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Impact of a Novel Education Curriculum on Surgical Training Within an Academic Training Program

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Background. **The training of the 21st century surgeon has become increasingly complex with the Accreditation Council for Graduate Medical Education (ACGME) core competency requirements and work-hour restrictions. Herein we report the two-year results of a novel problem-based learning education module at a large academic surgery program.**

Methods. **All data were prospectively collected from 2004 to 2006 on all categorical residents in the department of surgery ($n = 42$). Analysis was performed to identify any correlation between class attendance and American Board of Surgery In-Service Training Exam (ABSITE) score performance (percentile change). All data were reported as a mean with a standard error of the mean. Categorical variables were analyzed using a paired Student's *t*-test. A bivariate correlation was calculated using Spearman's ρ correlation.**

Results. **When comparing the 2004 scores (preprogram) to 2006 scores, there was significant score improvement ($P \leq 0.05$), with a mean increase of 8% on ABSITE scores across all classes. Furthermore, from 2005 to 2006, the mean ABSITE score was stable for all classes with no significant decrease ($P = 0.34$). Of note, the PGY-4 class had a significant improvement of 15% ($P \leq 0.05$). Bivariate analysis demonstrated a slight trend toward a significant relationship between class attendance and ABSITE score improvement, however, this did not reach statistical significance ($P = 0.15$).**

Conclusion. **A problem-based learning (PBL) based education program can successfully meet the educational goals of a surgical training program. Furthermore, this program has demonstrated consistent results with maintenance of score improvements through a two-year period.**

Key Words: **problem based learning; education; core competency; surgery training.**

INTRODUCTION

With the new mandates set forth by the Accreditation Council for Graduate Medical Education (ACGME) [1] and current work-hour restrictions, general surgery programs across the country have needed to address the training of surgical residents in the 21st century. This has resulted in an educational dilemma on how to train the next generation of surgical residents. The recent guidelines set forth by the American Surgical Association (ASA) [2] emphasized a broad restructuring of surgical training programs. In particular, the committee recommended a surgical curriculum that will provide the basic fundamentals of surgical knowledge and skills in a modular format that is able to assess competency.

In light of the changes proposed by the ASA, and to identify an improved teaching method that would increase resident participation and knowledge retention, we attempted to implement a new educational program to meet the ACGME core competency requirements in 2004. The program structure has been previously reported [3]; however, in brief, the one-year results demonstrated significant improvement in American Board of Surgery In-Service Training Exam (ABSITE) scores and also resident satisfaction with the new educational module. Herein, we report the updated two-year results and continued modifications of the surgical curriculum to meet the evolving needs of surgical training.

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METHODS AND MATERIALS

In 2006, the Baylor College of Medicine Department of Surgery had 42 categorical residents. These residents are spread across five clinical years and also a research track. The maximum number of categorical residents designated per postgraduate year class is eight. For this study, the score sets were compared from 2004 to 2006. Out of the 42 categorical residents, 27 had complete score sets for the two-year study period while 36 residents had complete score sets from 2005 to 2006.

Between 2004 and 2006, a comprehensive surgical education program was implemented within this academic surgery program. The education program is based on a problem-based learning (PBL) curriculum that focuses on the ACGME required core competencies. The curriculum includes weekly competence testing, electronic journal club, small animal laparoscopic laboratories, and a formal leadership training curriculum. Each PBL session is facilitated by one faculty member and a representative resident from each academic year, including residents in the research laboratory. The one-year results from this study have been previously described [3], and these results demonstrated a significant increase in ABSITE scores after implementation of the new curriculum. All data were collected in compliance with the Baylor College of Medicine Institutional Review Board.

