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Effectiveness of the flipped classroom versus symposia in teaching parasitology for Phase 2 MBBS students

Dr. Saritha N[1], Dr. Soumya Gopakumar[2], Dr Sheeba K Thomas[3], Dr. Serene Varghese[4]
[1]Professor and Head, Department of Microbiology, Government Medical College, Konni, Pathanamthitta, Kerala
[2]Assistant Professor in Community medicine, Government Medical College, Thiruvananthapuram, Kerala
[3]Associate Professor in Microbiology, Government Medical College, Konni, Pathanamthitta, Kerala
[4]Senior Resident in Microbiology, Government Medical College, Thiruvananthapuram

Corresponding Author

Dr. Saritha N
Professor and Head, Department of Microbiology, Government Medical College, Konni, Pathanamthitta, Kerala

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Abstract

Introduction: The Flipped classroom (FCM) concept inverts the teaching experience. Symposia were the conventional method used for teaching parasitology for Phase2 MBBS in our institution. The decrease in the duration of Phase 2 MBBS demands the need for a novel method for teaching parasitology with less class hours.
Objectives: The primary objective was to compare the effectiveness of flipped class room over symposia in improving the learning outcome in parasitology of phase 2 MBBS students as assessed by post test scores.
The secondary objective was to analyse the perception of students regarding the use of flipped classroom method and symposia in parasitology classes.
Methodology: It is a quasi experimental 2 group comparison cross over study with the minimum sample size of 30 students each in both groups with 6 cycles of intervention. There was crossover of the group after 3 cycles.
Result: The data collected that is post test score and feed back by Likert's scale was analysed using SPSS software version 25. Marks obtained in Flipped classroom and Symposium was checked for normality using Kolmogorov-Smirnov and Shapiro Wilk test and the distribution was found to be normal. So paired t test was used to compare the two. p value was found to be <0.001. The mean (SD) of flipped classroom and symposia were 6.7(1.07) and 4.8(1.5) respectively. The results of the feedback was expressed in percentages
Conclusion: The Flipped classroom was found to be more effective than symposia in improving the learning outcome of Phase2 MBBS students in Parasitology as assessed by Post test score. However there was statistically significant association between the two modes of class in only two questions related to choice of correct lab test and the time consumption of the class.

Key words: Flipped classroom, Phase 2 MBBS, Parasitology, Symposia

INTRODUCTION

The aim of medical education is to enable students to turn theory into practice.[1] Educators and researchers are in search of methods that move learners away from superficial learning to deep learning.[2]Flipped class room (FCM) is a useful teaching strategy that can be easily applied in present times. The method can generate an interest and create understanding of important parasitic infections in our country. The flipped classroom inverts the traditional learning experience. Lectures are shared outside of class time for individual review as homework, and classroom time is reserved for class discussion and interactive projects. They can also access all the basic information in advance, so when they enter the classroom, they feel prepared and ready to participate in interactive learning activities.

Symposia were the conventional method used for teaching parasitology topics for phase 2 MBBS in our institution. It is a teaching learning method where in a group of learners presents different aspects of a common subject followed by collective learning through discussions. Usually, symposium provides a broad understanding of a topic or problem and the listener is being provided with an opportunity to take decisions about a problem.[3] As per the new curriculum, the duration of phase 2 MBBS is less and a new method of teaching parasitology is needed, preferably a method where the class teaching time is reduced.

Research Question:

- Is Flipped class room better than symposia in improving the learning outcome in parasitology of phase 2 MBBS students as assessed by their post test scores?

H1 hypothesis:

- Flipped class room is more effective than symposia in improving the learning outcome in parasitology of phase 2 MBBS students as assessed by their post test scores.

Objectives:

- Primary objective: To compare the effectiveness of flipped class room over symposia in improving the learning outcome in parasitology of phase 2 MBBS students as assessed by post test scores.

