Defining the Autonomy Gap: When Expectations Do Not Meet Reality in the Operating Room

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OBJECTIVE: To develop operative independence with essential procedures by the end of their training, residents need graded autonomy as they progress through training. This study compares autonomy expectations, as defined by faculty and residents, with autonomy measured in the operating room.

METHODS: Operative procedures performed by general surgery residents between November 2012 and June 2013 were each assigned an autonomy score by the operating attending physician using a previously described rating scale (Zwisch). Scores range from minimum autonomy, "show and tell," to maximum autonomy, "supervision only." Autonomy expectations were defined by a survey asking faculty and residents what autonomy-level residents should achieve during each year of training for each of the 10 most commonly performed procedures. Faculty expectations, resident expectations, and actual operating room autonomy data were compared using analysis of variance with post hoc analysis by Tukey honestly significant difference test.

RESULTS: A total of 1467 operative cases were scored using the Zwisch scale over the period of the study. The 10 most common procedures accounted for 56.3% (827) of the cases. Resident and faculty expectations of resident operative autonomy were similar. For only laparoscopic cholecystectomy, residents expected significantly more autonomy than the faculty did during the junior years but they agreed with the faculty for the chief year. When expectations were compared with actual performance, the resident autonomy level achieved was significantly less than that expected by residents or faculty or both for all 10 procedures in at least one postgraduate level. For every procedure performed more than 5 times during the study period by postgraduate years 3 to 5 residents, autonomy was significantly less than expected.

CONCLUSIONS: Surgical faculty and residents had similar expectations for resident operative autonomy, yet actual resident performance failed to achieve those shared expectations for even the most common procedures. This autonomy gap provides more evidence for concerns about the preparedness of graduating residents for independent practice. (J Surg 71:e64-e72. © 2014 Association of Program Directors in Surgery. Published by Elsevier Inc. All rights reserved.)

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

COMPETENCIES: Patient Care, Medical Knowledge, Practice-Based Learning and Improvement

INTRODUCTION

To optimize patient safety, it is incumbent on surgical residency training programs to graduate residents who are competent to independently care for patients at the completion of their training. Currently, competency is assessed by the American Board of Surgery by 3 methods: (a) written examination, (b) oral examination, and (c) summative assessment by the program director.[1] The written examination is designed to test primarily medical knowledge and decision making in the form of multiple-choice questions. The oral examination is designed to test some basic knowledge but primarily problem-solving skills and ability to make safe decisions in challenging situations. The summative assessment documents the resident's ability to technically operate and care for patients in a real-world setting. The summative evaluation is usually based on rotation evaluations and personal experience with the resident and is a subjective summary of 5 years of clinical training in a few short paragraphs signed by the program director.

Objective data about the operations performed by residents during their training are currently obtained using the Accreditation Council on Graduate Medical Education's electronic operative logs. From a list of more than 300 types

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of operative cases, surgical residents self-report the frequency with which they perform specific operations throughout their 5 years of training. Bell et al.[2] asked general surgery program directors to review this list of operations and designate those that are essential for practice in general surgery. The program directors selected 121 of these procedures as those which a resident should be able to perform independently by the completion of their training. The authors then compared this list to the number of actual procedures logged by graduating chief residents. Only 18 of the 121 procedures were performed more than 10 times during training by the average graduating resident. In fact, for 63 of the procedures, the most commonly reported frequency was zero. Even more important is that the operative logs include no indication of how much of the case the resident performed other than the broadly stated "significant portions of the procedure" or how much help from the attending surgeon was required for safe completion.

The first mandate for detailed assessment of specific procedural competency was introduced by the American Board of Surgery in 2012.[3] The Board now requires each candidate for the qualifying examination to have written evaluations of 2 operative procedures performed by the program director or other faculty members over the course of their training. This is planned to increase to 6 cases for residents completing their training starting in the 2015 to 2016 academic year.[3] However, this provides documented evidence for a small sample of the more than 750 operative cases a resident performs during training.

