Comparison of Lecture-Based Learning vs Discussion-Based Learning in Undergraduate Medical Students

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OBJECTIVE: To compare lecture-based learning (LBL) and discussion-based learning (DBL) by assessing immediate and long-term knowledge retention and application of practical knowledge in third- and fourth-year medical students.

DESIGN: A prospective, randomized control trial was designed to study the effects of DBL. Medical students were randomly assigned to intervention (DBL) or control (LBL) groups. Both the groups were instructed regarding the management of gastroschisis. The control group received a PowerPoint presentation, whereas the intervention group was guided only by an objectives list and a gastroschisis model. Students were evaluated using a multiple-choice pretest (Pre-Test MC) immediately before the teaching session, a posttest (Post-Test MC) following the session, and a follow-up test (Follow-Up MC) at 3 months. A practical examination (PE), which tested simple skills and management decisions, was administered at the end of the clerkship (Initial PE) and at 3 months after clerkship (Follow-Up PE). Students were also given a self-evaluation immediately following the Post-Test MC to gauge satisfaction and comfort level in the management of gastroschisis.

SETTING: University of Iowa Hospitals and Clinics and the Carver College of Medicine, Iowa City, IA.

PARTICIPANTS: A total of 49 third- and fourth-year medical students who were enrolled in the general surgery clerkship were eligible for this study. Enrollment into the study was completely voluntary. Of the 49 eligible students, 36 students agreed to participate in the study, and 27 completed the study.

RESULTS: Mean scores for the Pre-Test MC, Post-Test MC, and Follow-Up MC were similar between the control and intervention groups. In the control group, the Post-Test MC scores were significantly greater than Pre-Test MC scores (8.92 ± 0.79 vs 4.00 ± 1.04, $p < 0.0001$), whereas the Follow-Up MC scores were significantly lower than Post-Test MC scores (7.17 ± 1.75 vs 8.92 ± 0.79, $p = 0.005$). In the control group, the Follow-Up MC scores were significantly greater than Pre-Test MC scores (7.17 ± 1.75 vs 4.00 ± 1.04, $p < 0.0001$). Analysis of variance for all control group MC examinations had a $p < 0.0001$. In the intervention group, the Post-Test MC scores were significantly greater than Pre-Test MC scores (8.33 ± 1.23 vs 4.60 ± 1.55, $p < 0.0001$), whereas the Follow-Up MC scores were significantly lower than Post-Test MC scores (7.13 ± 1.77 vs 8.33 ± 1.23, $p = 0.04$). In the intervention group, the Follow-Up MC scores were significantly greater than Pre-Test MC scores (7.13 ± 1.77 vs 4.60 ± 1.55, $p = 0.0002$). Analysis of variance for all intervention group MC examinations had a $p < 0.0001$. Mean scores for the Initial PE were significantly higher for the intervention group compared with the control group's score (7.47 ± 1.68 vs 5.25 ± 2.34, $p = 0.008$). Mean scores for the Follow-Up PE were significantly higher for the intervention group compared with the control group's score (7.87 ± 1.77 vs 5.83 ± 2.04, $p = 0.005$). A comparison of Initial PE vs Follow-Up PE was not significant in either group. Students in the intervention group were more comfortable in the immediate management of gastroschisis and placement of a silo and felt that the educational experience was more worthwhile than students in the control group did.

CONCLUSIONS: After a single instructional session, there was a significant difference in the students' scores between the control and the intervention groups on both administrations of the PEs. There were no significant differences between the 2 groups in any administration of the MC examinations. This seems to suggest that DBL may lead to better practical knowledge and potentially improved long-term knowledge retention when compared with LBL. Students in the DBL group also felt more comfortable with the management of gastroschisis and were more

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satisfied with the educational session. (J Surg Ed 73:250-257. © 2015 Association of Program Directors in Surgery. Published by Elsevier Inc. All rights reserved.)

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COMPETENCIES: Patient Care, Medical Knowledge, Practice-Based Learning and Improvement, Interpersonal and Communication Skills

INTRODUCTION

Traditional didactic lecture-based learning (LBL) has historically been the primary teaching modality in medical education. At its core, LBL is a teacher-centered approach that relies on the passive transfer of knowledge from the instructor to the learner. This method of teaching promotes superficial learning and often uses assessment models that reward a learner's ability to reproduce facts without truly understanding the topic.[1] Mounting evidence in educational research has questioned the efficacy of traditional lecture-based teaching,[2,3] which has led to a search for alternative methods of instruction. An alternative is problem-based learning, which has seen a steady rise in implementation in medical school curricula worldwide. In problem-based learning, students are presented with a clinical scenario and are encouraged to think critically, often in a small-group setting. In contrast to LBL, problem-based learning is student-centered and is designed to promote deeper understanding about underlying concepts and principles.[4] Numerous studies have attempted to investigate the efficacy of problem-based learning, with some studies showing increased knowledge[5-7] and others showing no effect on trainees' knowledge base or clinical performance.[8-10] There has also been some suggestion that problem-based learning increases the long-term retention of knowledge,[11] but that belief continues to be mostly based on anecdotal evidence.

A second alternative to traditional LBL is simulation-based learning, in which students further immerse themselves within the clinical scenario to gain practical knowledge and skills. Studies have shown the merits of simulation-based learning, with increased knowledge retention [12] and direct application to real-life clinical situations.[13] Numerous studies have shown an advantage to simulation-based learning over traditional LBL in student performance on examinations and learner preference.[14-16] There is also some suggestion that simulation-based learning may be superior to problem-based learning.[17] However, there is concern about the cost and amount of extra time required for simulation-based teaching.[18] One way to decrease cost and possibly teaching time is to use low-fidelity models, which has been shown to be just as effective as high-fidelity models in certain situations.[19] Irrespective of the level of fidelity, simulation-based learning has been proven to increase medical knowledge, technical skills, nontechnical skills, and learner satisfaction.[20]

Though modern-day medical education curricula often combine aspects of both problem-based and simulation-based learning, there is a surprising lack of educational research comparing these techniques with traditional LBL. In this study, we combined aspects of problem-based learning and a low-fidelity simulation-based model to form a discussion-based learning (DBL) curriculum as an alternative to traditional LBL. The purpose of this study was to compare practical knowledge and long-term knowledge retention in undergraduate medical students who undergo a single instructional session of either LBL or DBL. We hypothesized that students undergoing DBL would yield superior long-term knowledge retention, application of knowledge, and confidence when compared with those undergoing DBL.

METHODS

Study Settings

This randomized controlled trial was conducted by the Department of Surgery at the University of Iowa Carver College of Medicine.

Student Sample

A total of 49 third- and fourth-year medical students, enrolled in the 6-week surgery clerkship between September 2014 and February 2015, were eligible for this study. Learners were randomly assigned to intervention (DBL) or control (LBL) groups before the beginning of the surgery clerkship. Of the 49 eligible students, 13 declined to participate in this voluntary study. Of the 36 students enrolled in the study, 9 did not complete the long-term component of this study. Figure 1 summarizes the student sample and demographics.

Instructional Sessions

Both the groups were instructed on the immediate stabilization and surgical management of gastroschisis. The lesson plans for both the groups had identical objectives, and the session was led by the same board-certified pediatric surgeon (D.P.). All instructional sessions were approximately for 35 minutes, and occurred within the first 2 weeks of the surgery clerkship. Group sizes ranged from 4 to 8 students per instructional session. A 22-slide PowerPoint presentation was used for the control group. The PowerPoint presentation included listing of the objectives, a sample case scenario, and featured a combination of text and