- Secondary objective : To analyse the perception of students regarding the use of flipped classroom method and symposia in parasitology classes

MATERIALS AND METHODS

The study was conducted on Phase 2 MBBS students attending Microbiology class in GMC, Thiruvananthapuram. It is a quasi experimental 2 group comparison cross over study done over a period of six months from November 2021 to January 2022 after getting Ethics Committee approval. Those who agreed to participate in the study by giving consent were included in the study. Sample size was calculated using the formula $n=2S_p^2(Z1_{-\alpha/2}+ Z_{1-\beta})^2/\mu_d^2$, $S_p^2=S_1^2+S_2^2/2$, where S_1 and $S_2$are standard deviations of the group, μ_d = mean difference between the samples ,α = significance level and β= power. Taking S_1 and S_2 as 0.11 and 0.12, μ_d = 0.09 ,α = 5% and β= 80%, sample size was calculated applying the above formula using nMaster 2.0 and was determined as 26 each in two groups [4] . Hence the minimum sample size of 30 students each in both groups was included in the study with 6 cycles of intervention. The study was started after getting approval from the Institutional Research Committee and Institution Ethics Committee. The post test score was not considered for any of the formative or summative assessment of Phase2. Confidentiality of the study was maintained.

The students were informed regarding the study and the methods adopted in the study in detail. A group of 60 students were selected randomly from phase 2 MBBS students by simple random sampling by computer generated random numbers and 2 groups of 30 each were selected from them. They were given information sheet and an informed written consent was obtained from them. Six parasitology topics of public health importance and included under core competencies like Malaria, Filariasis, Kalaazar, Intestinal nematodes, Intestinal cestodes and Amoebiasis were selected for the study. Both the groups were given the topic one week prior and the flipped class room batch was provided with the resources for learning like power point on the topic, videos on the lifecycle of the parasite and links to useful reading materials through Microsoft Teams . In the class , the facilitator discussed the topic with the learners using clinical scenarios of the disease, doubt clearing sessions etc.

The students for symposia were given the topic one week prior to the class. The main topic was subdivided into 3 subtopics and three students were given one subtopic each for presentation for a duration of 10 minutes. After the symposia , time was given for discussion based on clinical scenarios with the teacher and clearing the doubts. The same faculty was used to teach a topic by both methods. After the class, both the groups were given the questionnaire prepared by a different assessor for post test evaluation to assess the knowledge and it included 5 objective and 5 short answer questions. Another questionnaire was given to obtain the perception of the learners regarding the two methods using 5 point Likert scale. The groups were switched after 3 interventions. The students not involved in the study were also given the resources and were included in the discussions later on. The schematic representation of study is given in Figure 1. Post test score and Feedback form in Likerts scale was collected.

The data was entered in MS Excel and analysed using Statistical package for Social Sciences version 25. All qualitative variables were expressed as % and quantitative variables using mean and standard deviation. Marks obtained in Flipped classroom and Symposium were checked for normality using Kolmogorov-Smirnov and Shapiro Wilk test and the distribution was found to be normal. So paired t test was used to compare the two as a paired data for each student by both methods were available. Feedback on flipped classroom as well as symposium was collected using a questionnaire. The results of the feedback were expressed as %. Chi square test was used to test the association between the feedback responses obtained for the flipped class and symposium. The responses were captured on a five point Likert scale. It was converted to binary by merging the responses for agree and ……agree versus other responses.

