

Curriculum Using the In-Situ Operating Room Setting

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OBJECTIVE: The American College of Surgeons/Association of Program Directors in Surgery is a comprehensive, simulation-based curriculum for General Surgery residents which exists in 3 phases. While phases 1 and 2 deal with core skills and advanced procedures respectively, phase 3 targets team-based skills. To date, the 3rd phase of this curriculum has not seen wide scale implementation. This is a pilot study to verify the feasibility of implementing the phase 3 curriculum in the in-situ setting.

DESIGN: In our initial attempt to implement Phase 3 at our institution, we chose to perform the training in an in-situ setting within an operating room (OR) at our main hospital, despite our having a separate simulation center. By choosing the in-situ OR environment for this training we were able to minimize concerns regarding resident and faculty availability and able to successfully complete 8 separate sessions during the academic year. During 7 sessions, 2 separate scenarios were performed while a single scenario was performed in 1 session. This single session was excluded from analysis, leaving a total of 14 scenarios to evaluate. The unique scenarios included laparoscopic crisis, postoperative myocardial infarction, anaphylaxis, and postoperative hypotension. All sessions were audiovisually recorded. In order to evaluate the effect of the training, the videos were viewed by 3 independent reviewers and all surgery, anesthesia and nursing participants were rated using the NOTECHs II scale. Degree of inter-rater agreement was established. The difference between the first and second simulations on the same day was then assessed. In addition, participant opinions of the simulations were assessed through electronic surveys following the training.

SETTING: Tertiary Care University Hospital.

PARTICIPANTS: We performed a total of 8 sessions, for a total of 15 scenarios. Eight surgery residents at the postgraduate year 1 (PGY1)-PGY3 level, 16 anesthesia residents at the PGY3-PGY4 level, 16 nurses and 13 ancillary staff participated.

RESULTS: From the first to the second scenario, the total team NOTECHs II score increased from 69.4 ± 1.4 to 77.3 ± 0.5 ($p = 0.007$). The NOTECHs II scores for each subteam also improved, from 24.2 ± 0.6 to 26.4 ± 0.5 ($p = 0.007$) for surgery residents, 23.7 ± 0.9 to 26.7 ± 0.4 ($p = 0.03$) for anesthesia, and 21.6 ± 0.3 to 24.3 ± 0.5 ($p = 0.01$) for nursing. The inter-rater reliability as measured by Kendall's coefficient of concordance was modest for the whole team score. Most of the participant responses were either favorable or strongly favorable.

CONCLUSION: The in-situ OR environment is both a unique and effective setting to perform team-based training. Furthermore, training in the in-situ setting minimizes or removes many of the logistic issues involved in designing and implementing team-based training curricula for general surgery residency programs. However, we found that administrative and departmental (surgery, anesthesia, and nursing) "buy in" as well as protected faculty time for education were all necessary for in-situ training to be successful. NOTECHs II is an established scale for the evaluation of teams in this simulation setting and appears to be a valid tool based on the results of this study. However, further assessment of inter-rater reliability as well as improved training of evaluators are necessary to determine if inter-rater reliability can improve. (J Surg Ed ■■■■-■■■. © 2017 Published by Elsevier Inc. on behalf of the Association of Program Directors in Surgery)

KEY WORDS: in-situ simulation, NOTECHs II, interpersonal skills, professionalism, APDS curriculum

COMPETENCIES: Practice Based Learning and Improvement, System Based Practice

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INTRODUCTION

Nontechnical skills are critical to safety in the operating room (OR), and have been demonstrated to significantly impact surgical outcomes.¹ Communication breakdowns have been repeatedly identified as a major cause of issues related to patient safety.^{2,3} In recent years, such concerns over patient safety have led to an increased emphasis on interdisciplinary and interprofessional teamwork skills during surgical training.⁴ During this same time period, simulation-based training has also increased in popularity as a means to provide technical and nontechnical skills training.⁵⁻⁷ Accordingly, the American College of Surgeons (ACS) and the Association of Program Directors in Surgery (APDS) have created a curriculum, which serves as a guideline for training surgery residents through simulation. While phases 1 and 2 deal with core skills and advanced procedures, respectively, phase 3 targets team-based skills.⁸ Specifically, phase 3 is a modular curriculum covering 10 scenarios in which cooperation between the team and a surgeon is necessary for a successful patient outcome. The third phase of the curriculum also includes suggestions on how to develop and implement simulated cases for resident team skills education and assessment.