Bhatti and Cummings[4] recommended a series of steps for continuous assessment of surgical competency that covered the continuum from resident selection to outcomes-based evaluation in practice. In addition to the standard written examinations and certification of judgmental competency by the program director and independent oral examiners, they noted a need to specifically evaluate procedural competency for specialty-specific index procedures. It is intuitive that, to determine if a resident is capable of safely performing an operation independently, they must be observed during independent operating experiences. In an era with multiple competing demands on academic faculty, including productivity requirements, pressures to improve operating room efficiency, and legal stressors, it is increasingly difficult to allow residents to work through procedures with limited assistance. Yet this elusive operative autonomy is not only important for evaluation purposes; procedural autonomy during training has been shown to be strongly associated with residents' confidence in their abilities and even affects the type of procedures they plan to perform in practice.[5]

We have previously described a 4-step scale (the Zwisch scale) that can be used on a daily basis to document the amount of assistance required by a resident to successfully complete each case in the operating room.[6] The amount of assistance required is an approximation of how capable the resident is to complete the operation autonomously. Operative autonomy is not an all-or-nothing event, the resident does not wake up one morning as an independent surgeon. Therefore, autonomy must be measured over time and in multiple different situations. To develop operative autonomy with essential procedures by the end of their training, residents need to achieve graded autonomy as they progress through training. As we begin to measure autonomy, for each level of training, it is important to establish progressive autonomy goals that are understood by faculty and residents. This study asks faculty and residents from a single institution to define goals for autonomy at each level of training for a selection of commonly performed general surgical procedures and compares these goals to actual autonomy measured in the operating room.

METHODS

Setting

All data were collected from a single tertiary care university medical center. The protocol was approved by the institutional review board and all faculty and residents consented to participation.

Zwisch Scale

The Zwisch scale is designed to measure the amount of operative supervision and assistance the attending physician must provide for a resident to safely perform a given operative procedure.[6] It is a 4-point scale describing the level of guidance provided by the attending physician during most of the procedure. The first level of the scale is "show and tell." This describes the maximum amount of attending physician's assistance. At this level, the attending physician demonstrates (shows) the essential maneuvers of the operation and describes (tells) their technical motions and thought processes to the assisting resident. The resident should be actively assisting the procedure and beginning to anticipate questions and next steps. Once the resident understands the steps of the operation and is beginning to perform the basic technical maneuvers, albeit with significant assistance, they are ready to move to the next level, "active help." At "active help," the resident is performing the technical skills under the direct guidance of the attending surgeon. The surgeon arranges exposure and retraction and guides the resident through the technical maneuvers both verbally and physically. During "active help," the attending physician is the leader and the resident follows. The resident is ready to move to the next level, "passive help," when less support is required to perform the steps and the resident begins to initiate transitions from one step to the next. At "passive help," the roles reverse. Now the resident is the leader in setting the flow of the operation, and the attending physician follows the lead and directions

of the resident. The attending physician–level help is still required to optimize exposure and retraction, improve efficiency, progress through the steps of the operation, and confirm intraoperative decisions. "Passive help" is a difficult level for the attending physician, as they need to relinquish the leadership role while still providing high-level assistance to ensure the case runs smoothly. The final level is "supervision only" where the resident is now able to safely accomplish the operation with only supervision or oversight and fine-tuning from the attending physician. The assistant in this situation is often a junior resident or medical student such that the operating resident now takes over the responsibility for setting up the exposure and directing the less experienced assistant in how to best facilitate the operation. This level mimics independent practice and represents the ideal goal of training.

The Zwisch scale can be applied to any operation. Zwisch scores vary depending on the complexity of the procedure, with residents performing more common straightforward procedures at higher Zwisch levels and more complex subspecialty procedures at lower Zwisch levels. Other factors that affect Zwisch score include the resident's prior experience, intrinsic technical skills, and familiarity with the specific or similar operation. Repeatedly scoring a specific resident performing a specific procedure then generates a performance curve for that resident with that procedure and can be used to measure and document progress in operative independence.

All faculty and residents participating in this study underwent frame-of-reference training for using the Zwisch scale to rate operative performance. This consisted of a discussion of the levels of the scale including key behaviors associated with each level and cues that the resident is ready to move to the next level for a given operation. Simulated video examples of each level were shown and discussed. Each resident and faculty surgeon then took an audience response system–based quiz to identify the correct level for 10 actual operating room cases. If there was variation in responses, a discussion of the appropriate level for a given scenario followed.[7] After completing this training, participant interrater reliability was excellent when grading example videos of actual operations using the Zwisch scale.