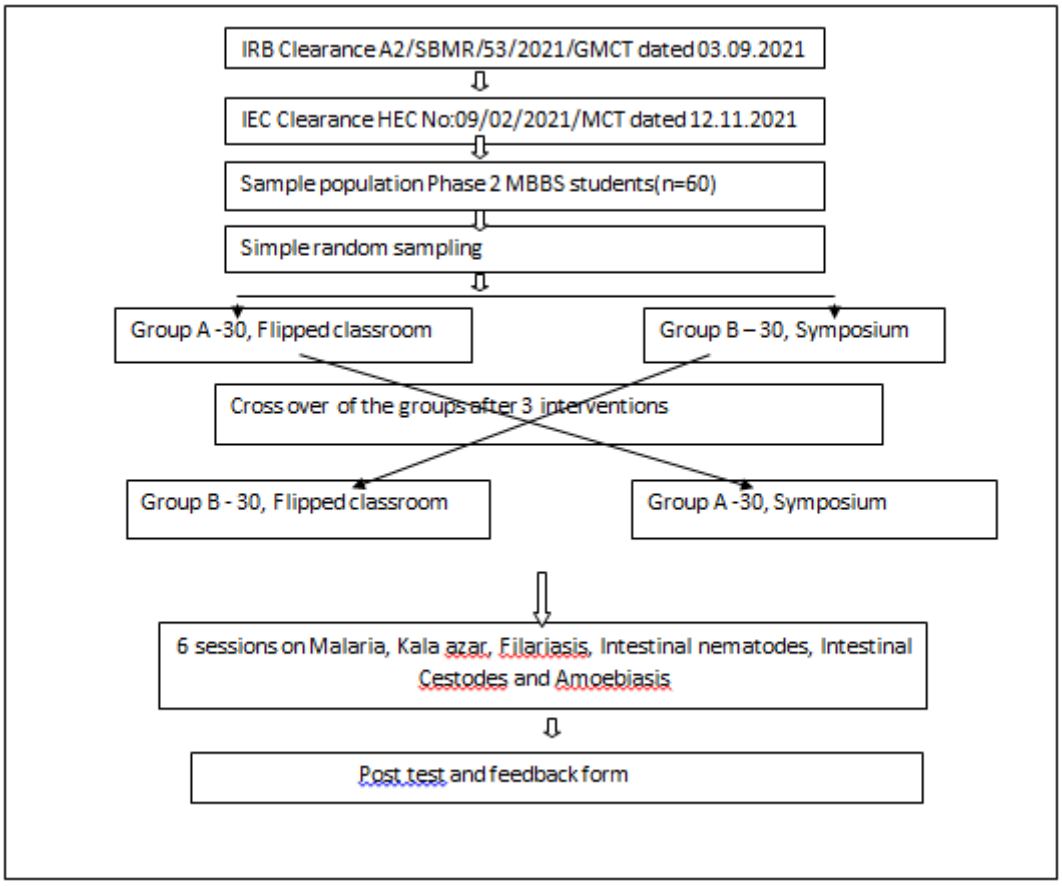

Figure 1 : Schematic representation of the study method

RESULTS

The post test scores and feedback responses were analysed and results tabulated.The distribution was found to be normal using Kolmogorov-Smirnov and Shapiro Wilk test. So paired t test was used to compare the two.(Figure 2,3,4) With t value 10.301 and degree of freedom 59 , pvalue was found to be <0.001(Table1) . The mean and standard deviation of the marks obtained in post test score of Flipped classroom was 6.7 (1.07) whereas the mean and standard deviation of the marks obtained in post test score of Symposium was 4.8 (1.5). Median calculated for marks obtained in FCM and Symposia were 6.6 and 4.7 respectively.

The feed back was obtained for both methods, Flipped class room and symposia using a questionnaire (Annexure 2) using 5 point Likert's scale. The responses for each question is expressed as percentages (Tables 2,3). The results of the Chi square test used to test the association between the feedback responses obtained for the flipped class and symposium (Table4). It was found that there was a statistically significant association between the two modes of classes with respect to 2 questions—Question 3(choose the correct laboratory test for the infection- pvalue-0.02) and Question 8 (the procedure was time consuming- pvalue-0.0008).The students responded that they thought that FCM will help them to choose appropriate laboratory test for the infection and symposia was time consuming.

Some additional comments received regarding the methods are compiled and tabulated in Table 4.

Annexure 1

Tables and Figures

Marks	**Flipped classroom**	**Symposium**	**Pvalue**
Mean (standard deviation)	6.7 (1.07)	4.8 (1.5)	< 0.001*
Median (First Quartile, Third Quartile)	6.6 (6.2, 7.4)	4.7 (3.6, 6.1)	
Minimum	4	1.5	
Maximum	8.7	7.7	

* Paired t test (t value – 10.301, degree of freedom–59)

Table 1 showing the mean (sd), median (Q1, Q3), Minimum and maximum marks in Flipped classroom and Symposium

