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The effect of team-based learning in medical ethics education

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Abstract

Background: Although now an important aspect of medical education, teaching medical ethics presents challenges, including a perceived lack of value or relevance by students and a dearth of effective teaching methods for faculty. Team-based learning (TBL) was introduced into our medical ethics course to respond to these needs.

Aims: We evaluated the impact of TBL on student engagement and satisfaction and assessed educational achievements.

Method: The medical ethics education using TBL consisted of four 2 h sessions for first-year medical students of Chonnam National University Medical School.

The impact of TBL on student engagement and the educational achievements was based on numerical data, including scores from IRAT, GRAT, application exercise and final examination, and the students' perception of medical ethics education using TBL.

Results: Most students perceived TBL activities to be more engaging, effective and enjoyable than conventional didactics. The GRAT scores were significantly higher than the IRAT scores, demonstrating the effect of cooperative learning. In addition, TBL improved student performance, especially that of academically weaker students.

Conclusions: The application of TBL to medical ethics education improved student performance and increased student engagement and satisfaction. The TBL method should be considered for broader application in medical education.

Introduction

Medical ethics is now an important aspect of medical education (Eckles et al. 2005). Since its emergence in the 1970s as a subject in the curriculum, ethics has become a core component of undergraduate and postgraduate medical training (Miles et al. 1989). This development stems from the recognition that ethical and moral issues present increasingly complex challenges to the medical practitioner (Hattab 2004).

Korean medical schools have responded to the need for teaching ethics in medical education, and a survey showed that 36 of the 41 medical schools (80%) in the country had adopted a medical ethics curriculum as of 2006. Nevertheless, teaching medical ethics presents challenges, including a perceived lack of value or relevance by students and a dearth of effective teaching methods for faculty.

Many methods have been used to increase student participation in the learning process, and widespread agreement exists that students who participate in group discussions are more satisfied with medical ethics education (Ales et al. 1992; Self et al. 1993; Smith et al. 2004). Group discussion requires many faculty tutors who work within small groups, but medical school faculty members often believe that they are incapable of teaching courses in medical ethics because they have no formal training in ethics education (Smith et al. 2004). Thus, difficulty in recruiting faculty tutors for medical ethics education poses a disadvantage to the group discussion approach.

We believe that team-based learning (TBL), an innovative educational method combining interactive small-group learning with expert-based content delivery, can overcome this disadvantage. TBL brings together theoretically based and empirically grounded strategies (Michaelsen 1998) to ensure the effectiveness of small groups working independently in classes with high student-to-faculty ratios (e.g. up to

Practice points

- TBL is an approach to large-group teaching that combines the strengths of small-group interactive learning with teacher-driven content delivery.
- Each TBL session included objective-oriented assignments, an individual readiness assurance test (IRAT), a group readiness assurance test (GRAT), and a group application problem.
- The application of TBL to medical ethics education improved student performance, especially that of academically weaker students, and increased student engagement and satisfaction.

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200 : 1) without losing the benefits of faculty-led, small groups with lower ratios (e.g. 7 : 1) (Hunt et al. 2003). TBL has economic advantages over other small-group methods because it can be conducted with multiple teams and an 'expert' instructor, and consequently does not require multiple facilitators (Levine et al. 2004). Therefore, we introduced TBL in medical ethics education.

In the United States, TBL has been used extensively in higher education since 1980s (Watson et al. 1991; Dinan & Frydrychowski 1995), and its application has been explored since 2000 in many US medical schools (Seidel & Richards 2001; Haidet et al. 2002; Koles et al. 2005; Michaelsen & Richards 2005; Nieder et al. 2005). However, there is no report of the use of TBL as an instructional strategy in medical ethics education.

We hypothesized that because the TBL strategy forces students to keep up with the course material, academic performance of all students would improve and students would find the effect of cooperative learning.

We described the implementation of TBL for medical ethics education and evaluated the impact of TBL on student engagement and satisfaction and assessed the educational achievements.