Zwisch Scoring of Operative Procedures

Operative evaluation data were collected between November 2012 and June 2013. Each time a participating attending surgeon and resident worked together in the operating rooms, a text message was automatically sent to the attending surgeon by the operating room computer system at the completion of the procedure. The surgeon was directed by a single link to a smart phone–accessible evaluation system and asked to input which of the Zwisch levels described the amount of attending physician's help the resident required for the safe completion of that operation. Data including resident name, faculty name, procedure date and time, evaluation date and time, and name of procedure were automatically collected from the operating room computerized database.

Autonomy Expectations Survey

The evaluation database was queried to identify the most common operative procedures done by the faculty involved in this study; the 10 most common procedures were identified. All faculty and residents who participated in the frame-of-reference training were asked to complete an anonymous survey. For each of the 10 procedures, they were asked to describe what Zwisch level they thought residents should achieve at each level of training (postgraduate year [PGY] 1-5). This generates two 5-step expected performance curves for each operation, one based on faculty opinions and another based on resident opinions.

Statistical Analysis

For each procedure and PGY level, faculty expectations, resident expectations, and actual operating room evaluation data were compared using analysis of variance with post hoc analysis by the Tukey honestly significant difference test. When a procedure was performed by fewer than 5 residents in a given year of training, that year was dropped from the analysis. A $p < 0.05$ was considered significant.

RESULTS

Operative Procedures

A total of 27 faculty and 31 residents in the Department of Surgery underwent frame-of-reference training to learn to use the Zwisch scale to rate operative supervision. Over the 8 months of the study, 1467 operative cases were performed by a Zwisch-trained resident and surgeon and scored using the Zwisch scale. All trained residents were evaluated at least once. Faculty response to the text message prompts was excellent, with 92% of evaluations completed. The 10 most common types of procedures performed are shown in Table 1. Exploratory laparotomy was originally one of the 10 most common procedure types. However, it was dropped from the analysis and replaced with the next most common procedure, umbilical hernia repair, because of the wide variety of operations that could be included under the generic umbrella term of exploratory laparotomy. Together, these 10 types of cases accounted for 827 of the 1467 total cases (56.3%) performed by participating faculty and residents during the study period. For 19 of those cases, the supervising faculty member declined to evaluate the resident. Discussion with faculty participating in the study revealed that this was most commonly owing to the resident only being present for a small portion of the case or

TABLE 1. The 10 Most Commonly Performed Procedures by Residents and Faculty Participating in the Study

Procedure	Number Performed	Percentage of Total Procedures	Percentage of Top 10 Procedures
Laparoscopic cholecystectomy	205	13.9	25.3
Laparoscopic appendectomy	147	10.0	18.1
Open inguinal hernia	99	6.7	12.2
Wide local excision melanoma	92	6.2	11.3
Morbid obesity procedures	57	3.9	7.1
Hemorrhoidectomy	48	3.3	5.9
Thyroidectomy/parathyroidectomy	43	2.9	5.3
Laparoscopic partial colectomy	43	2.9	5.3
Simple excision soft tissue mass	38	2.6	4.7
Umbilical hernia	36	2.4	4.5
Total	808	54.9	100

observing the case rather than participating. This left 808 cases for analysis.

The 10 most common procedures are all included in the curriculum developed by the Surgical Council on Resident Education (SCORE).[8] Of the 10 procedures, 8 are listed as "essential-common" in SCORE, which is defined as frequently performed operations in general surgery in which specific procedural competency is required by the end of training. These operations are felt to be done commonly enough that procedural volume in all institutions should provide sufficient experience. Wide local excision of melanoma is listed as "essential-uncommon" in SCORE, which describes operations seen in general surgery practice but often not done in large numbers by trainees. Specific procedural competency is required but often cannot be obtained by case volume alone. Laparoscopic procedures for morbid obesity are a SCORE "complex" procedure in which generic experience is required but not specific procedural competence. Some training programs may provide enough experience to develop competence. Translating from the SCORE description to the Zwisch scale, this would mean that residents should reach the highest level, "supervision only," for 9 of these 10 procedures.

Expected Performance Curves

Surveys were completed by 31 of 36 faculty (86%) and 22 of 31 residents (71%) trained to use the Zwisch system. For 7 of the 10 procedures (open inguinal hernia repair, laparoscopic appendectomy, local excision of subcutaneous soft tissue mass, hemorrhoidectomy, umbilical hernia repair, wide local excision of melanoma, and laparoscopic cholecystectomy) faculty and residents both unanimously agreed that the SCORE target of "supervision only" by graduation was appropriate. For 6 of those 7 procedures, the learning curves expected by the faculty and residents were not different. As an example, the expected learning curves for wide local excision of melanoma are shown in Figure 1. The only procedure where there were significant differences in the expected learning curves between the faculty and residents was laparoscopic cholecystectomy. For this procedure, residents expected they would require less supervision than the faculty did at the junior levels of training and these differences were significant at the PGY 1 and PGY 4 levels (Fig. 2). All participants did expect graduates to be able to perform laparoscopic cholecystectomy with supervision only at the PGY 5 level.

