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CASE BASED LEARNING VS TRADITIONAL DIDACTIC LECTURES AS A TEACHING- LEARNING METHOD IN PHARMACOLOGY

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Abstract

Background: The teaching and learning of Pharmacology is challenging. Traditional teaching-learning methods are inadequate to understand the basic concepts and the clinical application of Pharmacology thus there is a need to explore alternative methods. With the advent of Competency based medical education, there has been a paradigm shift towards newer methods of teaching and learning. Case based learning (CBL) is an innovative method of teaching and learning which ensures better understanding of the subject and promotes independent and deeper learning.

Aim & Objectives: The present study was conducted with the aim to evaluate the effectiveness of CBL as a teaching learning method. The objectives of the study were to compare the effectiveness of CBL with didactic lectures in terms of knowledge gained and to analyse the perception of the second-year undergraduate students towards CBL as a teaching learning method.

Methodology: The study was conducted on 90 students of second year MBBS in the department of Pharmacology after obtaining written informed consent. Ethical approval was obtained before starting the study. The students were divided into 2 groups of 45 students each – Didactic lecture (DDL) group and Case based learning (CBL) group. The CBL group was further subdivided into 3 subgroups of 15 students each. The study was conducted in 8 sessions for 4 topics (2 sessions for each topic). Crossover among the groups was done for the subsequent topics. The topics for the study included Anti-ulcer drugs, Anti-asthmatic drugs, Anti-hypertensive drugs and Anti-tubercular drugs. The knowledge gained by the students was assessed by scores obtained in pretest and post test questionnaire in both the groups and paired t test was applied. Unpaired t test was applied for comparison between the scores obtained in post-test questionnaire of both teaching learning methods. At the end of 8th session, the perception of all the students towards CBL was assessed by using a 5-point Likert scale. The

scores obtained in Likert scale were analyzed and Cronbach's alpha was calculated to check the internal consistency.

Results: There was significant difference in the post test scores of the CBL group as compared to DDL group (p value <0.001). Cronbach's alpha value for Likert scale was 0.873 which showed good internal consistency of the items used for the questionnaire. 82.21% of students agreed that CBL helped in better understanding of the topic, 80% of students agreed that CBL improved their learning skills and 73.32% of students agreed that CBL will improve their performance in the examination.

Conclusion: Case based learning improved the academic performance of the students. The students perceived CBL as a welcome step and a better alternative to didactic lectures in terms of deeper understanding of the topic, clinical correlation, improvement in learning skills and also aroused their interest in the subject.

Keywords: Pharmacology, Case based learning, effectiveness, perception, questionnaire, undergraduate students

Introduction: The knowledge gained in Pharmacology is important in the treatment and prevention of diseases.[1] The teaching of Pharmacology is demanding both for the teachers as well as the students. This is because of the plethora of theoretical knowledge to which the student is exposed in basic sciences. However, the traditional method of didactic lectures does not always help the students in understanding the basic concepts and its clinical implications in Pharmacology.[2] It is imperative that the teaching of Pharmacology involves clinical correlation for easy comprehension by the students. However, it is observed that didactic lectures primarily focus on lower cognitive domain (recall) rather than higher cognitive domain (comprehension and application).[3]

Medical education in India has witnessed a paradigm shift with the introduction of Competency Based Medical Education (CBME) in all medical colleges across the country since 2019. CBME is an outcome-based, student centric strategy which recommends the use of various methods of teaching and learning to create a competent Indian Medical Graduate (IMG).[4] In this regard, various teaching learning methods such as Case Based Learning (CBL), small group discussions and bedside teaching are being instituted across India, which would ensure sensitization of the faculty and students.[5]

Case based learning involves teaching wherein a clinical case problem is provided to the students. The students then try to identify their learning requirements by bridging the gap between what is known and what is unknown, while the teacher acts as a facilitator. It is student centric since learning usually occurs in small groups. CBL is an innovative method of teaching and learning where students are given an opportunity to learn on their own and integrate and apply the knowledge to solve the clinical case. Since CBL involves active participation of the students, it enhances the ability of the students in clinical correlation of the topic and to reflect upon the educational experience which is gained through the provided case.[6,7] CBL also promotes independent learning and deeper understanding of the topic and ensures life-long learning.[8] According to Jena Vellas outlook "*Adult learners have shown that they are willing, eager to learn in safe learning environment. Allowing small groups to find their voices enhance the power of safety. Trust in the sequence of activities builds safety where CBL is used*".[9]