Methods

TBL in the course and participants

The medical ethics education using TBL consisted of four 2 h sessions for first-year medical students of Chonnam National University Medical School. The first session was used to describe TBL and give out the instructional materials and create teams. The 160 students were assigned to 26 teams of six or seven students each. It was conducted based on random selection of student number or something similar, and students were informed that their team assignments would remain the same throughout the course. The remaining three 2 h sessions were used to teach medical ethics using TBL. The course contents focus on the principles of medical ethics (autonomy, non-maleficience, beneficence and justice), how to make ethical decisions and patient–doctor relationship.

After approval of study protocol by the university's curriculum committee and informed consent from the students had been gained, the study was accomplished.

Design of the TBL in medical ethics education

Preparation. Two or 3 days before the class, all students were given a student guide that indicated the learning objectives and textbook readings. The students were requested to read and study the preparatory material individually before the class.

Readiness assurance. The students completed a five-question, closed book, multiple-choice quiz with a 10-min time limit at the beginning of the class. The questions on the Individual Readiness Assurance Test (IRAT) assess whether students understand and can apply important concepts of the medical ethics basic to the practice of medicine (e.g. consent and informed consent to treatment, physician–patient relationship, death and dying, etc.). The answers were recorded on papers and submitted for later grading. Immediately after IRAT, the preassigned teams of six or seven students retook the same quiz as IRAT, with a 20-min time limit, forming a consensus for each answer. This was the Group Readiness Assurance Test (GRAT). The team questions were reviewed by having the teams show their answers simultaneously using lettered cards. If the team answers did not agree, the discrepancies were addressed by asking the teams to defend their answers (RAT question discussion). This discussion phase was scheduled for 20 min to complete the first hour of class.

Application exercise. Once the instructor felt that the students had mastered the core concepts testing RAT, the class moved on to the application exercise, in which the students worked in their teams on two questions that provided an opportunity to apply the knowledge to complex real-world problems. The application exercise questions were designed to be more challenging than the readiness assurance questions, by requiring problem-solving skills beyond the simple recall of relevant information, such as medical ethics dilemma cases. The teams had 30 min to complete group test and 20 min to review in a manner similar to the RAT question review.

Example

RAT question: A 90-year-old woman in a nursing home has had advanced vascular dementia, severe dysphasia, and a 9 kg weight loss over the past 2 months. Her five children are divided regarding the decision to provide artificial feeding through a gastrostomy tube. There is no living will. The oldest son approaches the physician after a family meeting and says, 'You should simply decide what is best for her and tell the others that's what we should do.' Assuming the physician proceeds in this manner, which of the following best describes the physician's action?

(A) Paternalism
(B) Preserving fairness in use of resources
(C) Protecting patient autonomy
(D) Rationing care
(E) Truth-telling

Application exercise question: Three years after hospitalization for diabetic ketoacidosis, an 87-year-old woman refuses insulin injections. She says that her medical condition has declined so much that she no longer wishes to go on living; she is nearly blind and will likely require bilateral leg amputations. She reports that she has always been an active person and does not see how her life will be of value anymore. She has no family and most of her friends are sick or deceased. On mental status examination, she is alert and cooperative. She accurately describes her medical history and understands the consequences of refusing insulin. There is no evidence of depression. She dismisses any attempts by the physician to change her mind, saying that the physician is too young to understand her situation. She says, 'I know I will die, and this is what I want.' Which of the following is the most appropriate next step in management?

(A) Discharge the patient after she has signed an 'against medical advice' form
(B) Seek a court order to appoint a legal guardian
(C) Offer insulin but allow the patient to refuse it
(D) Admit to the psychiatric unit
(E) Administer insulin against the patient's wish

Data collection. In addition to the individual and group RATs, the impact of TBL on student engagement and the educational achievements was based on final examination of medical ethics and the students' perception of medical ethics education using TBL.

In IRAT, GRAT and final examination of medical ethics, students get scores for the right answers and full credit for the best answer in the application exercise.

The IRAT scores were compared to the GRAT scores to evaluate the effect of TBL through cooperative learning.