For 3 of the procedures studied, both faculty and residents disagreed with the SCORE expectation of independence by graduation. For laparoscopic partial colectomy, which is a SCORE essential-common procedure both faculty and residents agreed that an appropriate target was between "passive help" and "supervision only," suggesting that for straightforward patients, the residents may be able to complete the procedure independently but were likely to need some senior-level assistance for many patients (Fig. 3A). A similar picture was seen for thyroidectomy and parathyroidectomy, which are also SCORE essential-common procedures (Fig. 3B). For morbid obesity procedures, designated as complex by SCORE, both faculty and

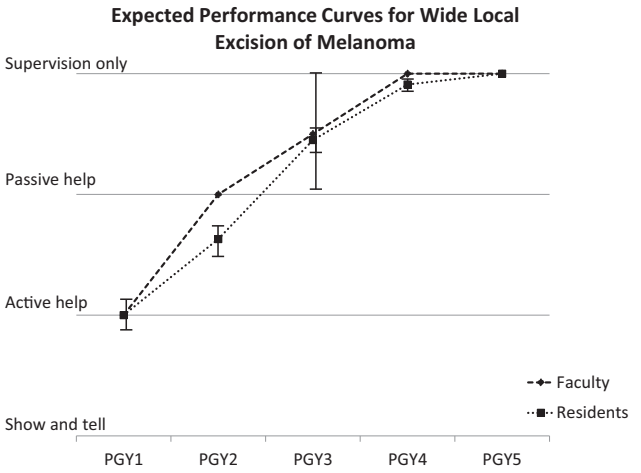

FIGURE 1. Expected performance curves as predicted by the faculty (dashed line) and the residents (dotted line) for wide local excision of melanoma. There are no significant differences between faculty and resident expectations.

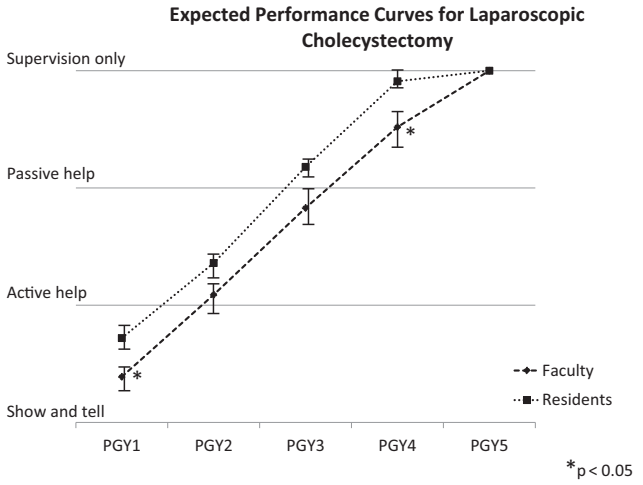

FIGURE 2. Expected performance curves as predicted by the faculty (dashed line) and the residents (dotted line) for laparoscopic cholecystectomy. Faculty expectations were significantly lower than residents expectations at the PGY 1 and PGY 4 levels.

residents agreed that residents should reach passive help by graduation (Fig. 3C).

Actual Operative Performance

When the expectations were compared with actual performance, all 10 procedures had at least 1 postgraduate level where the resident autonomy level achieved was significantly less than that expected by the residents or the faculty or both, creating an autonomy gap. Of the study procedures (laparoscopic cholecystectomy, laparoscopic appendectomy, open inguinal hernia repair, morbid obesity procedures, hemorrhoidectomy, and laparoscopic partial colectomy) 6 were performed more than 5 times by chief residents during the study period. For each of them, the actual mean Zwisch score in the chief resident year was significantly less than that expected by the faculty and residents (Table 2). In fact, for every procedure performed more than 5 times during the study period by PGY 3, 4, or 5 residents, autonomy was significantly less than expected (Table 2). Figure 4 shows an example of this autonomy gap for laparoscopic appendectomy, which is a common straightforward procedure performed by residents at all levels. When looking at more complex procedures such as a laparoscopic partial colectomy, the gap becomes even more pronounced (Fig. 5).

