

Original Article

Lectures, Interactive Learning, and Knowledge Retention in Continuing Medical Education

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Abstract: *At an annual continuing medical education (CME) event, the subject of the management of asthma in pregnancy was taught to attendees using a lecture format and, in consecutive years, a small group interactive teaching format was used. For both years of the study, knowledge retention was assessed by comparing multiple choice test scores on a pre-test, a post-test, taken shortly after the educational intervention, and a follow-up test taken 3 months after the educational intervention. Scores showed a significant improvement following the lecture and small group teaching formats for the post-test and follow-up tests. Scores at the preteaching and post-teaching tests were similar for the lecture and small group teaching formats. The scores on the follow-up test, however, were slightly better for the lecture group compared with the small group teaching format, although the difference was small and not significant. We conclude, therefore, that in a CME setting the lecture format of teaching compared favorably with small group learning in terms of knowledge retention.*

Key Words: Continuing medical education (CME), knowledge retention, lectures, small group interactive learning

An important objective of continuing medical education (CME) is the transfer of relevant knowledge to health professionals in clinical practice. Although a number of learning formats may be used to disseminate new medical information, traditionally, lectures and small group interactive sessions have been the most widely used. Lectures, being a passive form of learning, have been criticized as an ineffective way to deliver information¹ and, increasingly, they have been replaced by more interactive learning formats.² However,

lectures require less human resources and space³ than is needed when small group teaching is used.

At the undergraduate level, Romm et al.⁴ found little difference in short-term knowledge retention when epidemiologic principles were taught using a lecture format compared with a small group discussion format. Similarly, Martenson et al.⁵ found lectures and a problem-based format compared equally well in terms of knowledge retention by medical students who were taught a course on the musculoskeletal system.

In the areas of professional education and CME, direct comparisons are more limited between lectures and other teaching techniques. Nurses attending a course on cancer pain management showed equivalent scores on a test of knowledge retention, independent of whether teaching was by lecture alone or lecture plus role modelling.⁶ Pediatricians, however, showed slightly higher knowledge retention when teaching material was packaged in a case presentation format compared with that from a traditional lecture.⁷ To further clarify the appropriateness of lectures as a tool for knowledge retention compared with small group interactive learning in a CME setting, we compared both formats at an annual CME event.

Method

A Day in Lung Disease is an annual CME event sponsored by the Faculty of Medicine, University of Toronto. It is attended by physicians, who specialize in pulmonary disease, and other health professionals. This study was designed to test the effectiveness of a lecture format compared with small group interactive sessions on knowledge retention of attendees.

The instrument testing knowledge retention was a 14-item multiple choice test; four alternatives were given, with one correct answer in each item. No formal assessment of reliability or validity was attempted for the test. The test was reviewed, however, by three members of the Respiratory Division of the Faculty of Medicine, University of Toronto; the test was judged to have content validity. The test score for an individual was the total sum of the correct answers.

In the first year of this study, November 1992 (Year I), a lecture on the management of asthma and pregnancy was given by one of the usual faculty members of the program. The subject was chosen, because it was felt that general knowledge in this area among attendees was low; hence, learning could be measured more effectively. The multiple choice test was taken before the lecture by the attendees at the course. The same test was

given again on the same day, several hours after the lecture. Finally, this test was sent by mail, 3 months after the CME event, to the attendees who answered the pretest and post-test; the test was returned in a prestamped envelope. In the second year of the study, November 1993 (Year II), the same subject was delivered in the form of small group interactive sessions. Four sessions were each supervised by a facilitator who was a physician-faculty member who had received a 2-hour intensive training course in small group teaching by an educational consultant (J.T.). The group size ranged from about 10 to 15 persons. The preteaching, post-teaching, and follow-up tests were administered according to the same format as in Year I.

The material covered by the lecture in Year I was the same as the material covered by small group sessions in Year II. Since the test scores were on a ratio scale, their distribution was tested for significant deviations from normality through the Wilk-Shapiro test. The two years reflecting the teaching methods (lecture and small group teaching) and the three time points of testing (preteaching, post-teaching, and follow-up) yielded a 2 times 3 repeated measures design. Repeated measures analysis of variance was applied to the data.