However, it is imperative to gauge the effectiveness of CBL from student's perspective since the opinions and the preferences of the students are of paramount importance before making any amendments in the methods of teaching and learning. Thus, the present study has been planned with the aim to assess the effectiveness of CBL and to analyse the perception of students towards CBL. This will also facilitate in the implementation of Competency Based Assessment (CBA) which requires incorporation of clinical case based question in formative and summative assessments as laid down in the guidelines provided by the Medical Council of India.[10] Though few studies have been conducted on CBL in the past, most of them were conducted in a large group setting which impedes active participation of all students in the group.[3] Moreover, previous studies were conducted only on

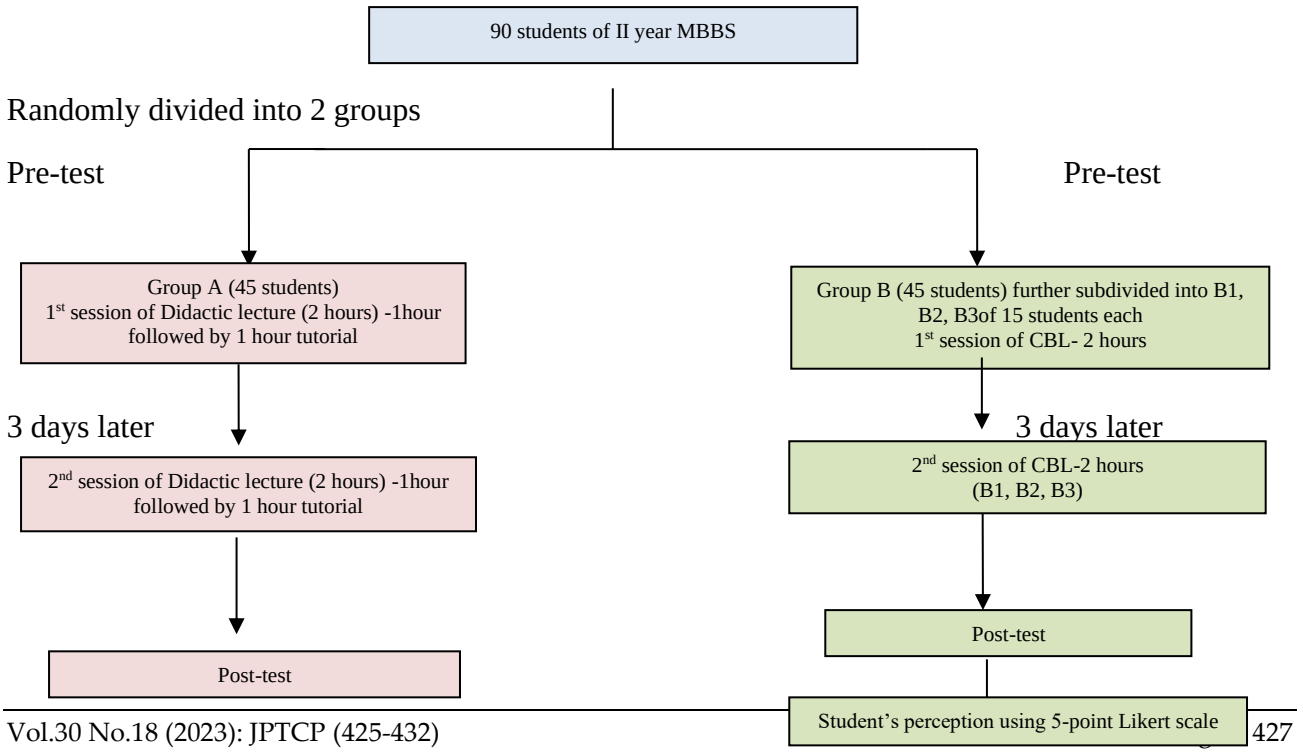
few topics to elicit the effectiveness of CBL for undergraduate teaching.[1] This study was planned in a small group setting and was conducted in multiple sessions on multiple topics to assess the effectiveness of CBL. It is a small step in strengthening the fact that CBL would improve the academic performance of the students in basic sciences and a better alternative to conventional methods of teaching and learning for the students as per the Competency Based Medical Education which has been introduced since 2019.