DISCUSSION

Concerns have been raised that residents are not prepared to operate independently at graduation, whether they are planning to enter practice or proceed onward to advanced fellowship training.[9] This concern comes not only from the faculty but also from the residents themselves.[10] Although

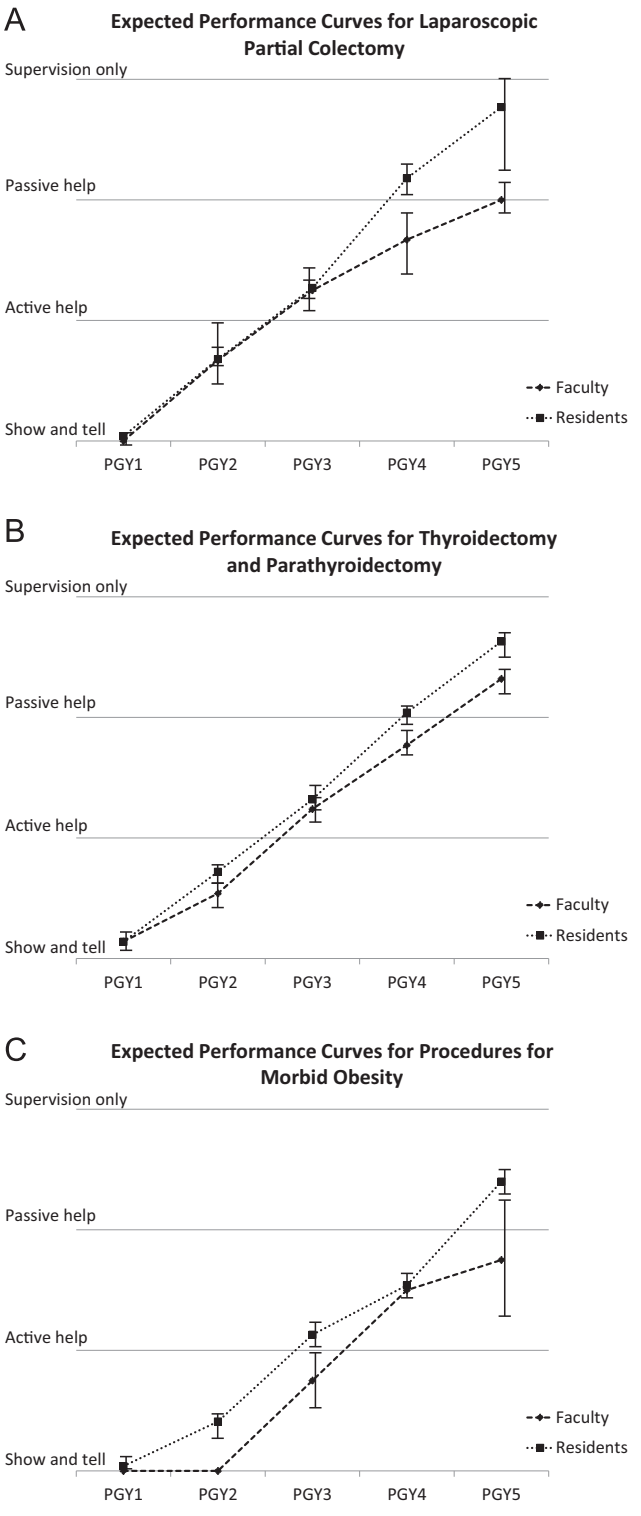

FIGURE 3. Expected performance curves as predicted by the faculty (dashed line) and the residents (dotted line) for (A) laparoscopic partial colectomy, (B) thyroidectomy and parathyroidectomy, and (C) procedures for morbid obesity. There are no significant differences between faculty and resident expectations.

