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Original Research Article

To introduce and measure the effectiveness of case based learning in physiology

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ABSTRACT

Background: Student/learner centered strategies are needed to promote active learning in the students. Medical Council of India (MCI) also encourages learner centric approaches. Objectives of the study were to develop case scenarios for teaching in Physiology and use them to teach 1st professional MBBS students and to evaluate the impact of this intervention on students' learning.
Methods: After the approval from Institutional Ethics Committee (IEC) the study was conducted on MBBS 1st professional students. The students were taught two topics using CBL strategy. Pre-post test score were taken for evaluation of students' learning. Students' feedback was taken to elicit their perceptions about the effectiveness of the strategy. Faculty feedback was also taken for feasibility and implementation of CBL.
Results: Majority of the students were satisfied with the session. Majority felt it to be a good learning experience and many wanted to attend more such sessions. Difference in the pre-post test scores was statistically highly significant.
Conclusions: CBL proved to be an interesting and effective active learning strategy. More of such sessions should be conducted to engage the students as felt by students and faculty both.

Keywords: Active learning strategies, Case based learning, Medical education

INTRODUCTION

Teaching in the subject of physiology is undertaken with the help of didactic lectures, practical demonstrations and tutorials. The students are supposed to come prepared in the tutorials for the meaningful bilateral discussion but they usually don't come prepared. As a result, the teachers end up giving a lecture only where the active participation of the students is minimal. So, student/learner centered strategies, where the students are engaged and participate actively, are needed to promote active learning in the students.

Medical Council of India (MCI) also encourages learner centric approaches.[1] Various methods are being used in many institutes to reinforce lectures in teaching physiology, such as case-stimulated learning, problem-based learning and patient-centered learning.

One of such strategy is case based learning (CBL) where the students are taught with the help of case scenarios and are involved to solve a problem in order to achieve the learning objectives. CBL is known to impart analytical and problem solving skills in the students.[2,3] Apart from making them participate actively it also motivates the students to learn. So, a study was contemplated where case scenarios were devised and used in the tutorial sessions in the subject of physiology for central nervous system in order to reinforce the physiological concepts which are taught in the didactic lectures.

Aim and objectives

Aim of the study was to evaluate the impact of case based learning (CBL) strategy as a teaching learning method in physiology with the following objectives:

To develop case scenarios for teaching in CNS physiology; To use these scenarios to teach 1st professional MBBS students; to evaluate the impact of this intervention on students' perceptions and learning; Elicit faculty feedback on feasibility and implementation of CBL in physiology.

METHODS

The present study was carried out after the approval from Institutional Ethics Committee on 1st professional MBBS students (n=150) batch in the department of physiology at Maharishi Markandeshwar Institute of Medical Sciences, Mullana, Haryana, India. Verbal consent was taken from the students.

Sensitization of faculty and PGs

After an initial consent from the head of the department a meeting of the core faculty members was planned where they were sensitized about CBL and its effectiveness on students' learning. After their initial approval to move ahead they were detailed about the intended intervention. As a part of an initial plan and suggestion of the faculty members, post graduates of the department of physiology were also sensitized so that they can be brought into the project to act as facilitators.

Designing case-scenarios

In a focus group discussion (FGD), topics for the scenarios were identified and case scenarios with predefined learning objectives were developed on two topics i.e. Parkinsonism and Alzheimer's disease, with the inputs of other faculty members of parent department and departments of Pharmacology and Medicine.

Intervention and assessment

After taking the consent from the students, they were briefed about the purpose and process of the strategy. Eventually the intervention was rolled out during one of the tutorial sessions. The students attended the tutorial sessions in three sub-batches (n=50) on three consecutive days. Before the students were exposed to the case scenario (Case 1), they were given a Pre-test (Annexure-A) containing a few multiple choice questions in order to elicit their base line knowledge about the given topic. After that they were presented with a case scenario (Annexure-B).

