Residents’ self-reported learning needs for intraoperative knowledge: are we missing the bar?

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The surgical profession has changed drastically over the past 20 years. New procedures and more advanced diagnostic and treatment regimens top the list of occurrences that have changed the face of surgery. From a training perspective, it is widely known that today’s residents are taking care of sicker patients and performing more complex surgeries compared with trainees in previous decades. Along with the increase in case complexity there is growing concern that residents are not getting enough experience with bread and butter general surgery cases.1,2 Although there is a paucity of objective evidence showing a decline in residents’ surgical knowledge, the American Board of Surgery and program directors have expressed concerns about residents’ readiness to enter practice after 5 years of training.1

In our previous work, we compared faculty and resident perceptions of resident learning needs in the operating room.3 Our results showed a significant gap between faculty
and resident perceptions. More than 65% of residents (at all levels postgraduate year [PGY]1–5) indicated that they felt unprepared for instrument use/selection and suture selection, whereas less than 30% indicated anatomy, patient outcomes, and natural history of disease. In contrast, more than 70% of faculty indicated residents were unprepared for anatomy, patient outcomes, and natural history of disease. Less than 43% of faculty indicated residents were unprepared for instrument use/selection and suture selection.

We have since collected additional resident data using our previously validated survey. The purpose of this study was to compare the intraoperative learning needs and educational resource use of junior and senior residents. Our goal was to gain a better understanding of the progression in learning needs when comparing junior and senior residents. Outcomes of this research will facilitate development of customized skills curricula geared toward specific resident training levels.

**Methods**

**Participants**

Participants for this study included resident volunteers attending the 90th Annual American College of Surgeons’ Clinical Congress Meeting and residents from our program at Northwestern (n = 125). Our program has approximately 68 residents per year and graduate 5 categorical chief residents each year. There are 9 major divisions in the Department of Surgery and there are 6 fellowship programs.

**Materials**

A previously validated, 27-item survey was used. This three-part survey queried residents regarding: (1) the extent to which traditional learning resources (texts, journals and videos) are used when preparing for cases in the operating room; (2) the extent to which web-based resources are used when preparing for cases in the operating room and (3) various operative management topics in which they felt poorly prepared.

**Procedure**

At the American College of Surgeons meeting, participants were recruited by verbal solicitation to an exhibit booth in the main exhibit hall near the scientific posters. Details of our data collection procedures in this venue have been described previously. Participants from our program completed the survey, in person, at the start of a weekly PGY-1 lecture. The survey was administered in the month of August to 2 consecutive-year PGY-1 groups. The first administration (year 1) yielded 18 participant surveys. The second administration (year 2) yielded 14 participant surveys. PGY-1 participants included categorical, preliminary and designated preliminary residents.

**Data analysis**

Data were analyzed using descriptive and comparative statistics including the Mann–Whitney U test and chi-square analysis. The goal of our analysis was to compare chief resident (PGY-5) and intern level (PGY-1) responses. This comparison would help us to understand the differences in learning needs when comparing junior and senior residents.

**Results**

**Participants**

The survey was completed by 125 residents, 93 from the Clinical Congress meeting and 32 from our program. Clinical Congress residents included the following training levels 5 PGY-2, 13 PGY-3, 23 PGY-4, 39 PGY-5, 5 PGY-6, and 1 PGY-7. Seven Clinical Congress residents did not indicate their PGY level. To minimize confounding variables we excluded all PGY residents who were not in the PGY-5 group. The final dataset included 39 PGY-5 residents from the Clinical Congress and 32 PGY-1 residents from 2 consecutive years in our program.

**Learning resources**

On a scale of 1 to 5, with 5 indicating frequent use, PGY-5 residents (n = 39) indicated surgical atlases (4.15; SD, .90) and surgical texts (4.15; SD, .90) were their most frequently used resources when preparing for a case in the operating room (Table 1). In contrast, PGY-1 residents (n = 32) indicated anatomy atlases (3.97; SD, .93) and advice from colleagues (3.64; SD, .90) were their most frequently used resources when preparing for a case in the operating room (P < .05). Despite the differences in how the PGY-5 group and the PGY-1 group prepared for a case, of 12 intraoperative management topics both groups believed they were the least prepared for instrument use/selection and suture selection (Table 2).