TABLE 2. Expected and Actual Operative Autonomy at the PGY 3, 4, and 5 Levels for Each of the Study Procedures Performed by Residents at These Levels More Than 5 Times During the Study Period. Zwisch Scores Are Scored as 1= "Show and Tell", 2 = "Active Help", 3= "Passive Help", and 4 = "Supervision Only"

Procedure	Expected Zwisch Score (Mean ± Standard Deviation)	Actual Zwisch Score (Mean ± Standard Deviation)	p Value
Laparoscopic cholecystectomy			
PGY 3	3.18 + 0.39	2.20 + 0.71	<0.001
PGY 4	3.91 + 0.29	2.77 + 0.61	<0.001
PGY 5	4.00 ± 0.0	3.42 ± 0.66	<0.001
Laparoscopic appendectomy			
PGY 3	3.32 + 0.48	2.55 + 1.12	0.011
PGY 4	3.95 + 0.21	3.30 + 0.77	<0.001
PGY 5	4.00 ± 0.0	3.51 ± 0.66	<0.001
Open inguinal hernia			
PGY 3	3.27 + 0.45	2.71 + 0.49	0.05
PGY 4	3.82 + 0.39	<5 Performed	
PGY 5	4.00 ± 0.0	3.00 ± 0.74	<0.001
Wide local excision melanoma			
PGY 3	3.45 + 0.51	2.55 + 0.57	
PGY 4	3.91 + 0.29	<5 Performed	
PGY 5	4.00 ± 0.0	3.17 ± 0.63	<0.001
Morbid obesity procedures			
PGY 3	2.13 + 0.56	<5 Performed	
PGY 4	2.54 + 0.51	<5 Performed	
PGY 5	3.41 ± 0.50	2.40 ± 0.57	<0.001
Hemorrhoidectomy			
PGY 3	3.19 + 0.73	2.56 + 0.85	0013
PGY 4	3.82 + 0.39	2.60 + 0.84	<0.001
PGY 5	4.00 + 0.0	<5 performed	
Thyroidectomy/parathyroidectomy			
PGY 3	2.32 + 0.48	1.63 + 0.66	<0.001
PGY 4	3.04 + 0.37	<5 Performed	
PGY 5	3.64 + 0.49	<5 Performed	
Laparoscopic partial colectomy			
PGY 3	2.27 + 0.46	1.31 + 0.48	<0.001
PGY 4	3.18 + 0.39	2.11 + 0.60	<0.001
PGY 5	3.77 ± 0.42	2.77 ± 0.20	<0.001

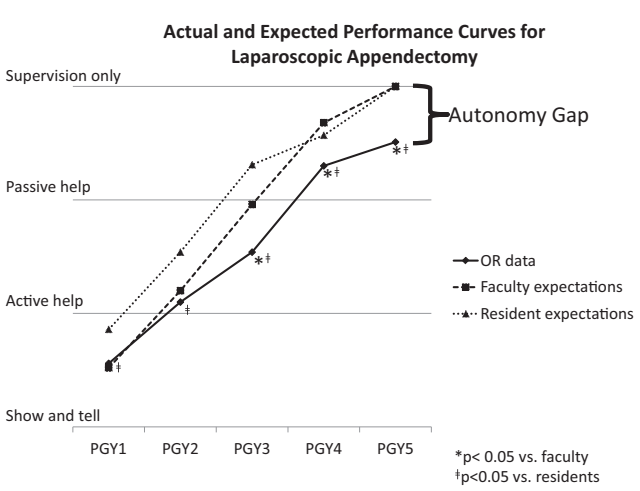

FIGURE 4. Actual and expected performance curves for laparoscopic appendectomy demonstrating a small autonomy gap.

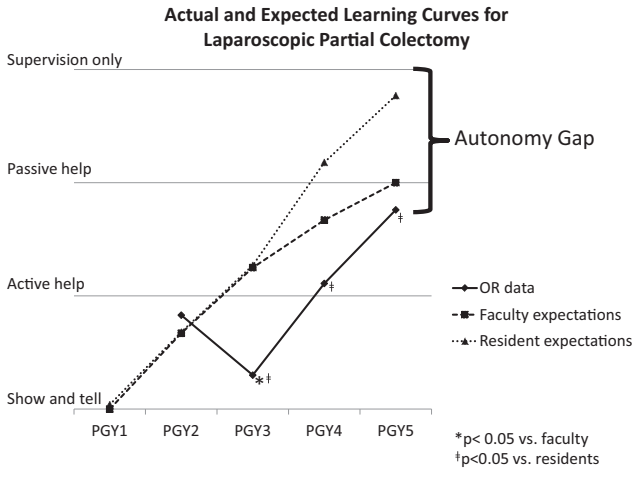

FIGURE 5. Actual and expected performance curves for laparoscopic partial colectomy showing a large autonomy gap from the actual PGY 5-measured autonomy to the SCORE standard of "supervision only."