Sl No	Questions (Flipped classroom)	Strongly disagree N(%)	Disagree N(%)	Neutral N(%)	Agree N(%)	Strongly Agree N(%)
1.	The teaching learning method increased my interest in the topic	0	2(3.3)	18(30)	27(45)	13(21.7)
2.	This method helped me to increase my knowledge about the parasitic infection discussed.	0	3(5)	13(21.7)	35(58.3)	9(15)
3.	I am sure that I will be able to choose the correct laboratory test for the infection	0	2(3.3)	11(18.3)	38(63.3)	9(15)
4.	I am confident that I will be able to interpret the laboratory test result	0	0	15(25)	40(66.7)	5(8.3)
5.	I had an opportunity to clarify my doubts regarding the topic	1(1.7)	2(3.3)	20(33.3)	27(45)	10(16.7)
6.	I was able to recollect better during the class.	1(1.7)	5(8.3)	18(30)	27(45)	9(15)
7.	The method improved my reasoning skills	0	2(3.3)	26(43.3)	25(41.7)	7(11.7)
8.	The method was found to be time consuming.	2(3.3)	11(18.3)	31(51.7)	13(21.7)	3(5)
9.	I feel this method is very useful and should be adopted.	0	5(8.3)	16(28.7)	29(48.3)	10(16.7)

Table 2 showing the feedback of students regarding Flipped classroom method.

Sl No	Questions (Flipped classroom)	Strongly disagree N(%)	Disagree N(%)	Neutral N(%)	Agree N(%)	Strongly Agree N(%)
1.	The teaching learning method increased my interest in the topic	2(3.3)	8(13.3)	14(23.3)	31(51.7)	5(8.3)
2.	This method helped me to increase my knowledge about the parasitic infection discussed.	4(6.7)	3(5)	9(15)	38(63.3)	6(10)
3.	I am sure that I will be able to choose the correct laboratory test for the infection	3(5)	10(16.7)	11(18.3)	32(53.3)	4(6.7)
4.	I am confident that I will be able to interpret the laboratory test result	3(5)	6(10)	16(26.7)	32(53.3)	3(5)
5.	I had an opportunity to clarify my doubts regarding the topic	3(5)	3(5)	15(25)	35(58.3)	4(6.7)
6.	I was able to recollect better during the class.	4(6.7)	6(10)	11(18.3)	34(56.4)	5(8.3)
7.	The method improved my reasoning skills	2(3.3)	8(13.3)	15(25)	32(53.3)	3(5)
8.	The method was found to be time consuming.	0	8(13.3)	18(30.1)	25(41.7)	9(15)
9.	I feel this method is very useful and should be adopted.	4(6.7)	6(10)	16(26.7)	31(51.7)	3(5)

Table 3 showing the feedback of students regarding Symposia.

Feedback responses	Flipped (n)	Symposium (n)	Chi square value	Odds ratio (95 % Confidence interval)	Pvalue
Q1 Agree and above	40	36	0.574	1.33 (0.6 – 2.8)	0.448
Disagree	20	24			
Q2 Agree and above	16	44	1	1 (0.4 -2.2)	0.58
Disagree	16	44			
Q3 Agree and above	13	47	4.73	2.4 (1.08 – 5.3)	**0.02**
Disagree	24	36			
Q4 Agree and above	15	45	3.75	2.14 (0.98 – 4.7)	0.052
Disagree	25	35			
Q5 Agree and above	23	37	0.14	0.86 (0.4 – 1.8)	0.7
Disagree	21	39			
Q6 Agree and above	24	36	0.32	0.8 (0.4 – 1.7)	0.57
	21	39			
Q7 Agree and above	28	32	0.3	0.8 (0.4 – 1.7)	0.58
Disagree	25	35			
Q8 Agree and above	44	16	11.1	0.3 (0.1 – 0.6)	**0.0008**
Disagree	26	34			
Q9 Agree and above	39	34	0.934	1.4(0.68 – 2.96)	0.35
Disagree	21	26			

Table 4 : Results of Chisquare test done on feedback responses obtained for both methods.

Sl no	Comments
1	Simply skimming through the topics before hand would help give a base idea on the topic.thus when class is taken later it would allow us to register better
2	Flipped form of classroom, since the material is already provided, we can read and come. Since the discussion is then given by the faculty may be they can explain the topic more clearly
3	Flipped form is slightly better than symposia. Flipped form means we can go through the presentation already sent and makes the class much more smoother

Table 5 showing additional comments received during feedback.