IRAT scores reflected students' comprehension of content within the assigned reading before participating in an active learning and the final examination of medical ethics reflected practical knowledge and skills taught in the course. Therefore, IRAT and final examination scores were used to evaluate the improvement of the students' academic performances through the TBL, and were compared by stratifying the students into four quartiles based on the grade point average (GPA) of the first year of medical school.

Students completed a self-administered questionnaire with anonymous responses to obtain individual perceptions of the experiences provided by the TBL course. Students' response to RAT items and application exercise questions and their self-perceptions on the effects of TBL were measured using a 5-point Likert response scale from 'strongly agree' to 'strongly disagree'. Higher scores indicated a more positive attitude.

Data analysis. The IRAT and GRAT scores were compared using a paired *t*-test. One-way analysis of variance (ANOVA) was used to compare the IRAT, GRAT, application exercise and end-of-course examination scores among the four quartiles of students. All analyses were performed using SPSS software version 15.0 (SPSS Inc., Chicago, IL, USA).

Results

Educational achievements of TBL

In all of the TBL classes, the GRAT scores were significantly higher than the IRAT scores both overall and in the groups stratified by GPA (Table 1). This confirmed group problem-solving to be more effective than individual problem-solving, irrespective of GPA level.

The effect of TBL on the student performance is presented in Table 2. The GRAT and application exercise scores did not differ significantly ($p = 0.114$ and 0.197, respectively), while the IRAT and final examination scores were significantly different ($p = 0.033$ and 0.000, respectively). On comparing the groups stratified by GPA level, the IRAT scores differed significantly between the second group and third group, but not between the third and fourth groups. In contrast, for final examination scores, the third group was not significantly different from the second group and scored significantly higher than the fourth group. This showed that TBL improves academically weaker students' performance.

Table 1. The effect of TBL on cooperative learning: Comparison of the IRAT and GRAT scores.

	TBL (1st)				TBL (2nd)				TBL (3rd)			
GPA quartiles	IRAT	GRAT	*t*	*p*-value*	IRAT	GRAT	*t*	*p*-value*	IRAT	GRAT	*t*	*p*-value*
I (1st–40th)	2.17 ± 0.50	2.98 ± 0.16	9.798	0.000	3.43 ± 1.13	4.53 ± 0.55	6.736	0.000	3.63 ± 1.01	4.58 ± 0.50	7.373	0.000
II (41st–80th)	2.08 ± 0.58	3.00 ± 0.15	9.944	0.000	3.38 ± 1.14	4.56 ± 0.50	6.082	0.000	3.73 ± 0.85	4.47 ± 0.51	5.454	0.000
III (81st–120th)	2.03 ± 0.54	2.92 ± 0.27	9.372	0.000	2.95 ± 1.13	4.30 ± 0.69	7.459	0.000	3.45 ± 0.90	4.45 ± 0.50	6.583	0.000
IV (121st–160th)	2.06 ± 0.49	2.94 ± 0.24	9.574	0.000	3.05 ± 1.04	4.45 ± 0.78	7.851	0.000	3.05 ± 1.21	4.28 ± 0.46	6.070	0.000
Overall	2.09 ± 0.53	2.96 ± 0.20	19.414	0.000	3.20 ± 1.12	4.46 ± 0.64	14.083	0.000	3.47 ± 1.02	4.45 ± 0.50	12.413	0.000

*By the paired *t*-test. Maximum score: 1st TBL, 4; 2nd TBL, 5; 3rd TBL, 5. IRAT, Individual Readiness Assurance Test; GRAT, Group Readiness Assurance Test.

Table 2. The effect of TBL on student performance: Comparison of the IRAT, GRAT, application test, and end-of-course examination according to GPA level.

