PUB: 129/2012

Original Research Paper

Initiating Case Based Learning (CBL) for large group in Pharmacology

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Abstract

Objectives: Undergraduate medical education (MBBS) still involves large classes and most of the curriculum is delivered through traditional lectures. Some students lack opportunities for active and self-directed learning. Hence, it is necessary to initiate Case-Based Learning (CBL) for large group teaching, gather perception of students and compare the effectiveness of the CBL with regular lectures.

Methods: Tuberculosis and malaria were chosen for CBL. We formulated 15 case scenarios in tuberculosis and 12 in malaria. CBL was facilitated in a large group of 112 students using buzz groups of about 10 students each. Structured feedback questionnaire was prepared to assess the perception of students about these modules using a five point Likert scale. After one month a test was administered which included questions from CBL and lecture topics.

Results: Most students (93% to 96%) either strongly agreed or agreed that the module improved their comprehension, stimulated interest in the subject, improved their ability to correlate pharmacology with medicine, increased understanding of bedside clinics of tuberculosis and malaria, rational drug therapy and adverse drug reactions. The marks scored in CBL topics was significantly high 4.85 ± 1.3 compared to lecture 3.98 ± 1.4 ($p<0.0001$). There was significant difference ($p<0.001$) in the marks between high and low achievers in the CBL topics, but performance of high and intermediate achievers was insignificant.

Conclusions: The majority of students perceived that CBL improved their ability to integrate the knowledge gained in pharmacology to bedside clinics. CBL significantly improved the performance of students. CBL was more effective than lecture for intermediate achievers.

Keywords: CBL, integrated learning, pharmacology

Introduction

The challenges of medical education in India are similar to other developing nations. The learning process still involves large classes and most of the curriculum is delivered through traditional lectures. Further, the curriculum is still taught disciplined based, teachers lack skills in other teaching-learning methods and newer student assessment methods. Thus, students lack opportunities for active and self-directed learning (Amin et al., 2006). Active learning happens when students are given the opportunity to develop a more interactive relationship with the subject matter of a course, encouraging them to generate rather than simply receive knowledge. In an active learning environment teacher facilitates students' learning (Armbruster et al., 2009; Chan et al., 2008). Adoption of active learning strategies strengthens students learning as they apply their own experiences and previous knowledge (Mehmet et al., 2005).

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In India the duration of MBBS course is four and half years followed by a one year internship. The student intake at our institution is 150 students per year, but in the second year we will have 110 to 120 students. Students in the second year are with us for one and half year which is divided into 3 semesters during this period pharmacology is taught. We have three didactic lectures per week and one practical session of two hours duration in each semester. Practical batches consist of 56-58 students; we have two batches in a week. Undergraduate medical students at Sri Devaraj Urs Medical College, Kolar, Karnataka, India in their feedback of pharmacology sessions have commented on the difficulty in applying the knowledge learnt during lecture classes in actual clinical postings. Also, there is an emphasis in many Indian Medical Colleges to decrease the quantum of rote memorization and adopt learning strategies that would enhance critical thinking among students (Ghosh et. al., 2007). Since CBL is either a case, problem, or inquiry based large group teaching it can be used to stimulate the acquisition of knowledge, skills, and attitudes, in an integrated manner. This form of instructional strategy might promote interest and facilitate learning in low achievers in addition to high achievers. It is important that medical students appreciate pharmacological principles and are able to apply them in the practice of medicine (Rangachari, 1997). Traditional pharmacology teaching in medical schools is discipline based and teacher-centered with a heavy emphasis on acquiring factual knowledge about drugs (Joshi, 1996) and does not train the student adequately for therapeutics (Walley,1993).

Hence we perceived the need for initiating CBL for large group teaching.

Objectives

1. To gather perception of students regarding CBL
2. Compare the effectiveness of CBL with traditional large group lectures
3. To compare the effectiveness of CBL among high, intermediate and low achievers

Methodology

Pharmacology is taught during second year MBBS where students will also have clinical exposure. Tuberculosis and malaria were chosen for CBL as they are the most common cases that students encounter in our setting. We formulated the objectives and developed 15 case scenarios in tuberculosis and 12 in malaria covering all the learning objectives for the two diseases. Structured feedback questionnaire was prepared to assess the perception of the students on these modules. The study was carried out after the approval from the institutional ethics committee. After content validation by the faculty, Medical Education Unit members and FAIMER fellows, it was piloted on 30 students and the internal consistency was found to be reliable (Cronbach's alpha - 0.72).