SCORE is very thorough in setting a final target for procedural competency by graduation, it does not address how much practice might be needed to achieve competency. If deficiencies in a given resident's operative skills are only recognized as they approach graduation, opportunities for remediation would have been missed. This study provides a blueprint for stepwise, procedure-specific performance curves that should be expected of residents as they progress through training. For most of the procedures studied, both the residents and the faculty agreed that the SCORE goal of "supervision only" by graduation was appropriate. Although there were small differences between faculty and resident perceptions of appropriate autonomy, for the most part, the differences were insignificant. In our institution, these performance curves will become a framework for measuring progress through our residency program and serve as reference points for evaluating milestones. It is important to note that performance curves will vary by institution related to the volume of specific procedures and the level of training at which residents perform them.

Despite residents and faculty having similar expectations at our institution, actual autonomy in the operating room did not meet these expectations. The most pronounced gaps were identified in more complex procedures such as morbid obesity surgery and laparoscopic partial colectomy, fields where advanced fellowship training is common. Frighteningly, there were also significant gaps observed in very basic procedures such as laparoscopic cholecystectomy and open inguinal hernia repair. Identifying the cause for these gaps is critical. One potential source is a decrease in the overall operative experience of residents. We, as educators, need to become more efficient at optimizing operative experiences. This may take the form of ensuring residents are more prepared before they enter the operating room by using focused curricula targeting specific operations or directed simulation experience so that they are starting from a knowledge base higher than their predecessors. We also need to focus on developing skills early such that residents are capable of progressive autonomy. This is especially critical as more restrictive work-hour regulations such as the 16-hour rule for interns come into effect. This has been shown to significantly limit intern operative experience.[11]

Factors Affecting Autonomy

The performance curve for surgery is not a smooth line with each case requiring less supervision than the previous. On any given day, the amount of assistance and supervision a resident requires depends on factors related to the resident, the supervising surgeon, the nature of the tasks and the circumstances surrounding the operation.[12] Resident factors include level of training, previous experience with the specific or similar procedures, previous experience with the supervising surgeon, communication skills, and self-confidence. These are the factors over which the resident has some control. The first step toward enhancing autonomy is preoperative preparation and communication of that preparation to the supervising surgeon. Although residents and faculty agree that preoperative preparation is important, their perceptions of what constitutes adequate preparation are often different. Rose et al.[13] asked faculty and residents at their institution to evaluate how adequate preoperative preparation was with respect to reading about the procedure, anatomy review, and discussion with the supervising surgeon. Residents felt they were significantly more prepared than the faculty did, especially with respect to preoperative reading and reviewing pertinent anatomy. Agnew and Dumanian[14] asked junior residents performing their first carpal tunnel operation to read about the operation from a set of textbook chapters available in the resident library. They then asked the residents to draw their planned incision at the start of the operation. Despite all residents reading the same material, there was significant variability between marked incisions. These difficulties in translation can be exacerbated by variability in descriptions and explanations between textbooks.

Another cause may be differences in what faculty and residents consider important knowledge for preoperative preparation. Pernar et al.[15] demonstrated that residents have fewer learning goals for a procedure and are often centered on the technical aspects of performing the operation. Conversely, faculty have many more goals for each operative teaching encounter and those very commonly include preoperative and postoperative decision making, topics which the residents felt were unimportant. Pugh et al.[16] surveyed residents and faculty to identify their perceptions of important learning needs. Faculty most commonly identified anatomy, natural history of the disease, patient outcomes, and procedure choices. Residents identified instrument use and selection, suture selection, and operative field exposure. In fact, those topics most important to faculty were identified as least important by residents.

We have to also recognize that surgeons are human and other considerations may limit even the best of intentions to allow autonomy. More experienced surgeons may be more confident in their ability to prevent a major error while supervising or recover from an error created by a resident. It is clear that not all operations are of equivalent difficulty and the potential consequences of errors and the baseline condition of the patient are important factors. External circumstances that may enhance or limit autonomy include legal issues and the presence of competing tasks. Stephens et al.[17] surveyed cardiothoracic residents, program directors, and cardiothoracic chairpersons and found that 73% of residents and 56% of faculty felt that increased scrutiny of outcomes adversely affected the amount of autonomy given to residents. Sterkenburg et al.[12] showed among anesthesia residents that competing responsibilities and proximity significantly affected autonomy. The need to more closely

supervise another room led to enhanced autonomy as did physical distance. If the faculty member was nearby, they were more likely to allow less autonomy; however, if they would need to come in from home more autonomy was often given. Lastly, the amount of trust faculty members have for a given resident is impeded when there is insufficient exposure. The faculty/resident ratio should be considered to ensure faculty members have enough time with each resident to build trust and understand capabilities. It is difficult to give autonomy to a resident with whom one is not familiar. The length of rotations and the total number of clinical faculty also require scrutiny. It would be interesting to survey surgery faculty on a national or even global scale to learn what Zwisch levels should be achieved by each PGY and by graduation to help guide rotation duration and operative assignments.

