January 2014

Task-based learning versus problem-oriented lecture in neurology continuing medical education.

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ORIGINAL ARTICLE

Task-Based Learning versus Problem-Oriented Lecture in Neurology Continuing Medical Education

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Abstract

Objective: To determine whether general practitioners learned better with task-based learning or problem-oriented lecture in a Continuing Medical Education (CME) set-up.

Study Design: Quasi-experimental study.

Place and Duration of Study: The Aga Khan University, Karachi campus, from April to June 2012.

Methodology: Fifty-nine physicians were given a choice to opt for either Task-based Learning (TBL) or Problem Oriented Lecture (PBL) in a continuing medical education set-up about headaches. The TBL group had 30 participants divided into 10 small groups, and were assigned case-based tasks. The lecture group had 29 participants. Both groups were given a pre and a post-test. Pre/post assessment was done using one-best MCQs. The reliability coefficient of scores for both the groups was estimated through Cronbach's alpha. An item analysis for difficulty and discriminatory indices was calculated for both the groups. Paired t-test was used to determine the difference between pre- and post-test scores of both groups. Independent t-test was used to compare the impact of the two teaching methods in terms of learning through scores produced by MCQ test.

Results: Cronbach's alpha was 0.672 for the lecture group and 0.881 for TBL group. Item analysis for difficulty (p) and discriminatory indexes (d) was obtained for both groups. The results for the lecture group showed pre-test (p) = 42% vs. post-test (p) = 43%; pre- test (d) = 0.60 vs. post-test (d) = 0.40. The TBL group showed pre -test (p) = 48% vs. post-test (p) = 70%; pre-test (d) = 0.69 vs. post-test (d) = 0.73. Lecture group pre-/post-test mean scores were (8.52 ± 2.95 vs. 12.41 ± 2.65; $p < 0.001$), where TBL group showed (9.70 ± 3.65 vs. 14 ± 3.99; $p < 0.001$). Independent t-test exhibited an insignificant difference at baseline (lecture 8.52 ± 2.95 vs. TBL 9.70 ± 3.65; $p = 0.177$). The post-scores were not statistically different lecture 12.41 ± 2.65 vs. TBL 14 ± 3.99; $p = 0.07$).

Conclusion: Both delivery methods were found to be equally effective, showing statistically insignificant differences. However, TBL groups' post-test higher mean scores and radical increase in the post-test difficulty index demonstrated improved learning through TBL delivery and calls for further exploration of longitudinal studies in the context of CME.

Key Words: *Task-based learning. Problem-oriented lecture. Problem-based learning. General practitioners.*

INTRODUCTION

Continuing Medical Education (CME) is the continuum of learning responsible for enhancing the knowledge and skills of physicians.[1] CME, whether live or virtual, may take many forms like grand rounds, enduring materials, journal-based activity, specialty conferences, work-shops, internet point-of-care learning, experts' opinions, academic writing, small group work, lectures at seminars, and departmental scientific meetings.[2]

A review of existing literature suggests that physicians' participation in CME is not influencing their clinical practices and behaviours. Therefore, the need of the hour is to improve the method of delivery currently being debated and questioned in many countries.[3] What is defined as problem-based learning (PBL) today and is the focus of many international continuing education conferences,[4] is a range of learning approaches rather than a single absolute process with task-based learning (TBL) at its eleventh and final step.

Traditional lecture is the most commonly employed method with problem-oriented teaching as its second step.[5,6] To-date, much of the CME is being delivered through traditional lectures.[1] This is inspite of strong criticism that lectures are delivered in isolation, with physicians as passive recipients, giving no time to absorb, delivered in monotonous uniform formats, and do not promote behavioural change or improve health outcome.

Fewer trials in North America have reported using PBL delivery in CME as a whole-curriculum, but with limited effects and conclusions.[7] The reason seems to be that PBL was initially intended and designed by Barrows for use in pre-clinical phases in the early years of medical education, and is often difficult to implement in the context of CME.[4]

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Received: March 02, 2013; Accepted: November 22, 2013.

