TEACHERS' TOPICS

Enhancing Team-Based Active Learning Through Hands-On Experience With Nicotine Replacement Therapy

Andrea S. Franks, PharmD

University of Tennessee Health Science Center College of Pharmacy, Knoxville, Tennessee

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Objectives. To enhance tobacco cessation active-learning in an ambulatory care elective course by adding hands-on experience with nicotine replacement therapy to a team-based learning (TBL) session.

Design. A hands-on experience that included students chewing a piece of nicotine gum was added to a TBL class session. Student pairs used a skills checklist to evaluate and give peer feedback on appropriate counseling and gum use.

Assessment. Students' scores on a tobacco cessation examination were higher than those of students enrolled in the previous course in which TBL alone had been used. Based on pre- and post-experience survey responses, students' perceptions regarding their abilities to provide tobacco cessation counseling improved. Subjective student comments regarding the experience were positive.

Conclusion. Participating in a TBL session that incorporated hands-on experience with nicotine gum in an ambulatory care elective course increased students' confidence in their ability to provide tobacco cessation counseling and provided a unique perspective on the product's characteristics.

Keywords: team-based learning, active learning, tobacco cessation, nicotine gum

INTRODUCTION

Tobacco use continues to be a significant cause of morbidity and mortality.¹ One in every 5 US deaths (443,000 annually) is caused by tobacco use.² Furthermore, US tobacco use costs over \$193 billion annually in lost productivity and medical expenses.^{2,3} Although the Healthy People 2010 target for cigarette smoking prevalence was <12%, 2010 data reflected a US prevalence of 19.3% (45.3 million). Smoking prevalence in 2011 was 19.0%, still significantly higher than the Healthy People 2020 goal of <12% smoking prevalence for US adults.^{1,4}

The Joint Commission of Pharmacy Practitioners Vision Statement for Pharmacy Practice in 2015 includes wellness and disease prevention as important pharmacist competencies.⁵ The Accreditation Council for Pharmacy Education (ACPE) Standards 2.0 include an emphasis on public health and disease prevention.⁶ Because tobacco use is the most common cause of disease, and because pharmacists in almost every practice setting care for patients who use tobacco products, tobacco cessation should be addressed in the curricula of colleges and schools of pharmacy.

The Rx for Change program⁷⁻⁹ is a comprehensive curriculum designed to equip health professionals and health professions students with evidence-based skills for assisting patients with tobacco cessation. It was developed by pharmacy faculty members in California and funded by the National Cancer Institute. The Rx for Change program was disseminated through a train-the-trainer approach for faculty members.⁹ It started in colleges and schools of pharmacy and has expanded to include all health disciplines.¹⁰⁻¹² This evidence-based program is based on principles set forth in the US Public Health Service Clinical Practice Guideline for Treating Tobacco Use and Dependence.¹³ The program includes core modules regarding epidemiology, drug interactions, assisting patients with quitting, aids for cessation, and case scenarios. The materials emphasize the 5A's (ask, advise, assess, assist, arrange)¹³ and patient-specific interventions that may include pharmacotherapy. A key component of the curriculum is the opportunity for hands-on experience with nicotine replacement therapy products which were initially provided to colleges and schools of pharmacy that participated in this nationwide initiative.⁷ Limited data are available describing teaching techniques being used for tobacco cessation in colleges and schools of pharmacy, although the Rx for Change program has been widely implemented.⁷⁻⁹

ACPE standards require that doctor of pharmacy education develop problem-solving and critical-thinking

Corresponding Author: Andrea S. Franks, PharmD, University of Tennessee College of Pharmacy, 1924 Alcoa Highway, Box 117, Knoxville, TN 37920. Tel: 865-974-2357. Fax: 865-974-2022. E-mail: afranks@uthsc.edu

skills through active-learning strategies such as application, case studies, and practice-based exercises.⁶ Publications that were developed as part of the American Association of Colleges of Pharmacy Curricular Change Summit strongly recommend that pharmacy education engage learners in highly interactive, meaningful learning experiences that develop critical-thinking, problem-solving, and communication skills.^{14,15} Team-based learning¹⁶ is an efficient method of active learning that is being used in colleges and schools of pharmacy¹⁷⁻²³ and in other health professions programs.²⁴⁻²⁷ Online tobacco cessation education has also been used in pharmacy education.²⁸ The literature does not specifically describe tobacco cessation training using TBL in health professions education, including colleges and schools of pharmacy.

The University of Tennessee College of Pharmacy implemented TBL as a teaching strategy during the 2007-2008 academic year in the ambulatory care elective course on the Knoxville campus.²⁰ Enhancing tobacco cessation TBL classroom activities with hands-on nicotine replacement therapy meets ACPE's standards regarding active learning and disease prevention, and gives students the tools to assist their patients with tobacco cessation. This manuscript describes the design and implementation of hands-on nicotine gum education as part of a tobacco cessation TBL session in an ambulatory care elective course.