In the monthly teaching schedule of pharmacology, there are 16 didactic lectures for one hour and four practical sessions for two-hour duration. Based on the opinion of the department faculty, eight hours of the didactic lecture were deleted from the monthly schedule. It was restructured to include CBL instead .CBL was initiated for the entire batch of 5th term students (n=112). CBL was facilitated in a large group of 112 students with buzz groups of 10 each. Each disease was assigned 5 hrs. of CBL. Case scenarios with background of a patient, clinical situation, manifestation of adverse drug reactions (ADR photographs), drug interactions, contraindications and rational use of drug therapy were used.

A sample case used in tuberculosis

Jaishree is a 25 year old teacher residing at Malur. She has been complaining of tiredness and malaise for the past one month. Her colleague at school commented that Jaishree seemed to have lost a lot of weight also and advised her to visit the hospital. At the hospital the doctor, on taking her history, noted that Jaishree was coughing with expectoration for two months, but had never coughed blood. She also had an occasional fever and chest pain upon coughing. Jaishree had never suffered from these similar symptoms and she had never been in contact with anyone with such symptoms.

Cases were displayed during the session and students were given eight minutes time to get acquainted with the case scenario, read, discuss and analyses it from different perspectives with their neighbors and later identify the main issues involved. They try to work out a solution through case solving. Later the questions were projected and the students were given an opportunity to respond. A Faculty only facilitated the learning process, discussed relevant points and summarized each cases scenario. A maximum of three scenarios were discussed in one hour.

Students' perception on CBL was obtained immediately using structured feedback evaluation questionnaire consisting of 7 statements (comprehension improved, stimulated interest in subject, correlate pharmacology with medicine, helped understanding of bedside clinics of tuberculosis and malaria cases, understand rational drug therapy and adverse drug reactions, extended this method to other topics and motivation to referred textbooks) on a five point Likert scale and two open ended questions. The purpose of feedback was explained to students and confidentiality of the results were ensured.

After one month, a test was administered which included questions from CBL and lecture topics which were comparable with respect to difficulty level (8 marks each) and marks (score) obtained was compared. For analyzing the effectiveness of CBL among the high (group1), intermediate (group 2) and low achievers (group 3) subgroup analysis was done considering the marks scored in the internal assessment (Table 2). Statistical analysis was done using SPSS version 11. Unpaired 't'test, ANOVA with post hoc test was done, $p < 0.05$ and was considered to be significant.

Results

Among the 112 students feedback was given by 105 (93.75%). The response rate is shown in (Table 1), the majority of the students stated that their learning skills improved. Most of them (93% to 96%) either strongly agreed or agreed with the first 5 statements extension of CBL to other topics in pharmacology was strongly agreed (56%) and agreed (33%). Motivation to referred text books was strongly agreed by 25%, agreed 47%, neutral 27%.

The marks scored in the topics covered during CBL sessions (4.85 ± 1.3) was significantly high as compared to lecture (3.9 ± 1.4) ($p<0.0001$). The marks obtained by high achievers in CBL and lecture topics was not statistically significant ($p=0.06$) (Table 2). This implies that the performance of high achievers is not influenced by the type of instructional strategy. However there was a significant difference in the scores obtained between the CBL and lecture topics in the intermediate ($p<0.0001$) and low achievers ($p=0.009$) (Table 2). From this it has been inferred that CBL may have helped these two groups to learn effectively.

There was a significant difference ($p<0.001$) in the marks obtained in the CBL topics between high and low achievers, but there was no difference ($p=0.09$) between high and intermediate achievers. This demonstrates that CBL may help intermediate achievers to improve their performance and match that of high achievers. Similarly the marks obtained by intermediate and low achievers was not significant ($p=0.07$), thus CBL may help them to perform better.

Table 1: Students' (105) perception on CBL (%)

Variables	Strongly agree (1)	Agree (2)	Neutral (3)	Disagree (4)	Strongly disagree (5)
Comprehension improved	52 (50)	47 (45)	6 (5)	0	0
Stimulated interest	54 (51)	47 (45)	4 (4)	0	0
Correlation of pharmacology with medicine	61 (58)	39 (37)	5 (5)	0	0
Understanding bed side clinics	57 (54)	41 (39)	5 (5)	2(2)	0
Understanding rationale drug therapy and ADR	44(42)	54(51)	6(6)	1(1)	0
CBL for other topics	59(56)	35(33)	10(10)	1(1)	0
Motivation to refer textbooks	26 (25)	49 (47)	29(27)	1 (1)	0

Table 2: Evaluation of intervention

Parameters	CBL Mean marks (out of 8) ± SD	Lecture Mean marks (out of 8) ± SD	Test P value
Group I (n=46) (> 40 marks)	5.27 ± 1.4 # μ	4.72 ± 1.4 $	0.06
Group II (n=45) (30-39 marks)	4.71 ± 1.1 ∞ μ	3.50 ± 1.1	0.0001**
Group III (n=14) (21-29 marks)	3.8 ± 1.9 # ∞	3.03 ± 0.5 $	0.009**
ANOVA P VALUE	0.001	0.0001	