Aim: To evaluate the effectiveness of CBL as a teaching learning method

Objectives: (1) To compare the effectiveness of CBL with didactic lectures in terms of knowledge gained by the students. (2) To analyse the perception of undergraduates towards CBL as a teaching learning method.

Methodology: Study design – Educational interventional study.
Study duration- 11 months.
Status of ethical permission from the institute - The present study was conducted after obtaining approval from Institutional Ethics Committee (Letter No./MGMC&H/IEC/JPR/2021/484 dated 21st June, 2021).
Sample size – The study was conducted on randomly selected 90 students of II professional MBBS in department of Pharmacology, MGMC&H, Jaipur. They were randomly selected and divided into 2 groups A –Group A and Group B of 45 students each. Group B was further subdivided randomly into 3 subgroups of 15 students with a facilitator in each group to ensure small group discussion effectively (Facilitator: Student ratio = 1:15). The questionnaire for pre-test and post-test consisted of 20 multiple choice questions which was validated by focus group discussions among 5 faculty members in the department of Pharmacology. The study was conducted in 8 sessions for 4 topics (2 sessions for each topic). The faculty members in the department of Pharmacology were trained to conduct CBL sessions. A pilot study was conducted on a small group of students to assess the feasibility of the study and necessary modifications were done. The topics for the study were selected from core area and included Anti-ulcer drugs, Anti-asthmatic drugs, Anti-hypertensive drugs and Anti-tubercular drugs. For the first topic, Group A was taught by didactic lecture while CBL was used for Group B.

Flowchart depicting the methodology



Inclusion criteria – All second year MBBS students batch 2019 willing to participate in the study.
Exclusion criteria – a) Students included in pilot study. b) Students not willing to participate in the study. c) Incompletely filled questionnaire.
Type of consent if taken - An informed consent was obtained from all the students before the commencement of the study.
Data collection method -The study participants were sensitized about the plan of study. Then pre-test questionnaire was given to both the groups. For the first topic, Group A (DDL group) was taught Anti-ulcer drugs by Didactic lecture by a teacher while Group B (CBL group) was exposed to 1st session (2 hours) of CBL for Anti-ulcer drugs. The CBL session was conducted in 3 subgroups by 3 facilitators simultaneously.
CBL session - A hypothetical validated clinical case problem pertaining to peptic ulcer was used in the form of handouts and questions related to drug therapy, adverse drug reactions, drug interactions and contraindications were given. The students discussed the clinical case problem among themselves to fill their learning gaps and solved the provided case. The teacher played a passive role acting as a facilitator and ensured that the discussion flows in the right direction. After 3 days, 2nd session of didactic lecture and tutorial for group A was conducted while Group B was given a modified case of Peptic ulcer pertaining to CBL.
Post-test questionnaire was then given to both groups at the end of didactic lectures for group A and CBL for group B (Peptic ulcer).
Then cross over was done in the next month for Anti-asthmatic drugs in which group A which was further subdivided into 3 subgroups of 15 students each with a facilitator, was taught by CBL while group B was taught by didactic lecture method. This was done to ensure that all students are exposed to CBL. In the next month, Group A was taught Anti-hypertensive drugs by didactic lecture while Group B was taught by CBL in 3 subgroups simultaneously. Thereafter, Group A was taught Anti-tubercular drugs by CBL in 3 small groups and Group B was taught the same topic using didactic lecture in the next month. Pre-test and post-test questionnaire was given for all 4 topics to both the groups.
At the end of the 4th topic, the perception of all students for CBL was then taken using a pre validated Likert scale consisting of 5 items (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree). Cronbach's alpha was calculated to measure the internal consistency of the items in the questionnaire used for Likert scale.