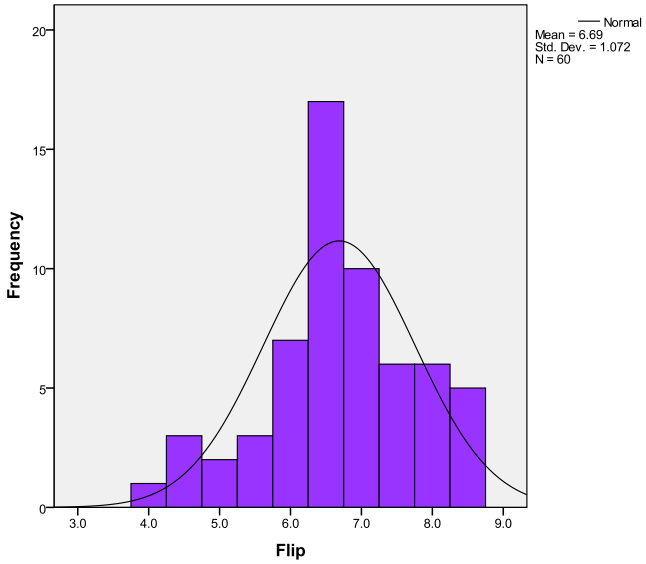

Figure 2 – Histogram showing marks obtained in Flipped classroom

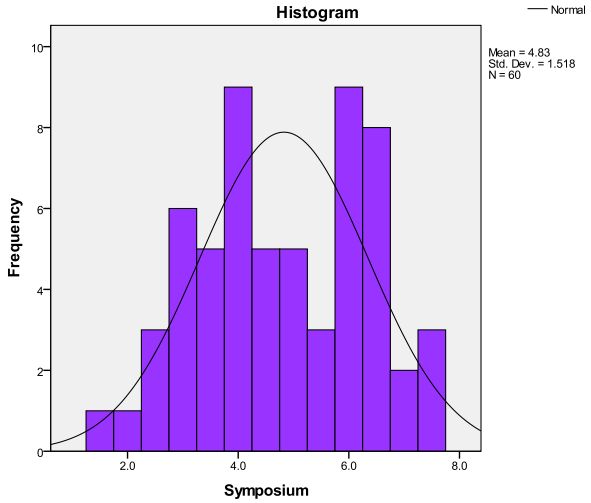

Figure 3 – Histogram showing marks obtained in Symposium

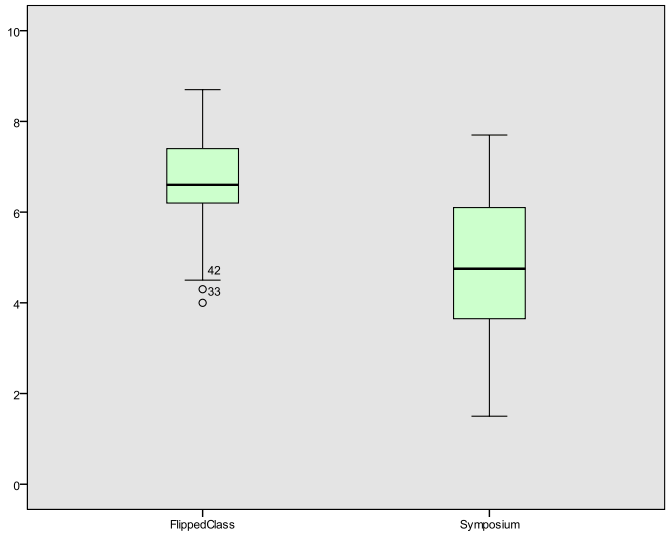

Figure 4 -Box plot describing the flipped classroom and symposium

DISCUSSION

This study was done to compare the effectiveness of flipped classroom over symposia in improving learning outcome of Phase 2 MBBS students in parasitology. Symposia was the method practiced in the previous years and the need for decreasing the teaching hours as per the new curriculum was the reason behind this study. The familiarity of the faculty and the students in using online platforms for teaching and learning helped the conduct of Flipped classroom method easy. According to the new curriculum, system based learning of Microbiology is introduced, thus emphasising the need for problem based learning of the subject areas. By comparing the post test scores of both the methods, it was clearly seen that mean(SD) of flipped classroom and symposia were 6.7(1.07) and 4.8(1.5) respectively. The perception of the students as measured by 5 point Likert scale also showed the usefulness of flipped classroom method.