This was designated as Session I. The case scenario included the clearly written symptoms and signs related to the topic. They were given time to solve the problem and try to find out the answers to the questions given at the end of scenario. The facilitators, during this session ensured the participation of each and every student by motivating them and guiding them to find out a solution for the problem. Subsequently, the students were given the specific learning objectives (Annexure–C) and instructed to try to find out the answers to the questions and come back in the next session.

Total of 136 students in three sub-batches attended the Session I. The students of all three different batches returned after one week in their respective batches for the Session II. All the students who attended Session I (n=136), attended the Session II.

During this session, the case was discussed in details, ensuring the participation from every student by the facilitators. Relevant questions were asked by the facilitator, so as to streamline the thought processes and to ensure that the students don't deviate from the learning objectives.

They were also encouraged to raise queries and doubts to the facilitator during the session. Then, they were given the Post-test (Annexure D), which contained the identical questions present in the pre-test and was evaluated. This whole process was repeated using different case scenario of different clinical condition (Case 2), in which 140 students, 146 students attended Session-I and Session-II respectively.

Feedback

After a thorough discussion, a questionnaire (Annexure-E) was administered to the students to elicit their perceptions about the new method of learning. The questionnaire included 12 items with 5 point Likert scales ranging from strongly disagree to strongly agree, with one open ended question at the end. Faculty perceptions about the feasibility and effectiveness of the process were also elicited in a focus group discussion.

Statistical analysis

The mean of scores obtained in the Pre-test were compared with the mean of scores of the Post-test for both the case scenarios (Case-1 and Case-2) and analyzed using paired t-test. The p-value of <0.005 was considered statistically significant. Perceptions of the students about effectiveness of the method were expressed as percentages. Responses to the open ended question were analyzed qualitatively.

RESULTS

Perceptions of the students about the CBL strategy

The results of the perception questionnaire are shown in Figure 1. Majority were satisfied and felt positive about the utility of the given method of teaching and

interaction. Majority agreed that they would like to indulge in more of such sessions.

Students' Remarks

Some of the responses written in the open ended remarks section were, "It was a fun activity", it was a break from routine sessions, we liked the concept of learning in groups, and we liked interacting with the faculty members". When asked in open-ended question regarding suggestions, most students said that no improvement was required. Most of the students emphasized that such kind of sessions should be repeatedly done for more topics and by trained teachers.

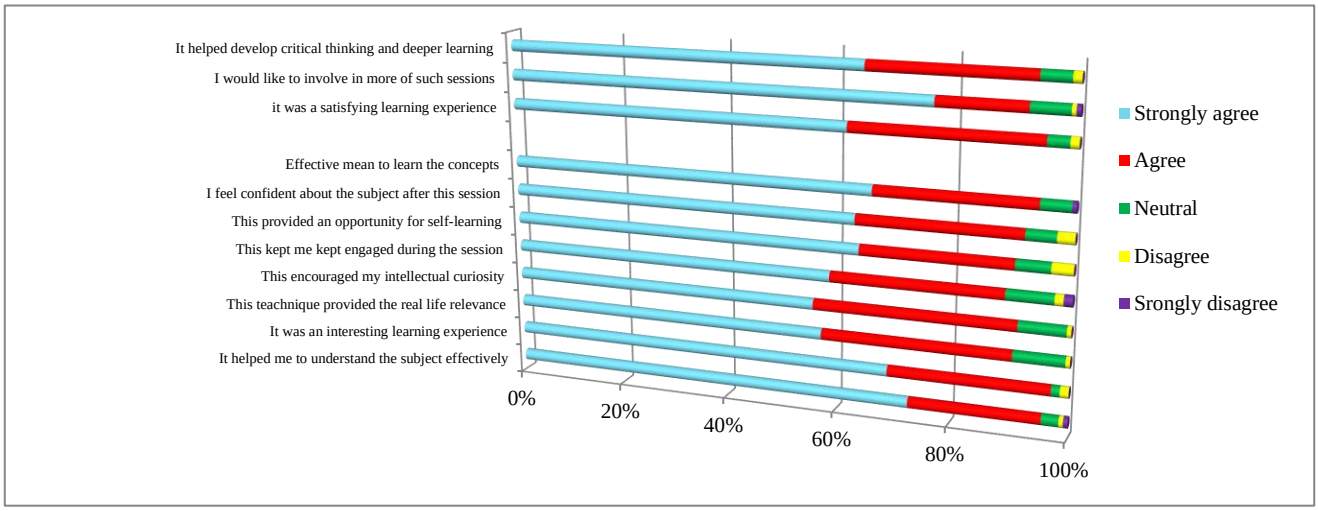

Figure 1: Perceptions of the students about the CBL strategy.