Measurement of outcome

- The knowledge gained by the students before and after the sessions was assessed using validated pre-test and post-test questionnaire.
- The perception of students towards CBL was assessed by a pre-validated questionnaire using a 5-point Likert scale (from strongly disagree to strongly agree)

Statistical analysis

The collected data was entered in Microsoft excel 2010 worksheet and statistical analysis was performed using IBM SPSS Statistics version 23. The pre-test and post-test responses in both the groups were compared using paired t test. Unpaired t test was applied for comparison between the scores obtained in post-test questionnaire of both teaching learning methods. A p value less than 0.001 was considered as statistically significant. Cronbach's alpha was calculated to measure the internal consistency of the items in the questionnaire for Likert scale. The value of Cronbach's alpha between 0.7 to 1 was considered as acceptable to excellent to test the internal consistency. Descriptive statistics was applied to assess the perception of students towards CBL using Likert scale in terms of n (%).

Results:

The study was conducted on 90 students of second year MBBS in pharmacology over a period of 4 months. The students were subdivided into 2 groups – Didactic lecture group (DDL) and Case based learning group (CBL). The mean scores of the students in pre-test and post-test questionnaire was

compared between the 2 modes of teaching and learning by applying paired t test. The mean scores of the students before and after the intervention in the DDL group are depicted in Figure 1.

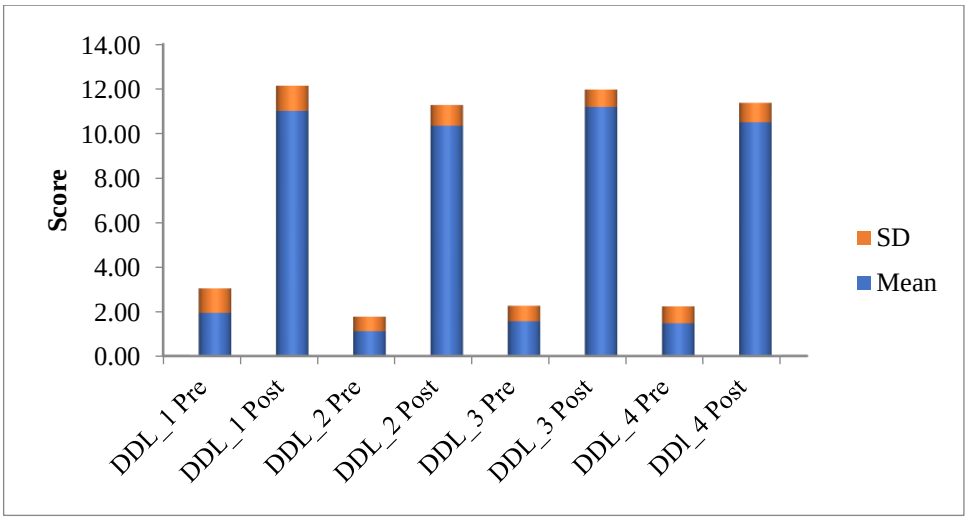


Figure 1: Comparison of pre-test and post-test scores in DDL group

The mean scores of the students before and after the intervention in the CBL group are depicted in Figure 2.