The neurology CME under study was designed for teaching about 'Headache', a major health problem worldwide and included in the ten most disabling conditions by World Health Organization.[8] General practitioners play a principal role and are an important resource in its diagnosis and management.[9] This study sought to determine the effects of two educational approaches - task-based learning and problem-oriented lecture on the learning of general practitioners in a Headache CME by pre-post testing.

METHODOLOGY

This study was conducted at the Aga Khan University, Karachi Campus, from April to June 2012. TBL activity was arranged at the executive hall with intranet e-library facility. The problem-oriented lecture was designed to cover all the cases identified for the TBL group and was set in the lecture hall.

Samples for the task-based learning and the problem-oriented lecture groups were based on volunteers from general practitioners of Karachi. The program details, goal, and learning outcomes were disseminated prior to the activity. On completion of the educational activity, assessments and evaluation, physicians were awarded Category-1 credits of the Aga Khan University Physician's credit system.[10] Physicians in TBL group were 30 in number, divided further into ten small working groups. They were assigned case-based specific tasks with explicitly defined learning outcomes, requiring an output. The TBL intervention included two sessions, morning and afternoon. The morning session consisted of 2 hours of exploring, constructing, sharing, and finally integrating small group learning around the task and outcomes into the required output format. The groups were assisted in the whole process through study guides.[11] After the first session of teamwork and discussion, a leader identified within the small working group, shared the in-depth small group learning with the larger group.

The lecture group consisted of 29 physicians who were called on the subsequent month to receive a problem-oriented lecture of around one hour, followed by a 15 minutes discussion.

Assessments for pre- and post-test were developed in line with the study goal and learning outcomes and remained the same as the other group.[12] Twenty one-best-type Multiple Choice Questions were developed using Headache management guidelines of British Association for the Study of Headache,[13] and the content was restricted to headache. The items were reviewed by two neurologists with an interest in the theme to check the design and content for the one best-type, to ensure high levels of knowledge and objectivity in assessment.[14] They were required to match MCQs with the blue print to confirm adequate content validity, relevance of the clinical problems, and to ascertain the adequacy of hypothetical constructs to be measured through these MCQs, which were clinical reasoning and better understanding.

The data was analyzed using IBM SPSS Statistics 19. Reliability coefficient of scores for both groups was estimated through Cronbach's alpha. An item analysis for difficulty and discriminatory indices was calculated for both groups. A p-value of < 0.05 was considered statistically significant. Paired t-test was used to determine the statistical significance between pre- and post-test scores in both groups. Using independent t-test, the impact of two teaching methods on physicians' learning was assessed through scores. Frequencies and percentages were calculated for the measures of age, gender, distinctiveness, post-basic qualification years, and clinical experience.

RESULTS

Of the 30 physicians subjected to pre-/post-test in the TBL group, 20% (n=6) were females with group mean age of 31.9 ± 8.1 years. Twenty-nine physicians in the lecture group completed pre-/post-test, of which 48% (n=14) were females with the group mean age of 31.8 ± 8.3 years. Physicians in the TBL group averaged 11 ± 9 years since they acquired their basic medical qualification; while those in the lecture group averaged 8 ± 7 years. The majority 60% (n=18) of the physicians in the TBL group and 66% (n=19) in the lecture group, were full time general practitioners with a basic medical qualification, whereas the rest were postgraduate trainees. Physicians in the TBL group had a clinical experience of 10.4 ± 8.9 years and those in the lecture group had 6.9 ± 6.7 years (Table I). Cronbach's alpha value was 0.672 for the lecture group and 0.881 for the TBL group. Item analysis for difficulty (p) and discriminatory indices (d) was obtained for both groups. Results for lecture group showed pre-test (p) = 42% vs. post-test (p) = 43%; pre-test (d) = 0.60 vs. post-test (d) = 0.40. TBL group showed pre-test (p) = 48% vs. post-test (p) = 70%; pre-test (d) = 0.69 vs. post-test (d) = 0.73 (Table II). Paired t-test statistics depicted lecture group pre-/post-test mean scores as significant

Table I: Study sample characteristics.