**P < 0.01 highly significant
# indicates difference between Gp1 &3 (p<0.001)
μ indicates difference between Gp1 &2 (p=0.09)
∞ indicates difference between Gp 2 &3(p=0.07)
$- indicates difference between Gp 2&3 compared to Gp1 (p<0.0001)

Discussion

Current trends in medical education have moved toward learner-centered teaching and student-initiated problem solving. The transition of the medical curriculum from a classical didactic and discipline-based approach to integrated PBL has also been adopted in Asia (Amin et al., 2006). Medical schools use the PBL and 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. A number of innovations have been carried out in pharmacology teaching and learning in both developed and developing countries (Maxwell & Walley ,2003; Barakzai, 2004; Sim,2004). There is an increasing emphasis on clinical reasoning and a more patient-oriented approach. Inquisitive learning in small groups and opportunities for self-directed learning are emphasized.

In this study students' perceptions revealed that case-based learning was well accepted. Their perceptions indicated that clinical reasoning, interpretations of drug related reactions, drug interactions, rational use of drugs, acquired through CBL increased their ability to think and apply the knowledge to patients. The majority of students strongly agreed that case-based learning was worthwhile in the progress of their learning and that the cases were relevant. They also stated that such teaching and learning method should be incorporated into other topics of Pharmacology. The study by Kassebaum et al., (1991) demonstrated several important aspects of students' attitudes to CBL after alternating their teaching methods during several sessions. They were able to show that students undertaking the CBL format were better at asking questions and making comments during class and CBL made learning more enjoyable. Pearson et al, (2003) concluded that the innovative CBL paradigm appeared to be an effective adjunct to the traditional lecture format. But, they were unable to determine if this method of teaching could increase other problem solving attributes or improve clinical performance.

Student evaluations were undertaken by Kassebaum et al., (1991); Engel & Hendricson (1994); Garvey et al., (2000); Hay & Katsikitis, (2001); Pearson et al., (2003); and Hansen et al., (2005); using a combination of Likert Scales and questionnaires. These studies demonstrated that CBL was enjoyed and embraced by the majority of students. Learning how to evaluate and analyze information is an important skill. Solving problems in therapeutics, prescribing appropriate drugs for a disease condition and delivering drug and disease-related information in a meaningful way to patients should be regarded as a key 'transferable skills' in Pharmacology (Shankar et al., (2003). A

method of orientating students towards therapeutics is to expose them to a sequential decision-making process for solving therapeutic problems (Joshi & Jayawickramarajah, 1996).

In our study the scores obtained in the test administered indicated that their performance was better in topics which were CBL sessions than didactic lectures. The study to evaluate beyond student attitudes of CBL models was carried out by Hay and Katsikitis (2001) where they not only measured students' attitude but also reviewed students' knowledge level. Students who were assigned to a tutor with expertise in the area of study, performed better on a voluntarily completed test of knowledge in both CBL and PBL topics. PBL students scored higher in clinically oriented examinations (Vernon and Blake 1993) and they did better in long term retention as compared to students from conventional curricula.

In this study it was also observed that the performance of high achievers was not influenced by the type of teaching and learning methodology as there was no significant difference in the marks obtained ($p=0.06$, Table 2). But there was a significant difference in the scores obtained between the CBL and lecture topics in the intermediate ($p<0.0001$) and low achievers ($p=0.009$). Hence, it is inferred that CBL may help these two groups to learn more effectively and improve their performance.

Our study had limitations. The opinions and marks obtained were only from a single batch of students. More studies on a large group of population are required and may be carried out in the future.

Conclusions

The students overall, had a positive opinion regarding CBL. The teaching and learning of pharmacology can be improved and a closer integration with the clinical disciplines may be required. CBL should be strengthened. Using 'real' cases from the hospital during the sessions would be better. The sessions on CBL were appreciated and it was suggested that it should be carried out for other topics in pharmacology. CBL was more effective than lecture for intermediate achievers. CBL is better for integrating the knowledge gained in pharmacology to the bedside clinics. CBL for large group teaching can be implemented to other topics, to ensure effective learning.

Acknowledgement

We are thankful to Dr. Vinutha Shankar MS, Dr. Ravi Shankar, Dr. Chitra Nagaraj, Dr. Thomas Chacko for their guidance. We also thank Medical Education Unit faculty Sri Devaraj Urs Medical College and Foundation for Advancement of International Medical Education Research and Participants for their feedback.

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