Impact of CBL on students 'performance

Difference in mean scores of Pre-test and Post-test was statistically very highly significant as shown in Table 1.

Faculty perception about Feasibility and Implementation of CBL

The faculty felt that CBL is an active learning strategy to engage the students and it also promotes student teacher interaction. They also felt that such sessions should be conducted on regular basis. It was also felt that developing CBL modules will be a challenging task, but training and interdepartmental integration will help in preparing and implementing CBL.

Table 1: Result of Pre-Post CBL evaluation test (Case 1).

	Mean	SD	Std. error mean	t	df	Sig. (2-tailed)
Pair 1 Var 00001-Var00002	-2.25000	1.58114	0.13558	-16.595	135	0.000

Difference in mean scores of Pre-test and Post-test for Case-2 were also very highly significant statistically (t=17.057, p<0.0001)

DISCUSSION

CBL as a teaching learning strategy was perceived as interesting and engaging by the students evident from the perception questionnaire results. It also seems to be a beneficial and useful method of teaching as reflected in the scores in the post test. Similar results have been shown in some of the other studies, which concluded that CBL could help in developing an effective learning environment, with the use of specific learning objects.[4,5] It helped in developing interest about the subject, as all the students were curious and attentive and it also motivated them to actively participate, with each one giving their inputs.[6] It 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.[7] The essence of this strategy is that the whole process is learner oriented.

During the study, it was observed that all the students seemed to enjoy the CBL session and were participating actively in the discussion. It made them work in small teams, which on one side fosters team spirit within the

small group (group dynamics), also brings a sense of healthy competition in between the groups and increasing the collaborative and communication skills of students.[8,9] Additionally, while they work on a case to answer the questions, it helps them develop clinical reasoning and diagnostic interpretation also, providing them early clinical exposure.

Faculty members of the department also felt that it is a unique method to engage the students meaningfully. Faculty also felt that more case scenarios should be developed for which faculty training and integration with other departments would help. Apart from this there is not much feasibility issue as the method does not require additional resources. They felt that such kind of sessions should be conducted routinely. The current study is a first of its kind in present Institute. The authors feel encouraged by the results of the study and hope that this study can serve as a precedence to develop more such modules in physiology and can be emulated by the other departments also for the benefit of the students.

Limitations

The scores of pre and posttest indicate the immediate recall/application of the knowledge, but the long term retention and application of the knowledge gained remains to be seen and less than optimal participation by some of the students.

Implications

We were able to demonstrate the feasibility to conduct CBL, which can act as precedence for other departments to use this strategy optimally for students benefit.

CONCLUSION

CBL is an interesting and effective active learning strategy. More of such sessions should be conducted to engage the students as felt by students and faculty both. Faculty development and interdepartmental integration may prove useful to develop more modules of CBL and implementation of CBL.

Outcomes: What this study adds

Present study is first of its kind in our Institute as CBL as a teaching learning strategy is not being practiced. This study can be used as a model to further and extend this strategy to other systems of Physiology and other subjects.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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Annexure-A

Pre-Test

A 65 year old male comes with gradually progressive stiffness, difficulty walking and going down stairs. On examination: expressionless face, staring gaze with limitation of gaze in all the direction and slowness of movement with tremors.