**Comments**

By using a 27-item survey, we sought to assess residents’ self-reported learning needs with respect to intraoperative management knowledge and resident resource use when preparing for cases in the operating room. Our results show that PGY-1 residents (n = 32) primarily use anatomy atlases to prepare for cases in the operating room. Conversely, PGY-5 residents (n = 39) largely rely on surgical atlases.
and surgical texts. Both groups reported low use of surgical videos.

When assessing resident learning needs for intraoperative management knowledge, out of 12 possible topics both PGY-1 and PGY-5 level residents indicated with the highest frequency that they believed they were unprepared for instrument use/selection and suture selection. This was an unexpected finding. Table 2 lists the 12 operative management topics used in our survey. The topics cover a broad range of preoperative, intraoperative, and postoperative areas. In our previous study, faculty indicated that residents were unprepared for anatomy, patient outcomes, and natural history of disease. Faculty were less likely to choose instrument use and suture selection as one of the intraoperative management topics that residents were least prepared for. This disparity between faculty and residents’ perception of resident learning needs, underscores an important gap in surgical education and training.

In 2006, Grober and Jewett4 published a concept paper on the trajectory of “operative competence.” In this article, they stated that “cognitive competence requires mastery of a predefined body of knowledge and is achieved through reading, and attendance at various academic lectures and conferences. Technical and motor skills competence is achieved by repetitive practice and is characterized by rapid initial improvements in performance followed by decreasing gains over time. Operative competence is the ability to perform the entirety of a surgical procedure and is a much broader domain that includes technical competence. In addition, operative competence includes cognitive competence and other competency domains such as clinical judgment, professionalism, confidence, and poise, which are essential in patient care and team management.

Because operative competence includes both technical/motor skills competence and cognitive competence, and is expected to improve significantly over time, we expected senior residents to have different learning needs when compared with junior-level residents. One potential explanation for our observation includes an increase in procedural and patient complexity necessitating an extended time period for a surgical trainee to move from a technical skills focus to a decision-making focus when progressing on the operative competency trajectory. Another possible explanation is that our training curricula and educational resources are out of touch with the learning needs of today’s residents.5 Anecdotally, we found that several of the most popular surgical texts and atlases do not have a section devoted to detailed descriptions of surgical instruments and suture selection. The assumption is that residents will learn this in the operating room. The reality is that this may not be the focus of current intraoperative teaching.

Today’s residents represent a heterogeneous group of individuals with different learning needs based on prior experiences, knowledge and learning styles. Faculty should assess each resident’s learning needs prior to going to the operating room to identify knowledge gaps and ensure that their assumptions regarding resident’s knowledge are accurate. One strategy geared towards accomplishing this goal is the Briefing-Intra-operative teaching-Debriefing model.6 This model outlines a specific protocol where faculty and

Table 1  Mean resource ratings and mean rank (Mann-Whitney U) for PGY-1 and PGY-5 groups

<table>
<thead>
<tr>
<th>Learning resource</th>
<th>PGY-1 (n = 32), mean (SD) [mean rank]</th>
<th>PGY-5 (n = 39), mean (SD) [mean rank]</th>
<th>z</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anatomy atlas</td>
<td>3.97 (.93) [43.88]</td>
<td>3.15 (1.11) [29.54]</td>
<td>-3.02*</td>
</tr>
<tr>
<td>Advice from colleagues</td>
<td>3.64 (1.34) [25.86]</td>
<td>3.92 (.87) [27.41]</td>
<td>-0.34</td>
</tr>
<tr>
<td>Surgical atlas</td>
<td>3.42 (1.28) [29.03]</td>
<td>4.15 (.90) [40.64]</td>
<td>-2.48†</td>
</tr>
<tr>
<td>Web-based resources</td>
<td>3.39 (1.05) [43.65]</td>
<td>2.51 (1.19) [29.03]</td>
<td>-3.09*</td>
</tr>
<tr>
<td>Surgical text</td>
<td>3.25 (1.31) [27.61]</td>
<td>4.15 (.99) [41.77]</td>
<td>-3.01*</td>
</tr>
<tr>
<td>Journals</td>
<td>2.16 (1.17) [31.33]</td>
<td>2.61 (1.18) [39.83]</td>
<td>-1.78</td>
</tr>
<tr>
<td>Surgical videos</td>
<td>1.19 (.47) [29.67]</td>
<td>1.72 (1.02) [41.19]</td>
<td>-2.71†</td>
</tr>
</tbody>
</table>

Scale: 1, rare use; 5, frequent use.
*P ≤ .003.
†P < .05.