Results

In Year I, 41 out of 65 attendees completed the pretest. All of these, plus one (i.e., 42), completed the post-test; 23 completed all three tests. In Year II, 27 of 56 attendees completed the pretest and post-test; 14 completed the pretest, post-test, and follow-up test.

There was no statistical evidence for significant deviations from a normal distribution in the test scores. Parametric analysis of variance and t-tests were, therefore, appropriate for the data.

Through the application of one-way analysis of variance, the preteaching and post-teaching test scores were compared for those who did (FU+) and those who did not (FU-) complete the follow-up test, to determine if they were substantively

different. The preteaching test means were 4.51 and 4.10 for FU+ and FU- respectively. The mean preteaching test scores were not statistically different ($p = .3861$). The post-teaching test means were 6.84 and 6.45 for FU+ and FU- respectively. The mean post-teaching test scores were not found to be statistically different ($p = .4689$).

To the test scores of those individuals who completed preteaching, post-teaching, and follow-up tests, 23 in 1992 and 14 in 1993, 2 times 3 repeated analysis of variance was applied. The nonsignificant interaction ($p = .3812$) in the analysis of the variance indicated that there were no significant differences between Year I and II in time-related changes of test scores. The nonsignificant year main effect ($p = .2899$) indicated that the average scores for the 2 years did not differ discernibly. However, the analysis of variance yielded a significant time of testing main effect ($p = .0001$), indicating that test scores changed with time of testing across Year I and II. Analyses of variance on contrasting the levels in time of testing were used to tease out the nature of the significant main effect. Compared with preteaching, post-teaching ($p = .0001$) and follow-up ($p = .0006$) tests showed that test scores had significantly increased. There was a slight, but statistically significant, decline in test scores across both methods from post-teaching to follow-up tests ($p = .0461$).

The small and unequal sample sizes for the two groups of subjects renders the negative findings tentative, insofar as the low statistical power may have produced the insignificant results. On the other hand, the positive findings are valid, because the statistical tests are adjusted for the sample sizes. Table 1 displays the mean scores and standard deviations for Years I and II. In Years I and II, the low mean pretest score confirms the low level of baseline knowledge of the subject.

Discussion

Several logistic problems emerged in carrying out this study. Although attendees for Year I and Year II were similar, less attendees took the post-test and follow-up test in Year II. This may have been due to the varying degrees of interest on the part of the four facilitators in soliciting participation in the study. Furthermore, although the facilitators for Year II were recognized as talented teachers, none of them had had formal training as facilitators in small group interactive teaching other than in the 2-hour intensive training session. Also, there was no quality assurance, apart from a periodic observation by the educational consultant during their sessions that the four facilitators behaved in a consistent fashion in interacting with their groups. Nevertheless, the small group interactive teaching sessions of Year II are representative of how such

Table 1 Descriptive Statistics for Individuals Who Provided Data at Pre, Post, and Follow-up Tests

Year and Time of Testing		Time of Testing					
		Pre		Post		Follow-up	
Year	No.	Mean	SD	Mean	SD	Mean	SD
I	23	4.87	1.36	6.83	2.19	6.48	2.47
II	14	3.93	2.27	6.86	2.38	5.57	2.14
<i>Year I and II Combined for Time of Testing</i>							
Time of testing	No.	Mean	SD				
Pre	37	4.514	1.789				
Post	37	6.838	2.230				
Follow-up	37	6.135	2.359				

Knowledge Retention in CME

teaching takes place in the context of CME at many universities.

This study has demonstrated that knowledge is retained with little loss at 3 months, irrespective of the educational interaction used. Knowledge retention was slightly, but not significantly, better for attendees who had the material delivered as a lecture in Year I compared with the attendees of Year II, who had the information delivered in small group teaching sessions. Had the facilitators received more training in Year II and had more attention been paid to ensure uniformity in style and approach in Year II, the results may have been different. In a situation that reflects current CME practice, however, the lecture format compared well with small group teaching in transferring information.

The implication of this study is that lectures have a role in CME when the goal is knowledge retention. Techniques for maximizing the effectiveness of lectures have been developed^{8,9} and should be utilized in the CME setting. Lectures and interactive forms of teaching should be examined in different CME settings to determine their roles when the educational objective is knowledge retention.

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