Characteristics	Group	
	TBL n=30	Lecture n=29
	Number (%)	
Male	24 (80)	15 (52)
Female	06 (20)	14 (48)
General practitioners	18 (60)	19 (66)
Postgraduate trainees	12 (40)	10 (34)
	Mean (SD)	
Age in years	31.9 (8.1)	31.8 (8.3)
Post basic MBBS years	11.0 (9)	8.00 (7)
Clinical experience (years)	10.4 (8.9)	6.9 (6.7)

SD = Standard deviation

(8.52 ± 2.95 vs. 12.41 ± 2.65; p < 0.001). TBL group pre-post test mean scores were also statistically significant (9.70 ± 3.65 vs. 14 ± 3.99; p < 0.001, Table III). Independent t-test exhibited insignificant difference in participants' understanding and clinical reasoning skills at baseline (lecture group 8.52 ± 2.95 vs. TBL group 9.70 ± 3.65; p = 0.177). However, analyzing the post-scores yielded lecture group 12.41 ± 2.65 vs. TBL group 14 ± 3.99; p = 0.07, Table IV.

Table II: Reliability coefficient of lecture and TBL pre/post-test scores using Cronbach's alpha.

Method	α	Mean discriminatory index (d)	Mean difficulty index (p)
Lecture (n=29)			
Pre-test score	0.672	0.60	42%
Post-test score		0.40	43%
TBL (n=30)			
Pre-test score	0.881	0.69	48%
Post-test score		0.73	70%

Table III: Comparison of lecture and TBL pre/post-test scores for statistical significance using paired t-test.

Method	Score	Mean	SD	p-value
Lecture (n=29)	Pre-test score	8.52	2.959	< 0.001
	Post-test score	12.41	2.653	
TBL (n=30)	Pre-test score	9.70	3.659	< 0.001
	Post-test score	14.00	3.991	

p < 0.05 was considered as significant.

Table IV: Determining the significance of two teaching method using independent t-test.

Method	Score	Mean	SD	p-value
Lecture (n=29)	Pre-test	8.52	2.959	0.177
TBL (n=30)	Pre-test	9.70	3.659	
Lecture (n=29)	Post-test	12.41	2.653	0.077
TBL (n=30)	Post-test	14.00	3.991	

SD = Standard deviation.

DISCUSSION

In this study, the TBL and problem-oriented lecture based educational interventions were compared to assess improvement in understanding and clinical reasoning skills among a group of general physicians in Karachi, Pakistan. The learning outcomes for both the groups were the same. That is, upon completion of the educational activity, the participants should be able to understand the concepts and principles in headache diagnosis and justify a treatment plan using clinical reasoning skills. For TBL intervention, ten tasks were designed using actual clinical headache cases and were distributed among small working groups. These were added with the problems to trigger discussion. These tasks had the potential of reversing the traditional approach for teaching and learning.[5] In the beginning, tutors used a teacher-directed approach in explaining the tasks and output requirement. Participants were encouraged and supported towards a student-directed approach to share, discuss and analyze cases in small groups. Two tutors, particularly the neurologists involved in planning this CME project, were selected to facilitate the TBL and deliver lectures to ensure uniformity. A study guide with a detailed description of the clinical cases; learning outcomes; output requirements and the learning issues was prepared to assist learners in the TBL process. In addition, first-hand resources such as clinical guidelines, handbook of headache, intranet access to AKU e-library and accessibility to laptop were also specified.[11] The problem-oriented lecture consisted of two talks for 30 minutes each. The first speaker focused on headache diagnosis and the second covered management. These talks were prepared to cover the clinical cases and problems that were developed for TBL intervention.