Potential Solutions

Recognizing the many sources of the autonomy gap, we need to develop strategies to decrease it. One way to address this disconnect is to enhance early operative exposure; providing interns with more experience in basic situations may help them overcome the hurdles of understanding instrument selection and use and suture selection earlier so they can focus on the more complex issues. In fact, the American Board of Surgery will begin a requirement for residents to perform at least 250 cases during their first 2 years in 2014 to 2015 to encourage improvement of the early operative experience.[18]

Preoperative preparation is major contributor to the amount of autonomy given to a resident in the operating room. Strategies to improve both the amount and content of the preparation may help. This could include something as simple as assigning cases in advance. Pernar et al.[15] noted that residents who were assigned to a case the same day articulated fewer learning goals overall and 30% did not identify any learning goals at all. Another method to improve preoperative preparation is to clearly define the supervising surgeon's learning goals for the resident. This may mean a discussion about a common operation early in the rotation so the residents understand the key clinical issues. It could also include a focused set of readings and technical videos with learning objectives assigned at the beginning of the rotation. Roberts et al.[19] described the briefing, intraoperative teaching, debriefing system (BID) as a method to enhance intraoperative learning. The briefing component is a discussion between the resident and the supervising surgeon. It includes setting learning goals, identifying what the surgeon considers the key decisions and knowledge related to the procedure, and setting expectations for the resident's role. If this briefing discussion is held the day before surgery, the resident has the opportunity to prepare more appropriately, knowing what the faculty member considers to be most important.

Intraoperative teaching can focus on autonomy while still maintaining the flow of the operation. Setting expectations allows a focus on autonomy for specific portions of the operation without dramatically affecting case length and operative efficiency. This is especially important with less experienced residents. It is useful to involve the resident in this thought process as well, soliciting their opinion on what portions of the operation they would prefer to focus on. Faculty development may also help with the autonomy gap. The faculty do not typically get trained on how to teach or supervise in the operating room. Our experience with a half-day retreat on Teaching and Supervising in the Operating Room was very well attended with faculty fully engaged in wanting to know how to improve their teaching and assessment skills in the operating room.

Perhaps the most important and least commonly used way to improve autonomy is the provision of specific feedback to the resident at the completion of the procedure in a structured debriefing. This is where the faculty member guides the resident to reflect on what they have learned from this procedure. By reviewing the resident's perceptions, the surgeon helps the resident identify underlying principles and concepts that can be applied to many situations. Debriefing can also focus on why and how errors happened, so that they are less likely to be repeated.[19]

Limitations

The major limitation of this study is that it represents the perceptions and experience of a single institution. Resident comfort levels with procedures are often related to volume and timing of exposure. Programs with more cases of specific types and rotations on specialty services at different levels may develop comfort with different operations. For example, at our institution, endocrine surgery is uncommonly performed after the third PGY. Therefore, our residents may be less likely to reach competency at thyroidectomy and parathyroidectomy than those who do a dedicated endocrine rotation in their chief year. This study would benefit from being repeated in multiple institutions to accurately measure nationwide trends.

CONCLUSIONS

This study demonstrates that an autonomy gap exists between expectations of procedural autonomy for residents and what actually occurs in the operating room. This gap is not only present for the most complex procedures but also includes basic procedures commonly performed in practice. There are significant implications of this autonomy gap with respect to patient safety as these residents enter practice. It would be valuable for other institutions to perform this type of analysis in their own programs as a way of identifying strengths and gaps in their graduating residents.

Identification of the appropriate degree of autonomy for common procedures at each level of training will facilitate early identification and remediation of struggling residents. Autonomy gap analysis can be repeated at regular intervals as well to track the effects of changes in the resident curriculum. Additional research is needed to explore barriers to resident operative autonomy.

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