DESIGN

The University of Tennessee College of Pharmacy offered the ambulatory care elective course as a semester-long class during the third year of the professional curriculum. On the Knoxville campus, class met once weekly for 2-hour TBL sessions and class enrollment ranged from 20 to 30 students. Course goals included increasing students' knowledge and problem-solving abilities for common chronic diseases through case-based application and discussions with peers and faculty members. The course built on and made connections with ambulatory care topics included in the therapeutics curriculum. The course was described in detail in a previous issue of the *Journal*.²⁰

To be consistent with recommended TBL practices, teams of 5 to 7 students were formed at the beginning of the semester and remained consistent throughout the course.¹⁶ Pre-class preparation materials, including reading objectives and a reading assignment, were posted on the course management system Blackboard (Blackboard, Inc, Washington, DC) 1 week prior to each class. The tobacco cessation reading assignment used materials from the Rx for Change program along with a review article. In-class activities included the administration of 10-question individual and team readiness assurance

tests, a short debriefing and appeals process, and application exercises that included patient cases. The application exercises followed published guidelines for effective TBL known as the "4 S's": significant, same problem, specific choice, and simultaneously report.¹⁶ Each team worked on the same significant complex patient cases and reported their team answers simultaneously via cards with letters. Team reporting was followed by a detailed intra-team discussion led by the faculty facilitator. In addition to weekly individual and team quizzes, the course concluded with a cumulative final examination. Table 1 outlines a brief teaching plan including timeframe, and Appendix 1 is an example of a case-based application exercise.

Mint-flavored and unflavored nicotine gum, 2 mg per piece, was purchased with seed grant funding provided through the University of Tennessee College of Pharmacy. Prior to class, small plastic bags were each filled with 2 pieces of gum (1 mint, 1 unflavored). The tobacco cessation session followed the standard TBL format. During the application exercise, when one of the selected answer options included nicotine gum, the faculty facilitator distributed a packet to each student. Students were advised that this activity was optional and that they could decline participation. They were advised not to use the products if they were a current or former smoker, pregnant, or breastfeeding. They were also advised to remove and dispose of the gum immediately after completing the exercise. PowerPoint slides from the Rx for Change program were used as a guide to review appropriate dosage

Table 1. Tobacco Cessation Class Schedule

	Time Allotted (Minutes)
Individual readiness assurance test (iRAT)	10
Team readiness assurance test (tRAT)	10
Quiz review, clarification, appeals	10
Teams work on Case 1 of application exercise	10-15
Reporting out, discussion of Case 1 questions	10-15
Teams work on Case 2 of application exercise	10-15
Reporting out, discussion of Case 2 questions	10-15
Full class faculty-facilitated nicotine gum experience	10
Pairs of students assess each other using nicotine gum skills checklist	10
Faculty-led discussion, reflection, debriefing	10

and administration of the nicotine gum. The faculty facilitator instructed the students to try the unflavored product first. The “chew and park” technique was discussed and then experienced. Students were encouraged to share their observations and reflections. Students worked in pairs with the mint-flavored gum, using a skills checklist for the appropriate steps of nicotine gum use. Follow-up discussion and debriefing focused on the sensation of nicotine release, the texture of the gum, and differences between the unflavored and flavored products. Students were also asked how this experience would change the way they counsel patients regarding the use of nicotine gum in the future.

ASSESSMENT AND EVALUATION

Twenty students were enrolled in the elective course. Students were administered a self-assessment the week before the tobacco cessation session to establish their baseline self-rated abilities and confidence related to tobacco cessation. The assessment evaluated self-rated abilities including overall ability, key competencies of tobacco cessation counseling, and confidence for counseling using a previously validated instrument.⁸ The same self-assessment was given after the class session with the addition of an open-ended question asking the students to share comments related to their experience with the nicotine gum. Paired sample *t* tests were used to test for significant changes in self-ratings across time.

Student ratings of their counseling abilities before and after the class session are described in Table 2. After the learning experience, most students (95%) reported their tobacco cessation abilities as 4 or 5 on a 5-point scale (ie, very good or excellent). Similarly, more than two-thirds (14) rated their self-confidence as very or extremely confident for each of the 11 aspects of counseling in the self-efficacy assessment. Twenty students (100%) rated themselves as moderate, very, or extremely confident on each of the 11 counseling aspects. The counseling ability mean score on the posttest was 4.7 ± 0.4 , differing significantly from the pretest mean of 3.8 ± 0.8 ($p < 0.001$).

Self-efficacy assessment results are also included in Table 2. The mean score after the class session (4.6 ± 0.4) was significantly higher ($p < 0.001$) than the mean score before the session (3.6 ± 0.8). A significant difference was also observed for each individual item.