Educational Module

The didactic portion of the educational program this year was modified from the use of multiple textbooks to only the *Schwartz Textbook of Surgery* [4]. Each week there is an assigned reading topic that is disseminated to faculty and residents at the four major teaching hospitals. There is a single curriculum that is established by the Surgery Education Office and the weekly topics are based on this curriculum. To further reinforce the topics of the week, the various hospitals have either resident presentations or didactic teaching that corresponds with the clinical relevance of the weekly topic. The residents are also kept abreast of the latest literature on the subject via an electronic journal club. The most recent or pertinent articles on the topic are attached to weekly quizzes, allowing for discussion of these articles, which are incorporated into the basic science reading. To insure that the residents have read the material prior to the class discussion, the weekly quiz is turned in before the class via e-mail. The quizzes are then reviewed in each small group with discussion of the assigned topic and articles. The most important aspect of the small group meetings is the discussion of the case scenarios, led by the surgical chief resident and facilitated by the assigned faculty member. The PBL class sessions are mandatory and there is a sign-in sheet that the residents must sign on a weekly basis. The residents are excused from all clinical duties during these sessions. In regards to enforcement of attendance, there are no direct consequences from poor class attendance; however, class attendance is addressed during the bi-yearly meeting with the program director.

Included in the academic curriculum is a formal leadership training program. Currently there is a didactic lecture series that focuses on leadership principles and the application of these principles for surgery teams. The course work is performed with the collaboration of faculty from the University of Texas School of Public Health. Outside guests (i.e., leaders in industry, community leaders, NASA astronauts) are also invited to address the residents on being effective leaders in a diverse social environment.

To assess the impact of the educational module, the 2006 ABSITE scores were collected and compared with the previous scores from 2004 and 2005. The reported ABSITE scores are reported as percentile rank when compared with the cohort of United States residents. Furthermore, a correlational analysis was performed to identify whether there was a significant relationship between class attendance and ABSITE score improvement.

Statistics

All data were calculated and reported as the mean with a standard error of the mean. Categorical variables were compared using a paired Student's *t*-test. Bivariate correlation was calculated using a Spearman's ρ correlation coefficient. Outliers were excluded if they were greater than two standard deviations from the mean value. A P value of less than or equal to 0.05 was considered statistically significant. Statistical analysis was calculated using SPSS version 11.0 (SPSS Corp., Chicago, IL) and Microsoft Excel (Microsoft Corp., Redmond, WA).

RESULTS

When comparing the 2004 scores (pre-program) with the 2006 scores, there were 27 residents with three complete score sets over the three years. The average score in 2004 was 52.7% ± 4.8% while for 2006 the score was 61.2% ± 4.2 (Table 1). Even though analysis of each individual class did not demonstrate a significant change in scores, each class did improve with a positive score change. Furthermore, when all classes were combined to form a larger sample size, the mean change across all classes was 8% with a P-value ≤ 0.05.

Between 2005 and 2006, there were 36 residents with complete score sets. In 2005, the average score for the 36 residents was 57.0% ± 4.5%, while the average score in 2006 was 60.6% ± 3.5%. The previous report by Nguyen *et al.* [3] demonstrated a significant increase at one-year postprogram implementation. These results from the 2005 to 2006 academic year would continue to support the role and success of this PBL based curriculum with stabilization and even a small increase in the average ABSITE scores ($P = 0.34$). In analyzing the effect of the educational curriculum by postgraduate year (Table 2) the PGY-4 class had the most dramatic increase in their ABSITE score tests from the previous year with a 15% increase in ABSITE scores ($P \leq 0.05$). All other PGY classes had stable ABSITE scores with no significant decrease in any class.

The correlation between ABSITE scores and PBL based attendance was also analyzed. Percent change in ABSITE scores from 2005 to 2006 were compared with the attendance of each surgical resident for the PBL

TABLE 1

American Board of Surgery In-Service Training Exam (ABSITE)

ABSITE score percentile change (2006 scores compared with 2004)

Postgraduate year class	% change	*P*-value
PGY-5	+14%	0.15
PGY-4	+7%	0.21
PGY-3	+7%	0.55
Research	+2%	0.95
Total class	+8%	0.05