GPA quartiles	IRAT	GRAT	Application test	End-of-course examination
I (1st–40th)	9.23 ± 1.91	12.07 ± 0.73	4.37 ± 0.74	48.80 ± 2.49
II (41st–80th)	9.21 ± 1.68	12.05 ± 0.61	4.03 ± 0.83	47.45 ± 3.89
III (81st–120th)	8.05 ± 1.47	11.69 ± 0.69	4.23 ± 0.83	46.22 ± 3.40
IV (121st–160th)	7.88 ± 2.10	11.70 ± 0.68	3.95 ± 1.36	43.48 ± 4.35
F	6.090	1.829	1.578	15.866
p-value*	0.001	0.144	0.197	0.000
*Post-hoc***	I > (III, IV) II > (III, IV)			I > (III, IV) (II, III) > IV

*By one-way ANOVA, ** by Tukey test. Maximum score: IRAT and GRAT, 14; Application test, 6; End-of-course examination, 50.

Table 3. Students' perception of medical ethics education using TBL.

		Mean ± SD	Median(range)
Students' response to RAT items and application exercise questions	RAT items assessed the pre-class assignment content	3.79 ± 0.70	4(3)
	RAT items helped to understand the course content and concepts	3.82 ± 0.56	4(3)
	Application exercise questions applied basic facts and concepts	3.78 ± 0.78	4(3)
Students' self-perceptions on the effects of TBL	TBL promoted student's engagement in the class	4.26 ± 0.83	4(4)
	TBL promoted the learning of essential concepts or skills	4.05 ± 0.80	4(4)
	TBL promoted effective cooperative learning	3.79 ± 0.83	4(4)
	TBL promoted increased reading of the textbook by the students	3.59 ± 0.94	4(4)

(Score from 1 = do not agree at all to 5 = fully agree).

Students' perception of medical ethics education using TBL

Of the 160 first-year medical students, 132 completed the survey (response rate, 79.5%). Table 3 presents the results of students' rating of RAT items and application exercise questions and the students' self-perception to the effect of TBL. When asked to rate the RAT items and application exercise questions, the answers to these questions were positive. Students believed that TBL helped them understand the course content and concepts, made them study more consistently and encouraged interaction, discussion, and problem solving (Table 3).

Discussion

We introduced TBL into the medical ethics curriculum to address the shortcomings of typical, small-group, problem-solving exercises and to improve the active learning experience for our students. To the best of our knowledge, this is the first empirical study to investigate the utility of incorporating team-learning activities into medical ethics education. The results suggest that the application of TBL improved student performance and increased student engagement and satisfaction.

In this study, the GRAT scores were significantly higher than the IRAT score. By working together in a very prepared and focused way, students performed better as groups than as individuals. This result is consistent with the finding of Nieder et al. (2005). One of the major benefits of TBL is that the performance of academically weaker students improved compared to their achievements in other science courses taught using traditional lectures (Seidel & Richards 2001; Koles et al. 2005; Nieder et al. 2005). This study showed that the final examination scores of the second lowest academic quartile performed better. This result may be explained by the students' self-perception of the effects of TBL that it assisted their class engagement and understanding of the medical ethics concepts. However, the final examination score of the lowest academic quartile was significantly lower than that of the better students. This result might be due to short implementation period. In this study, TBL was conducted four times, which we believe was too infrequent to help the academically weakest students.

In the students' self-perception of effects of TBL, scores of cooperative and self-directed learning is lower than those of other items. We believe that although the intent and components of TBL was presented in the first class, it remains difficult to change the attitude of students who are comfortable with lectures after years of experience. In this study, no peer evaluation was applied. If peer evaluation had been conducted, the intra- and inter-group discussion may have been improved. Michaelsen et al. (2004) consider peer assessment to be one of the key components of the TBL paradigm because it helps ensure student accountability. However, Thompson et al. (2007) reported that many students were resistant to peer evaluation as part of TBL grading.

This study suffered three limitations. First, because the study was cross-sectional, we could not evaluate the long-term TBL outcomes. Second, the students' test scores might have been influenced by many factors. Third, the relatively small sample size limited the statistical power and prevented statistically significant results.

Conclusion

Although now an important aspect of medical education, teaching medical ethics presents challenges, including a perceived lack of value or relevance by students and a dearth of effective teaching methods for faculty. TBL was introduced into our medical ethics course to respond to these needs.

The application of TBL to medical education improved student performance, especially that of academically weaker students, and increased student engagement and satisfaction. The TBL method should be considered for broader application in medical education.

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