Student responses to open-ended question on the posttest described the experience positively. Students specifically responded that the opportunity to experience the sensation of the nicotine gum would help them better explain to patients how to use it appropriately. Several students reported that they were surprised by how long it took for the nicotine to be released from the gum and the

taste and sensation were different from what they expected. One student’s response best summarizes the statements:

“The hands on experience with trying the nicotine gum allowed me to more fully experience what my patients will experience. I believe it allows for a better understanding and a better counseling experience for both the practitioner and the patient. I also believe it allowed me to more fully retain the information that will be necessary for counseling.”

Four final examination questions addressed tobacco cessation. The same 4 questions were used in the fall semester 2011 (TBL alone, no nicotine gum) and the fall semester 2012 (TBL plus nicotine gum experience). Mean scores were compared using a *t* test. Of the 4 tobacco cessation questions, the 2011 class ($n=26$) answered a mean of 3.5 ± 0.7 correctly. The 2012 class ($n=20$) answered a mean of 3.8 ± 0.4 questions correctly ($p=0.047$). Detailed performance is described in Table 3.

DISCUSSION

The nicotine gum exercise enhanced TBL by adding hands-on experience with a unique nonprescription product that is characterized by several important patient-counseling points. These combined teaching techniques seek to develop critical-thinking skills and deep foundational learning. These outcomes may not be adequately assessed with a summative multiple-choice examination, which is a relatively short-term assessment of knowledge. Future research should assess long-term retention of key concepts of nicotine gum use between groups who participate in TBL alone vs those who have the additional experience of chewing the gum.

Previously published pharmacy education literature describes educational outcomes and student perceptions with full implementation of the complete Rx for Change curriculum^{8,9} or with TBL in various courses and classroom environments.¹⁷⁻²³ However, no literature describes integrating the nicotine replacement therapy experience and Rx for Change materials within a TBL class session. This model could be expanded to other products, devices, or medications to enhance a TBL session.

Now that the Rx for Change grant is no longer active, one potential barrier to implementing this type of educational program is the expense of the products. Seed funding from the college was used to obtain products for this pilot study. Depending on class size and budget restraints, this may or may not be a barrier for other faculty members wishing to implement a similar learning experience. Because the nonprescription gum is available generically and because each student only needs 1 or 2 pieces, the

Table 2. Student Self-Ratings Before and After Participation in a Hands-On Experience With a Nicotine Replacement Product

Question	Pre-class, Mean (SD)	Post-class, Mean (SD)	Change (95% CI)	P
Counseling ability ^a				
Counsel a patient on tobacco cessation	3.8 (0.9)	4.6 (0.6)	0.7 (0.2-1.3)	0.005
Ask about tobacco use	4.2 (1.0)	4.7 (0.5)	0.5 (0.4-1.1)	0.033
Advise patients to quit	3.9 (1.1)	4.6 (0.6)	0.8 (0.8-1.4)	0.016
Assist with quitting	3.5 (0.8)	4.6 (0.6)	1.2 (0.7-1.6)	0.001
Arrange follow-up counseling	3.6 (1.1)	4.7 (0.6)	1.1 (0.5-1.7)	0.001
Overall competency (mean of above responses)	3.8 (0.8)	4.7 (0.4)	0.9 (0.4-1.3)	<0.001
Self-efficacy ^b				
Know the appropriate questions to ask patients when providing tobacco cessation counseling?	3.6 (1.0)	4.6 (0.5)	1.0 (0.5-1.4)	<0.001
Have the skills needed to counsel for an addiction?	3.3 (1.2)	4.3 (0.7)	1.0 (0.4-1.6)	0.002
Can provide motivation to patients who want to quit?	3.9 (1.0)	4.6 (0.6)	0.7 (0.3-1.2)	0.002
Have the skills to monitor and assist patients throughout their quit attempt?	3.4 (1.1)	4.6 (0.7)	1.2 (0.5-1.8)	0.001
Have sufficient therapeutic knowledge of the pharmaceutical products for tobacco cessation?	3.8 (0.9)	4.9 (0.3)	1.1 (0.7-1.5)	<0.001
Know when a referral to a physician is appropriate?	3.9 (1.3)	4.8 (0.4)	1.0 (0.3-1.6)	0.005
Can create patient awareness of why health care professionals should ask questions about tobacco use and encourage quitting?	3.8 (0.9)	4.6 (0.6)	0.7 (0.2-1.2)	0.004
Can sensitively suggest tobacco cessation to patients who use tobacco?	3.7 (1.0)	4.6 (0.6)	0.9 (0.3-1.5)	0.002
Are able to provide adequate counseling when time is limited?	3.3 (1.0)	4.6 (0.5)	1.3 (0.8-1.8)	<0.001
Can help recent quitters learn how to cope with situations or triggers that might lead them to relapse to using tobacco?	3.4 (1.2)	4.4 (0.8)	1.1 (0.4-1.7)	0.001
Can counsel patients who are not interested in quitting?	2.8 (1.1)	4.4 (0.7)	1.5 (0.9-2.1)	<0.001
Overall self-efficacy (mean of above responses)	3.6 (0.8)	4.6 (0.4)	1.0 (0.6-1.5)	<0.001

^a Based on a 5-point scale ranging from 1 = poor to 5 = excellent.

