and started thinking like that.
4. We had a better understanding and co-ordination with the instructor.
5. We will be able to correlate the theoretical information with that of its application in near future.
6. Now I know how to study in a medical college.
7. Few said that it created confusion at some points which cleared off after faculty discussion.
8. Sometime the extent of information could not be levelled.
9. Time duration provided for preparing the case was less.
10. It is good method of revision of topic if done with didactic lecture.
11. It should not replace lecture.
12. There should be enough gap between CBLs.

Regarding improvement of this method of teaching following responses were recorded from students-
1. Big group had less participation and so small groups should be for discussing the case so that everyone could get a chance to participate.
2. More time should be given to the case discussion.
3. CBL should be simultaneous with didactic lecture.
4. Grouping should be changed for every CBL.
5. Each group should be given separate topic so that more topics are covered in less time.
6. It would be much better if patients replace paper cases.

DISCUSSION
Current trends in medical education have moved toward learner-centered teaching and student-initiated problem solving. The approach that the students adopt appear to be an important factor in determining quantity and quality of education. This in turn is influenced by factors such as curriculum, teaching characteristics, departmental characteristics and assessment methods[10] Medical schools use the Problem based Learning (PBL) and Case Based Learning (CBL) models to encourage students to develop self-directed learning and encourage teachers to make the basic disciplines more clinically relevant through the use of clinical scenarios. CBL allows students to develop a collaborative, team-based approach to their education and their profession. It is intended to foster learning for competence, a deep level of understanding and provide opportunities for vertical and horizontal integration of the syllabus. Our results were supported by some of the other medical education researches, which stated that CBL could help in developing an effective learning environment, with the use of specific learning objects [1, 2]. CBL also made the subject easier to learn and it also solidified their understanding of the subject. It helped them in developing logical thinking, clinical reasoning and diagnostic interpretation. This was also observed by other previous workers[11, 12] The use of case studies in the basic sciences have shown a positive effect on the learning outcomes [13].
In our study the scores obtained in the test administered indicated that their performance was better in topics which were CBL sessions than the didactic lectures. 89.6% of students considered Case based teaching helped in better understanding and comprehension of the subject material. Case based teaching methodology served the primary objective and allowed the students to handle the course content analytically and relate the course content with clinical situation thus have active learning which was agreed by 96.4% of students[14, 15] The students understand the need of the subject that their thinking and analytical skills improved and they could correlate basic sciences to clinical but this requires a lot of effort by the faculty and also time.

**Outcomes: What This Study Adds**
The students overall, had a positive opinion regarding CBL and going through the result of CVS topic as compared to last year has motivated the faculty to use active teaching learning strategies and the faculty has started realizing role of faculty development programmes in Medical education and were interested in education related projects. As this is one of the first project of its kind to be started in our newly started institution. Earlier they thought all what is told in medical education is theoretical and not feasible. The students have started liking physiology more and are trying to apply this concept to other subjects also. This project is innovation in itself as it has involved students in deep learning as this is first initiative of its kind in our college. This message has spread in other allied colleges of University and may lead to overall improvement. If continued it can really help students understand and apply Physiology in their clinical classes as well.

**Limitations**
- Time for doing the project was very less due to late joining of 1st Prof Students and it was not possible to start CVS in the beginning.
- Other faculties from the Department were not involved.
- Session went beyond college hours done in routine college time
- Due to time constrains it was not possible to do in small groups.

**My Reflections**
- What was good: It gave me enough time to interact with students. The improvement seen in CVS topic in this Batch is quiet.
- What could have been differently: I realized that educational projects require a lot of involvement and support of colleagues. I could have sought more active help of colleagues in carrying out this project.
- The road ahead: Some of the intermediate outcome measure of the study have not been addressed such as the change on the teaching practice of the teachers. I plan to work on it.

**CONCLUSIONS**
Introduction of CBL improves learning. The students feel that their thinking and analytical skills improved, and they could correlate basic sciences to clinicals but this requires a lot of effort by the faculty and also requires time. In fact, if the Medical Council of India is initiating such active learning strategies, time for CBL should be included in the curriculum as in the present scenario as time duration of 1st professional year of MBBS has shortened and only didactic lectures are covered in that time.

**Implications**
It will serve as a good initiative to start active learning strategy in our college which has started few years back. In fact, the results of the students shown in topics covered with Case Based Learning may make them receptive and motivate other faculty members to adopt new active learning strategies and take active part in faculty development programmes. CBL has helped in promoting self-study and problem-solving skills in the students which will promote learning.

**Summary of Results**
A total of 150 MBBS students of 1st year took part in the study but finally data of only 125 students who were present in all the four sessions of CBL was compiled and analysed. The score in CVS improved from 36% to 76%. It was observed that 93.6% found CBL to be helpful in understanding the principles of group dynamics and 91.2% found that CBL was a better method of teaching/learning than the conventional one. Overall 88.8% were satisfied with the course methodology used during session.

**Achievements**
Case-based learning helped the students to integrate basic and clinical sciences. This increased their interest in the topic overall in whole 1st Professional year of MBBS. Their learning became directed. They accepted the change from traditional methods to interactive teaching using cases. In fact, it helped them to reach learning objectives. The faculty was satisfied as well as further motivated to continue using interactive methods of learning.

**REFERENCES**