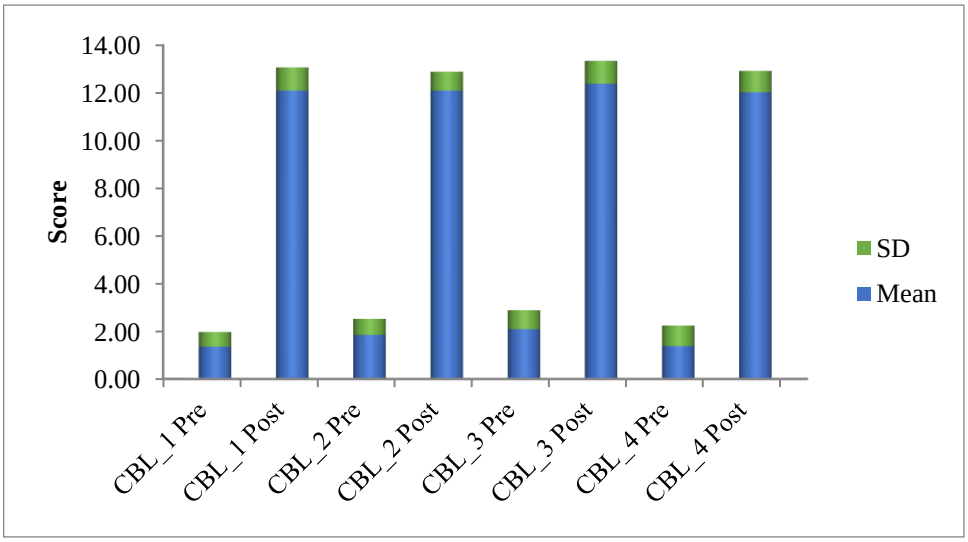


Figure 2: Comparison of pre-test and post-test scores in CBL group

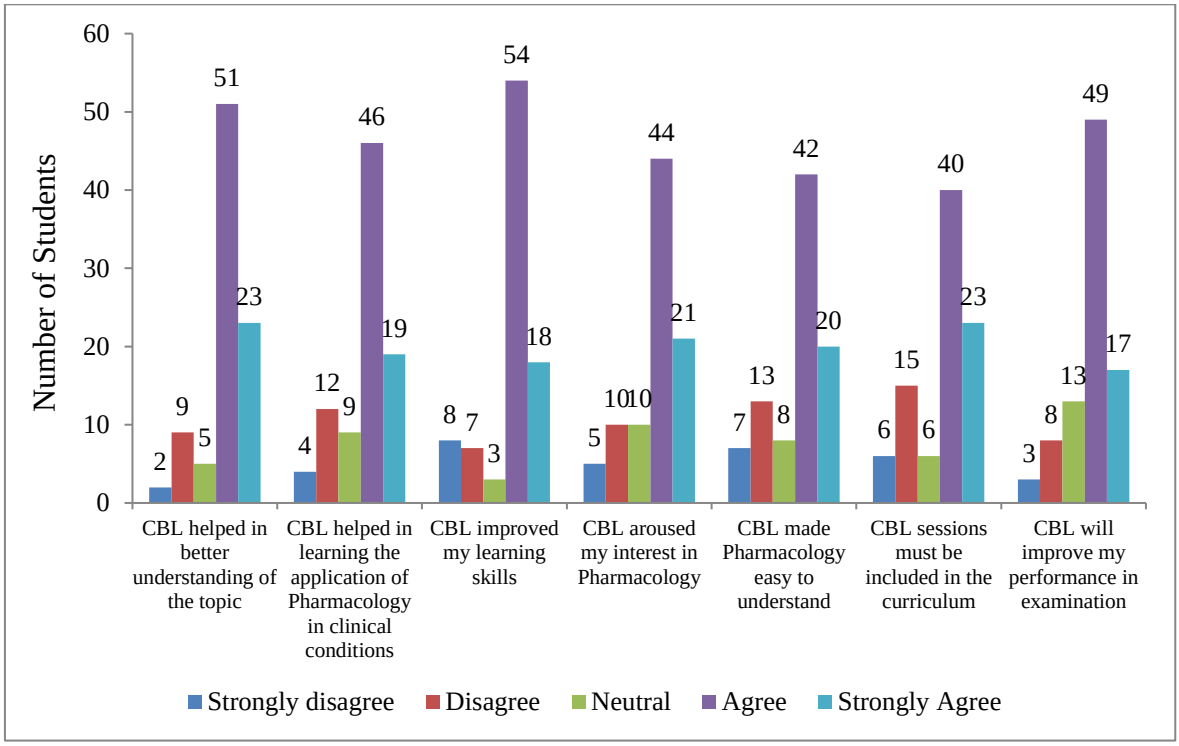
The mean scores of the students in the post test questionnaire in both the groups were then compared by unpaired t test and the result was significant (p value <0.001) which shows that the difference is highly significant between the two methods viz. DDL and CBL as depicted in Table 1.

TL method	Mean	SD	SE	p value
DDL	10.75	0.41	0.20	< 0.001
CBL	12.15	0.16	0.08	t=6.41; df=6

Table 1: Comparison of scores between post-test questionnaire of DDL and CBL

The perception of students towards CBL was assessed by a pre-validated questionnaire using a 5-point Likert scale (from strongly disagree to strongly agree). Cronbach's alpha value for Likert scale was 0.873 which showed good internal consistency of the items used for the questionnaire. 82.21% of students agreed that CBL helped in better understanding of the topic, 80% of students agreed that

CBL improved their learning skills while 73.32% of the students agreed that CBL will improve their performance in examination. (Figure 3)