^b Based on a 5-point scale ranging from 1 = not at all confident to 5 = extremely confident.

cost is not excessive, particularly when the value of the learning experience is considered.

A potential limitation of this pilot study is that these students had strong baseline knowledge of tobacco cessation. This topic had already been taught in their first year as part of the Self-Care and Nonprescription Drugs course. This may explain why students self-rated themselves highly in terms of self-efficacy even prior to the learning experience. Although this could confound the findings related to knowledge, abilities, and confidence in this area, all of the students enrolled in the ambulatory

care elective course received the same instruction regarding tobacco cessation throughout the required curriculum.

The students performed better on the final examination questions with the TBL combined with nicotine gum experience compared to students who had TBL alone. The examination questions likely did not measure things learned from hands-on experience (eg, tingling) or the added value of the sensory experience to long-term retention through deep learning. Future research should develop better measures of deeper learning to better assess educational innovations.

Table 3. Pharmacy Students' Answering Examination Questions Correctly After Participating in a Team-based Learning Exercise Alone and Combined With Hands-on Experience With a Nicotine Replacement Product

Question	Students Answering Correctly, %	
	TBL Alone (n=26)	TBL Plus Hands-On Experience (n=20)
Selecting patient-specific pharmacotherapy	92.3	100
Nicotine gum dosage	88.5	95
Selecting patient-specific NRT	92.3	90
Selecting patient-specific pharmacotherapy	73.1	95

Abbreviations: TBL = Team-based learning; NRT = nicotine replacement therapy.

During the next academic year, this study will be implemented more broadly in a required therapeutics course, and the experience will be expanded to other nicotine replacement therapy products.

SUMMARY

After participating in a TBL session that included hands-on experience with nicotine gum, pharmacy students' self-rated confidence and ability to counsel patients about tobacco cessation improved. The addition of the nicotine gum experience was associated with improved performance on tobacco cessation examination questions compared to TBL alone. Future plans include implementing this teaching strategy more broadly in a required therapeutics course and expanding the experience to include other nicotine replacement therapy products. A similar approach could be taken with other nonprescription products and devices.

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Appendix 1. An Example of an Application Exercise

Mr. A is a 56 y/o male who is a long time patient at the family medicine clinic where you are the team of pharmacists. He is referred to you for smoking cessation and COPD management and education. He is complaining of chronic cough and shortness of breath, and uses his albuterol MDI daily.

PMH: COPD (hospitalized once last winter), hypertension, depression

Medications:

HCTZ 25 mg daily

Lisinopril 10 mg daily

Citalopram 20 mg daily

Tiotropium DPI once daily

Albuterol HFA MDI 2 puffs Q6H prn

Social history: cigarettes 1 ppd x 30 years, no illicit drugs, drinks socially.

During the interview, you ask if he is ready to quit smoking in the next 30 days. He responds, "Yes, this last stay in the hospital really scared me. I didn't smoke while I was in the hospital – they put a patch on me. But, when I got home and watched the game with my buddies, they were drinking beer and smoking like always. So, when one of them offered me a cigarette, I thought I would just have one, and next thing you know, I was back to my regular pack a day."

1. Which of the following regimens would you choose to assist with Mr. A's tobacco cessation?
 - A. Add bupropion
 - B. Discontinue citalopram and change to bupropion
 - C. Nicotine patch
 - D. Nicotine gum
2. If Mr. A had a history of a mild, localized rash from his nicotine patch in the hospital, which would you choose?
 - A. Add bupropion
 - B. Discontinue citalopram and change to bupropion
 - C. Nicotine patch
 - D. Nicotine gum
3. Regardless of your recommendations above, during a follow up visit two weeks later, Mr. A reports that he decided to use the nicotine patch. He is tolerating the patch and has only slipped up and smoked 2-3 times. He sometimes has strong cravings for a cigarette, especially when he is doing activities that he associates with smoking. (watching game with friends, first thing in the morning, sitting on the porch after dinner).
 - A. Add nicotine gum prn and continue patch with scheduled taper
 - B. Discontinue nicotine patch and change to nicotine gum 4 mg Q 1-2 hours prn cravings
 - C. Discontinue nicotine patch and change to nicotine lozenge 2 mg Q 1-2 hours prn cravings
 - D. Add bupropion 150 mg Q a.m. x 3, then 150 mg BID x 12 weeks.