In the study by Chowdhury TA etal in UK in 2019, feedback scores of the students showed that 53.2% opted FCM over traditional lectures. The scores were higher for FCM (Mean 4.4, SD 0.33) compared to conventional learning .(Mean3.6, SD 0.28)[1].A study by Pereira V and Desilve N in Srilanka in 2017 about the flipped classroom model for teaching and learning microbiology in comparison to traditional lectures proved that the new model is more effective when the final assessment marks were compared.56% of the students agreed that FCM was important in medical education and 54% preferred a combination of new and old methods as the better choice. The mean scores of the topics covered by FCM in the assessment was 6.85 with SD 1.9 compared to 5.4 and 2.6 in topics covered by conventional lectures.[2] Our study also showed similar findings in relation to FCM as assessed by post test score.

Viveka S, Sagar TV and Sudha MJ, in their study from South Kerala in 2017 regarding the effectiveness of FCM in teaching anatomy found out that the mean scores after regular and flipped classes were 12.92 and 13.41 respectively. A few drawbacks of the method were noted in their study which included the necessity of carefully tailored learning material for the students so that they don't lose interest and accept the technique. These could be applied in our study also as the perception of the students on the technique did not reflect the findings obtained by post test score.Overall rating of FCM was 4.15 out of 5 in their study.[5]

The introduction of FCM in Microbiology and Infectious diseases by Nieuwenhuizen PV and Gordon R in NewYork 2015 also proved that FCM is a promising method. The respondents in the study reported that FCM led to more effective learning and less time was required to relearn the material later. They commented that they enjoyed the flipped classes and hoped to remember the contents longer than the conventional classes.[6]This may be the reasons for the improved post test score in FCM in our study also.

Singh K, Mahajan R , Gupta P and Singh T in 2018 , in their article on FCM have posed certain challenges in FCM from their experience. This included self directed learning skills in students, technical issues in providing learning resources, time constraint for the classroom discussion and the resistance to change from the conventional method.[7]The use of an appropriate learning management system will help to overcome the above mentioned challenges.

A study by Hui Lin et al in China in 2021 found that students in the inverted classroom group achieved higher scores in their in-course assessments (82.35 [SD 11.45] vs 81.33 [SD 9.51], respectively) and in their final exams (73.41 [SD 10.37] vs 71.13 [SD 11.22], respectively) than those in the traditional lecture-based group, but the scores were not significantly different (*P*=.13, unpaired two-tailed *t* test). Further, most of the students reported that the inverted classroom increased their learning motivation, made them more confident, and helped them understand the content on pathophysiology better. The students in the inverted classroom also improved in their problem-solving skills and teamwork abilities. However, some students from the inverted classroom group also reported that the self-learning and preparatory work before class increased their learning burden.[8]In contrary to this, our study showed significant difference in the improvement in learning outcome as assessed by post test scores between the two methods.

In a study by Burnham, K. D., & Mascenik, J. in 2018 in clinical microbiology, it was shown that the test performance of students in the FCM was equivalent to that of students receiving traditional lectures. Mean difference between test scores for the FCM and traditional groups was 1.9 points (95% confidence interval [CI], -4.0-0.14). Survey responses indicated that respondents feel positively about self-learning in FCM and prefer the flexibility provided by FCM.[9] The inclusion of methods to promote self learning in medical education will definitely increase the learning outcomes in long term.

A study by Zhang D etal in 2021 proved that the students were more satisfied with flipped-classroom combined with case based learning in clinical parasitology sessions. Compared to traditional lecture-based classroom, more students agreed that this method could help improve their initiative learning, enhance their ability of communication, promote their abilities of clinical thinking, searching literatures, presenting, team work and student-teacher interaction.[10] But in our study, there were no statistically significant associations between the 2 methods as assessed by feedback scores.

CONCLUSION

The analysis of the post test scores of FCM and symposia showed that p value is <0.001. Hence the null hypothesis was rejected and thus it was found from the study that FCM was more effective in improving the learning outcome of phase 2 MBBS students in Parasitology.

Limitations of the study:

Though the post test scores showed statistical significance, the perception of the students did not reveal any statistically significant difference between the two methods. A study involving larger sample and studying other aspects of clinical microbiology using FCM may throw more light into the usefulness of the method.

Recommendation:

FCM could be considered as a method to teach Parasitology for Phase2 MBBS students as there was improvement in learning outcome as assessed by post test scores. Bur further studies are recommended to analyse the usefulness of the method more accurately.

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Conflict of interest: NIL

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