By providing a controlled environment, phase 3 of the ACS/APDS Surgery Residents Skills curriculum plays an important role in the objective assessment of 3 of the critical core competencies set forth by the ACGME,⁴ namely communication and interpersonal skills, professionalism, and system-based practice. Since the training is conducted in a controlled, safe environment, it also allows for errors to be committed while giving the opportunity for remediation outside the realm of clinical care. Despite the availability of this fully developed and standardized curriculum it has not seen widespread implementation to date. There are many potential reasons for this including a lack of awareness regarding the existence of the curriculum, the cost of implementation, the lack of trained faculty, and perhaps most importantly the lack of protected faculty and resident time.^{4,5,9} Specifically for phase 3, program directors have identified the challenges related to coordinating team-based training as a major obstacle to its implementation.⁵ However with the increasing accumulation of evidence demonstrating the usefulness of team training as well as other nontechnical skills training, the attitudes regarding such training will need to change.¹⁰

We recently designed a practical way of implementing phase 3 of the ACS/APDS curriculum using an actual OR for team training. This in-situ environment was chosen for many reasons. Firstly, it obviates the need for a dedicated simulation center with its associated costs. Also, and more importantly, it increases resident and faculty availability because they are already on the site at the time of simulation. For these and more reasons, we believe that this training model will be useful for academic and

community surgery programs alike. In this paper, we present our experience to date with in-situ OR simulations and also present the resident/participant opinions on the usefulness of these simulations. As this was a pilot study of in-situ OR simulation training, we also chose to evaluate residents' nontechnical skills to gauge the usefulness of the training. To do this we used a well-established tool for evaluating teamwork, the NOTECHS II scale, and hoped to demonstrate the validity of this instrument for use in this setting.¹¹⁻¹⁴

METHODS

We performed 8 sessions of in-situ simulation with 7 of the sessions involving 2 scenarios and 1 session involving only 1 scenario. This single scenario was excluded from data analysis. In order to prevent disruption to the OR schedule and minimize indirect costs, all simulations were performed "first case" in the morning in an OR that is reserved for add on cases and which was unstaffed at the time of the simulations. This was done with the permission and support of both the surgery and anesthesia departments as well as perioperative services. All participants chosen to participate in the training were already scheduled to be on site the day of the training and were informed of the training at least a month ahead of time. There were a total of 53 participants: 8 general surgery residents at the postgraduate year 1 (PGY1)-PGY3 level, 16 anesthesia residents at the PGY3-PGY4 level, 16 circulating OR nurses, and 13 anesthesia technicians (Table 1).

During each session, participants were put into teams consisting of a surgical resident, 2 anesthesia residents, 2 circulating nurses, and 1 or 2 anesthesia technicians. Based on their particular session, participants were exposed to 1 or 2 of 4 distinct scenarios that were chosen because we felt they would maximize the need for proper teamwork and communication: rapid exsanguination, air embolus due to laparoscopic trocar, patient losing vitals while performing prone position surgery and postoperative myocardial infarction with hypotension following laparoscopic cholecystectomy. We utilized the SimMan 4G (Laerdel, NY) for all scenarios. All other equipment were the same as those used in a standard OR. Each scenario was followed by systematic debriefing using crisis resource management (CRM) techniques.¹⁵ Debriefing was performed by surgery and anesthesia faculty and an experienced simulation educator. It

TABLE 1. Participant Breakdown

Category	Number
General surgery residents	8
Anesthesia residents	16
OR nurses	16
Anesthesia technicians	13 (not included in evaluation)
Total	53

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