1. Most likely diagnosis is:

a) Stroke b) Parkinson's disease

c) Progressive Supranuclear palsy d) Multisystem Degeneration

2. Above symptoms are due to:

a) Occulomotor palsy b) Pyramidal tract lesion

c) Degeneration of extra pyramidal system d) midbrain lesion

3. This condition results from the death of the neurons that produces:

a) Serotonin b) Dopamine

c) Acetylcholine d) Nor-epinephrine

4. Which of the following is not a symptom of the above condition?

a) Early memory loss b) Tremors

c) Muscle rigidity d) Inability to initiate movement

5. Tremors produced in the above condition are:

a) 4-6 Hz b) kinetic

c) Seen only in the hands d) present during sleep

6. Drugs useful in the above condition are:

a) Levodopa alone b) Levodopa + carbidopa

c) Dopamine d) Acetylcholine

7. Why dopamine itself is not used to control the manifestations in the above condition:

a) It is not absorbed orally b) Dopamine does not cross the BBB

c) It is too expensive d) Levodopa has higher affinity for D2 receptor

Annexure-B

Case-History

A 63-year old woman was brought by her son to the hospital with complaints of slurred and soft speech with shaking of hands, arms and legs at rest. She also complained of having trouble rising from a chair with stiffness of arms and legs. Moreover, her feet seem to get stuck to the floor while walking. She has trouble maintaining balance. Her son also noticed that her mother took small steps while walking and didn't swing her arms also. Altogether, it was difficult for her to carry out even routine activities. She lost interest in everything, started remaining aloof and depressed. This even resulted in sleep impairment and daytime somnolence.

The appointed neurologist examined her thoroughly. Based on clinical history and examination, he prescribed her with medication and advised her son to provide proper nursing care to her mother. The doctor explained her son about the progress of the disease, side-effects of the medication and its prognosis.

Annexure-C

Learning Objectives

1. What is your most likely diagnosis?

2. What is the patho-physiology behind this clinical condition?

3. What are the diagnostic clinical features of this condition?

4. What are the different lab investigations available to diagnose the condition?

5. Enumerate the drugs used in the treatment of this condition and the rationale behind the use of these drugs?

6. What advice should be given to the relatives/care takers about the care of the patient?

Annexure-D

Post-Test

A 65 year old male comes with gradually progressive stiffness, difficulty walking and going down stairs. On examination: expressionless face, staring gaze with limitation of gaze in all the direction and slowness of movement with tremors.

1. Most likely diagnosis is:

a) Stroke b) Parkinson's disease

c) Progressive Supranuclear palsy d) Multisystem Degeneration

2. Above symptoms are due to:

a) Occulomotor palsy b) Pyramidal tract lesion

c) Degeneration of extra pyramidal system d) midbrain lesion

3. This condition results from the death of the neurons that produces:

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4. Which of the following is not a symptom of the above condition?

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c) Seen only in the hands d) present during sleep

6. Drugs useful in the above condition are:

a) Levodopa alone b) Levodopa + Carbidopa

c) Dopamine d) Acetylcholine

7. Why dopamine itself is not used to control the manifestations in the above condition:

a) It is not absorbed orally b) Dopamine does not cross the BBB

c) It is too expensive d) Levodopa has higher affinity for D2 receptor

Annexure-E

Feedback Proforma

Please provide your feedback by encircling the appropriate option

1-strongly agree 2-agree 3-neutral 4-disagree 5-strongly disagree

This technique helped me to understand the subject effectively.	1	2	3	4	5
This technique was an interesting experience.	1	2	3	4	5
This technique provided the real time relevance.	1	2	3	4	5
This technique encouraged my intellectual curiosity.	1	2	3	4	5
This technique kept me engaged during the session.	1	2	3	4	5
This technique provided an opportunity for self-learning.	1	2	3	4	5
I feel confident about the subject after this technique.	1	2	3	4	5
This was an effective means to learn the concepts.	1	2	3	4	5
It was a satisfying learning experience.	1	2	3	4	5
I would like to involve in more of such cases.	1	2	3	4	5
This involved deeper learning approach and helped in development of critical thinking.	1	2	3	4	5

Overall Remarks/Suggestion(s):