Despite ethical considerations, right educational planning and support for quasi-experimental research design,[15] the results of this study should be viewed with caution due to some limitations. Literature has strongly supported task-based learning (TBL), a development of PBL,[5] in medical practice and particularly in continuing medical and professional education.[4] Yet, no evidence of testing the TBL approach in CME has been reported till-date. TBL is not a new concept to medical academia and is focused on a set of tasks. Compared to PBL, it offers practical advantages and saving of resources such as time, financial cost, opportunity cost, space, materials, etc.[4,11]

TBL is a useful approach to integration, in which the responsibility for integration is mainly learner-dependent.[6,11] In essence, learners build their understanding on issues in relation to the assigned task through trans-disciplinary integration constructing meaning from their own information and experience from the real world,[14] using educational principles underpinning PBL.[11,13]

The TBL approach explicitly defines the required output format expected from a learner on completion of the task. Study guide in this process assist learners with the learning issues and integration, highlighting available resources in the form of books, articles, e-libraries, computer suites, etc.

Physicians voluntarily opted for either group. The results showed TBL group had an edge over the lecture group in terms of post-test mean scores (lecture group 12.41 ± 2.65 vs. TBL group 14 ± 3.991). Similarly, post-hoc item analysis for difficulty (p) index also supported TBL learning among the two interventions [lecture group pre-test (p) = 42% vs. post-test (p) = 43%; TBL group pre-test (p) = 48% vs. post-test (p) = 70% (Table II)]. Radical increase in the post-test TBL difficulty index depicts that TBL delivery improved learning in 70% of the participants, enabling them to answer more items correctly, as compared to 48% in the TBL pre-test. There could be multiple biases contributing to TBL intervention's performance, for example, physicians opting for the TBL group were mostly senior graduates with more years of clinical experience as compared to the lecture

group. Most importantly, the encouragement and support by facilitators to TBL group contributed to the overall outcome probably by increasing the efficiency and performance of the physician participants, though they were same and were provided to the problem-oriented lecture group as well.

Moreover, item analysis for discriminatory index [lecture group pre-test (d) = 0.60 vs. post-test (d) = 0.40; and TBL group pre-test (d) = 0.69 vs. post-test (d) = 0.73] demonstrated that all the presented items were clearly discriminating between high achievers (upper group) and low achievers (lower group) in both the groups. This study also raises questions about the cost-effectiveness of both the educational interventions. TBL group consumed more than 4 hours while the lecture group were finished in almost one hour only.

This could start a debate about the opportunity cost of the physicians participating and the community they cater to. The physicians could benefit by a series of lectures on different themes at the same time. On the other hand, TBL promoted collaborative learning, problem solving approach through small group discussions and tasks.

The TBL approach used in this CME is not a novel concept and physicians may have been introduced to this methodology during their medical school years, though it was applied for the first time in a continuing medical education setting at the Aga Khan University in Pakistan. Initially, the physicians showed reluctance that was reflected in their constant queries and confusion. Their apprehension was reduced after some time as two expert neurologists encouraged them to adopt student-directed approach and focus merely on the assigned case-based tasks supported through printed study guides.

Lectures are often used in adult education despite strong criticism. Yet, the providers should think before implementing TBL strategy in CME. The areas that need to be considered are opportunity cost of the physicians, intensity and length of the educational interventions (i.e. 4 hours vs. 1 hour.), logistic and administrative arrangements, availability and scope of learning resources, and finally commitment from the participants and faculty.

CONCLUSION

Improvement in participant scores in both educational interventions was clearly noticed. Both problem-oriented lecture and task-based interventions were equally effective as the results show a statistically insignificant difference. Therefore, both approaches can be considered as vital teaching tools in continuing medical education. However, TBL groups' slight edge over the lecture group in terms of post-test mean scores and radical increase in the post-test TBL group difficulty index, pointed at improved learning through TBL delivery, and favours further exploration in longitudinal studies in the context of CME.

Disclosures: The authors acknowledge the support provided by Pharma Evo, Pakistan in the form of unrestricted funds for this study. The authors or their families have no personal financial benefit or relationship that would constitute a conflict of interest.

Acknowledgement: This study was reviewed and approved by AKU Ethical Review Committee (Ref: 1956-DCPE-ERC-11).

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