Table 2  Item frequency (percent) and chi-square analysis comparing PGY-1 and PGY-5 self-reported learning needs for intraoperative management

<table>
<thead>
<tr>
<th>Operative management topic</th>
<th>PGY 1 (%) (n = 32)</th>
<th>PGY 5 (%) (n = 39)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instrument use/selection</td>
<td>90.6</td>
<td>56.4</td>
<td>.001*</td>
</tr>
<tr>
<td>Selection of suture material</td>
<td>84.4</td>
<td>53.8</td>
<td>.006*</td>
</tr>
<tr>
<td>Surgical field exposure</td>
<td>53.1</td>
<td>46.2</td>
<td>.365</td>
</tr>
<tr>
<td>Postoperative care Sequence of procedures</td>
<td>50.0</td>
<td>41.0</td>
<td>.303</td>
</tr>
<tr>
<td>Patient positioning</td>
<td>43.8</td>
<td>30.8</td>
<td>.189</td>
</tr>
<tr>
<td>Procedure choices</td>
<td>43.8</td>
<td>38.5</td>
<td>.417</td>
</tr>
<tr>
<td>Patient selection</td>
<td>37.5</td>
<td>48.7</td>
<td>.240</td>
</tr>
<tr>
<td>Follow-up procedures</td>
<td>34.4</td>
<td>30.8</td>
<td>.472</td>
</tr>
<tr>
<td>Anatomy</td>
<td>21.9</td>
<td>35.9</td>
<td>.152</td>
</tr>
<tr>
<td>Patient outcomes</td>
<td>21.9</td>
<td>25.7</td>
<td>.466</td>
</tr>
<tr>
<td>Natural history of disease</td>
<td>12.5</td>
<td>15.4</td>
<td>.501</td>
</tr>
</tbody>
</table>

*P < .01.
residents spend 2–3 minutes before a case in the operating room (i.e. at the scrub sink) to jointly establish 1–2 specific learning objectives (Briefing). During the case, faculty teaching and coaching deliberately focus on the pre-established learning objectives (Intra-operative teaching). After the case, the resident is asked to reflect on his or her performance and attainment of stated learning objectives (Debriefing). This type of learning approach provides some structure to operative teaching and allows the resident’s learning needs to be addressed, while faculty have a platform for guided teaching and coaching.7

Without explicit knowledge of residents’ individual learning needs, faculty risk offering knowledge and factual information that has no long-term knowledge benefits for the resident.8 Educational theorists have associated this type of teaching with the blank slate or empty vessel model of teaching, wherein the instructor pours knowledge into the mind of a passive, receptive student. Constructivist learning supporters argue that blank slate teaching does not provide a meaningful interaction between prior knowledge and new knowledge or the educational dialogue between student and teacher that is necessary for internalizing knowledge and developing a deeper level of understanding.9

Study limitations included a small sample size and the use of self-report surveys as a data collection instrument. In addition, the chief residents (n = 39) were part of a convenience sample of volunteers attending the 90th Annual American College of Surgeons Clinical Congress meeting. As such, there may be an element of selection bias concerning the residents who chose to visit the exhibit hall and most likely had financial sponsorship to attend the meeting. Although we are unaware of any statistics on which types of training programs are able to sponsor their residents to attend the meeting, generalizability of our findings must be considered in this context. In addition, although surveys are used commonly for needs assessments, the results are heavily dependent on content and context, which also may affect generalizability.10

The implications of this study for surgical training are clear; although the ideal platform for training in intraoperative management knowledge is the operating room, the need to ensure operative competence and patient safety calls for additional measures.11–14 As several stakeholders in surgical education continue to outline the future of surgical education and assessment it is imperative that residents be involved in the process.14–17 This will help to ensure that learning needs are clear and curricula are planned to fully address them. Our previous study showed a significant gap in residents’ self-reported learning needs and faculty indication of residents’ learning needs. The current study unexpectedly showed that senior-level residents disproportionately are concerned about the technical aspects of intraoperative management compared with surgical decision making, which, at a minimum, questions our perceived learning trajectory for operative competence. Finally, faculty need to assess the learning needs of individual residents to ensure adequate understanding of a resident’s prior knowledge.

References