***Cronbach's alpha value = 0.873**

Figure 3: Perception of students towards CBL using 5-point Likert scale (n=90)

Discussion:

The traditional system of didactic lectures in Pharmacology is teacher centred and lacks active participation from the students and the clinical application of knowledge of Pharmacotherapy is also minimal.[11,12] Pharmacology is a discipline which is closely related to clinical aspects; learning through clinical cases with its clinical relevance would be more obvious and easier to understand.[13] Case based learning is a new teaching-learning method in Pharmacology in which the student is provided a clinical case scenario in order to ensure clinical correlation of the topic being taught and the application of theoretical concepts to practice. The teacher plays a passive role, acting as a facilitator thus promotes self-directed learning among students. It also provides a glimpse of the importance of the pre-clinical years in which motivation of the students is seldom lost owing to theoretical teaching without clinical correlation.[14]

In the present study, the knowledge gained by the students was assessed by comparing the mean scores of the students in the post-test questionnaire among the two groups viz. CBL group and DDL group which was found to be statistically highly significant (p value <0.001). This implies that the performance of the students significantly improved when CBL was employed as a teaching-learning method. These findings are consistent with a similar study conducted earlier.[1,3,15] However, another similar study concluded no significant difference in the performance of the students among the two groups, but the students perceived the CBL sessions to be more interesting and motivating.[13]

The perception of the students towards CBL was assessed by using a 5-point Likert scale ranging from strongly disagree to strongly agree. In this study, 82.21% of the students agreed that CBL helped in better understanding of the topic and 80% of the students agreed that CBL improved their learning skills. These findings are coherent with another similar study conducted recently in which 89.88% of the students agreed that CBL was useful in understanding the topic and 89% of the students agreed that CBL helped them in understanding the basic concepts and its relevance.[16] In this study, 73.32% of the students agreed that CBL will improve their performance in the examination which is consistent with another study in which CBL was perceived as an effective tool for learning by 84% of the

students with improvement in the level of preparation for examination (75% of the students).[13] In the present study, 72.22% of students agreed that CBL helped in learning the application of Pharmacology in clinical conditions as evidenced by another similar study conducted by Kaur et al.[13] However, these findings are in contrast to another study conducted by Dube et al where only 50% of the students agreed that CBL helped in application of the concepts of basic sciences to clinical settings.[17]
In this study, 72.21% of the students agreed that CBL aroused their interest in Pharmacology as evidenced by similar study conducted by Baheti et al in which majority of students agreed that CBL sessions increased students' involvement and aroused their interest in the subject.[3] In the present study, 69.99% of the students agreed that CBL sessions must be included in the curriculum as evidenced by another similar study conducted by Sood et al in which 81.9% of the students agreed that CBL must be used in conjunction with didactic lectures.[16] The present study has concluded that CBL is accepted as a teaching-learning method by majority of the students as observed in similar other studies.[16] However, as CBL sessions should ideally be conducted in a small group setting, it requires adequate resources in the form of manpower, infrastructure and is time consuming.[18] In this context, studies have recommended that CBL sessions can be conducted for few topics only.[16]

Conclusion:
Case based learning proved to be a positive initiative which was more effective than the traditional system of teaching by didactic lectures as evidenced by higher mean scores obtained in the post test questionnaire. Majority of the students agreed that CBL helped in better understanding of the topic with improvement in their learning skills. It also helped in clinical correlation of the topic being taught and aided in the implementation of Competency Based Curriculum for the first batch of students under CBME. However, CBL is demanding as it requires adequate resources in terms of sufficient time and a reasonable number of teaching faculty trained for conducting CBL sessions for successful implementation of Case based learning as a teaching learning method in Pharmacology. This can be addressed by planning CBL sessions on topics which are difficult to comprehend and organization of faculty development programs to train the faculty members.

Limitations and further recommendations:
The present study was conducted to assess the perception of students towards CBL on four topics in Pharmacology. Similar studies must be conducted in different medical colleges across the country to strengthen our findings. Small size of the sample is a limitation of this study. Long term outcomes of CBL such as better health care delivery and clinical acumen in practice can be assessed by follow up of the students which was another limitation of this study. The teaching faculty is another major stakeholder in the implementation of CBL thus the perception of faculty members should also be assessed in future.
Conflict of interest: None
Financial support: Nil

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