

Effect of Ongoing Assessment of Resident Operative Autonomy on the Operating Room Environment

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OBJECTIVE: We have previously demonstrated the feasibility and validity of a smartphone-based system called Procedural Autonomy and Supervision System (PASS), which uses the Zwisch autonomy scale to facilitate assessment of the operative performances of surgical residents and promote progressive autonomy. To determine whether the use of PASS in a general surgery residency program is associated with any negative consequences, we tested the null hypothesis that PASS implementation at our institution would not negatively affect resident or faculty satisfaction in the operating room (OR) nor increase mean OR times for cases performed together by residents and faculty.

METHODS: Mean OR times were obtained from the electronic medical record at Northwestern Memorial Hospital for the 20 procedures most commonly performed by faculty members with residents before and after PASS implementation. OR times were compared via two-sample *t*-test. The OR Educational Environment Measure tool was used to assess OR satisfaction with all clinically active general surgery residents ($n = 31$) and full-time general surgery faculty members ($n = 27$) before and after PASS implementation. Results were compared using the Mann-Whitney rank sum test.

RESULTS: A significant prolongation in mean OR time between control and study period was found for only 1 of the 20 operative procedures performed at least 20 times by participating faculty members with residents. Based on the overall survey score, no significant differences were found between resident and faculty responses to the OR Educational Environment Measure survey before and after PASS

implementation. When individual survey items were compared, while no differences were found with resident responses, differences were noted with faculty responses for 7 of the 35 items addressed although after Bonferroni correction none of these differences remained significant.

CONCLUSIONS: Our data suggest that PASS does not increase mean OR times for the most commonly performed procedures. Resident OR satisfaction did not significantly change during PASS implementation, whereas some changes in faculty satisfaction were noted suggesting that PASS implementation may have had some negative effect with them. Although the effect on faculty satisfaction clearly requires further investigation, our findings support that use of an autonomy-based OR performance assessment system such as PASS does not appear to have a major negative influence on OR times nor OR satisfaction. (J Surg Ed 1:■■■-■■■. © 2016 Association of Program Directors in Surgery. Published by Elsevier Inc. All rights reserved.)

KEY WORDS: graduate medical education, surgery, evaluation, autonomy

COMPETENCIES: Interpersonal Communication, Practice-Based Learning and Improvement

INTRODUCTION

There has been concern that general surgical residency programs are not adequately preparing their residents to operate as independent surgeons on graduation.^{1,2} Progression to operative autonomy with core procedures is arguably the single most important goal of surgical residency training. Factors that may impede the development of resident autonomy in the operating room (OR) include faculty

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concerns about maintaining excellent surgical outcomes while addressing administrative pressures for high procedural volumes.³⁻⁵ Currently, operative competence is determined by self-logged procedural numbers and aggregate faculty assessments based on recall. A real-time assessment system for resident operative performance would allow more reliable data to assess and guide the resident's progression toward operative competency. To be successful, this system must both provide valuable assessment data without requiring excessive time investment from the busy surgical faculty. We have previously demonstrated the validity of the Zwisch scale and the feasibility of using it as part of the Procedural Autonomy and Supervision System (PASS) for the assessment of intraoperative performance, deployed via smartphones directly after the finish of an operation.⁶

In the planning phases of PASS and before its implementation, feedback was sought from both faculty and residents at our institution and others. In this process, concerns were expressed by our faculty members and others that creating an operative performance assessment system that had resident autonomy as its primary focus may have unanticipated negative consequences including prolonging OR times and increasing tension in the OR between faculty and residents. Concerns were primarily based on the possibility that PASS would induce behavioral changes in the OR with both residents and faculty members that would lead to increased resident participation in more difficult parts of the operations that would increase faculty angst and prolong case duration. Therefore, this study sought to determine if, for cases performed involving both faculty and residents, implementation of PASS would significantly influence: (1) mean OR times or (2) faculty and resident satisfaction with the educational experience in the OR or both. We hypothesized that PASS implementation would not negatively affect OR times, nor faculty or resident OR satisfaction.

MATERIALS AND METHODS

Participants and Setting

All preliminary (PG1, $n = 6$) and categorical (PGY1, $n = 5$; PGY2, $n = 5$; PGY3, $n = 5$; PGY4, $n = 5$; PGY5, $n = 5$) general surgery residents who were clinically active at our primary teaching hospital, Northwestern Memorial Hospital, during the study period participated in this study ($n = 31$). All full-time general surgery faculty based at our primary teaching hospital who operate with our preliminary or categorical or both general surgery residents and agreed to use PASS participated ($n = 27$). This included faculty surgeons from several general surgery subspecialties (MIS, Trauma, Surg Onc, Endocrine, Colorectal, Vascular, Transplant, Thoracic, and private practice general surgeons) and with a broad range of experience. Overall, we were able

to generate PASS assessments for 92% of the OR procedures performed between our general surgery residents (prelim or categorical) and our participating general surgery faculty members (as defined earlier) during the study time period. With this study, we did not breakdown participation by each individual resident or faculty member. Although, we fully intend to explore variability in assessment scores based on faculty variables (i.e., age, sex, subspecialty, years of experience, etc.) in future studies that was beyond the scope of the current study. All faculty members and residents participating in the study underwent frame-of-reference training to ensure the Zwisch scale was used consistently and the smartphone-based PASS system was used correctly. The study period was defined as December 1, 2012 through June 30, 2013. All data pertaining to individual resident performance were kept confidential and accessible only to the principal investigators and study coordinators.

Design

The Zwisch scale of progressive autonomy is a 4-level scale of operative autonomy.⁷ The first level is "Show and Tell," in which the faculty general surgeon performs critical portions of the operation while explaining the operation and thought process to the surgical resident, who is essentially observing and assisting, but may participate on noncritical portions. The second level is "Active Help," in which the resident performs some portions of the operation, with active guidance from the faculty, who may take over as needed for difficult portions of the operation. The third level is "Passive Help," in which the resident is performing most critical portions of the operation with the faculty assisting but providing guidance only when requested or required for patient safety. The final level is "Supervision Only," in which the resident is the primary surgeon who safely performs most critical portions of the procedure with help from junior resident or OR staff as first assistant. The faculty silently supervises, but does not assist surgically nor provide significant guidance unless requested by the resident or required for patient safety (Fig. 1).

With PASS, on completion of the OR procedure, a text message is automatically sent to the faculty member's smartphone identifying the resident's name, procedure title, date, and time. After acknowledging their participation in the case, the faculty member is first prompted to rank the resident as 1 of the 4 levels discussed earlier on the Zwisch scale. Next, the faculty member must define the difficulty level of the procedure when compared with their previous experiences with the very same procedure or with other procedures of a similar nature. For this, they must define the case as ranking among the "Easiest 1/3," "Middle 1/3," or "Most difficult 1/3" of procedures of this type they have ever performed (Fig. 2).

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