Questions Posed by Residents in the Operating Room: A Thematic Analysis

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OBJECTIVE: Questioning behavior is a type of intraoperative communication for which little information exists on the types of questions that residents ask. The purpose of this study is to describe and identify themes of questions asked by residents in the operating room.

DESIGN: Trained observers documented questions asked by residents during operations. Thematic analysis was applied.

SETTING: University of Utah Hospital (Salt Lake City, Utah) operating rooms; institutional.

PARTICIPANTS: A total of 10 general surgical residents (postgraduate year 1 to 5) were observed along with 10 attending general surgeons. Cases were purposefully selected to be broadly representative of general surgery cases.

RESULTS: Thematic saturation occurred following examination of 16 operative cases, which included 178 questions asked by residents. Two broad categories of questions emerged: case-related (71%) and noncase-related (29%), with multiple subcategories within the 2 groups. Case-related subcategories included operative techniques, logistics, patient care, and other. Questions unrelated to the case included subcategories of social, work-related but unrelated to case, other. Less than 1% of questions asked by residents during operations were reflective.

CONCLUSIONS: Most questions related to the case were technical and most of those unrelated to the case were social; almost all questions were transactional in nature. Our identification of questioning themes by residents expands understanding of resident questioning behaviors, and therefore may enable residents and faculty to be more effective in establishing entrustment. (J Surg Ed 76:315–320. © 2018 Association of Program Directors in Surgery. Published by Elsevier Inc. All rights reserved.)

KEY WORDS: questions, operating room, surgical education, thematic analysis

COMPETENCIES: Patient Care, Medical Knowledge, Interpersonal and Communication Skills

INTRODUCTION

In surgery, there is arguably no teaching venue more important than the operating room (OR). While skills and knowledge relating to the care of the surgical patient are also acquired outside of the OR, the knowledge acquired in the OR is central to the development of a surgical trainee. Teachable moments in the OR arise from many sources, with learner questions providing one of the most meaningful opportunities.

Questions play a key role in active, adult learning in terms of establishing and maintaining attention to a particular subject or activity, and in facilitating encoding of data by the learners. Spontaneous questions by learners may illustrate either basic or deep approaches to learning material, approaches that have been described as reflective (metacognitive) and self-questioning (cognitive).[1] Reflective questions are those that involve "delving deeper into… existing knowledge or information" and that result in a deeper level of understanding by the learner.[1] Self-questioning helps to organize and integrate new information on a scaffolding of existing knowledge. Self-questioning also exemplifies comprehension monitoring in that students generate questions based upon incomplete or inadequate understanding, a skill set that can be taught.[2] Entrustment of residents, allowing them increased autonomy in the operating room, is based upon faculty recognition that residents are engaging in deep learning.

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Previous studies of team interactions in the OR have focused on communication between team members and on learning activities that occur in the OR. While those are both important areas of inquiry, the nature of questions asked by residents in the OR has not been clearly described. Because of this identified knowledge gap, the specific aim of this study was to identify themes of questions asked by residents in the OR. Identified themes of resident questioning can provide a foundation for both faculty and resident development around operative learning.

MATERIAL AND METHODS

The analytic method used for this qualitative study was thematic analysis, which allowed for an inductive approach for the inquiry. Thematic analysis has been described as pattern recognition within data; emerging themes are identified through repetitive reading of the data.[3] Thematic analysis involves identification of themes that are important in description of a particular phenomenon.[4] Boyatzis described a data-driven, inductive approach to thematic analysis that moves from rich description to interpretation of data.[5] Use of thematic analysis allowed us the flexibility to systematically identify patterns of questioning exhibited by residents during operations, which was our primary goal for this study.

Data Acquisition and Coding

After receiving Institutional Review Board exemption, a variety of general surgery cases were selected for observation at a single academic teaching hospital (University of Utah) between June and December of 2015. Cases were selected to be broadly representative of general surgery cases (i.e., laparoscopic colectomy, laparoscopic cholecystectomy, parathyroidectomy, open inguinal hernia, indwelling port catheter placement, mastectomy). The case selection process was designed to insure a variety of residents at different levels of training (senior level and junior level) and then to maximize the number of included attending surgeons; emphasizing variation in trainee level and attending surgeon across a limited spectrum of core general surgery cases increased the likelihood of identifying a full spectrum of questioning behaviors by residents in the OR.

Two trained observers (JB and CF) performed all data collection. Questions in the OR were documented verbatim electronically on an iPad in real time from "time out" until the surgical drapes were removed. Timing of the specific questions was not tracked but any pauses in interactions of the resident and the attending surgeon were noted. In addition to documenting questions posed by surgical residents, documentation of whom the resident's questions were directed toward, be that the attending surgeon, operating room staff, medical student, or another member of the operative team, as well as their method of communication in response to the question (i.e., verbal, nonverbal, action in response to question) was also recorded. The observers stood away from the sterile field as to not interfere with the procedure and to attempt to minimize the Hawthorne Effect. Subjects knew they were being observed for an education study but they were not aware of the specific information being documented.

The initial step of the coding process occurred at the time of the observation with identification of a resident question as an "important moment" and subsequent documentation of the questions.[5] Following documentation of the questions, the Primary Investigator (PI) and senior investigator (BO and AC) immersed themselves in the reported questions and repeatedly examined the content of the questions. The PI and senior investigator met routinely to review observation notes, which included providing feedback, challenging one another's data analysis, adding to concepts and themes, and consulting for iterative feedback; analytical and theoretical memos were maintained as part of these reviews as patterns were identified. Patterns were then related into themes. Themes were reviewed, defined, and named, consistent with an inductive approach to thematic analysis.[6] Data confirmation occurred using peer debriefing and audit trails from meeting notes. Data collection continued until saturation was achieved and no new themes emerged during the coding process. Saturation occurred following observation of 16 cases.

RESULTS

From the 16 observed operative cases, the observers recorded 178 discrete questions asked by residents (median 8 questions per case; range 1 to 24 questions per case). We observed 10 residents with 10 attending surgeons and 12 different resident and/or attending surgeon pairings during the 16 observed cases. Observed residents included four postgraduate year (PGY) 1, 3 PGY3, and 3 PGY5 residents.

Two broad themes of resident questions emerged: questions directly related to the operative case (e.g., "Can you cut above this knot?"), and questions unrelated to the operative case (e.g., "How is your diet going?"). The PI and senior investigator reviewed the questions independently and agreed upon categorization of 154/178 (86.5%) as case-related or noncase related questions. With a third reviewer (CF) to adjudicate, we achieved agreement on all but 8 questions (4.5%); these questions were excluded from analysis. Case-related questions constituted 126 (71%) of all observed questions, an impressive contrast to the 52 (29%) observed questions that were unrelated to

the operative case. The rate of questions asked by residents varied from 2 to 13.8 questions per hour. There was no correlation between the average rates in which case related questions were posed compared the rate in which noncase related questions were posed.

Questions were also categorized based upon whom the resident was addressing. The vast majority of questions (110/178; 62%) were asked of the attending surgeon. Questions to OR staff, either circulating nurse or scrub technician, were 31% of asked questions (55/178). Only 6 questions were asked of medical students scrubbed into cases, and 7 questions were asked of an attending surgeon from another service. While reviewing which team members were targeted by questions, questions were also categorized as either transactional (basic) or reflective (deep) based upon the content of the question. Only 8 of the 170 included questions were reflective in nature, all of which were addressed from the resident to the attending surgeon; these questions and the training level of the resident asking the question are displayed in Table 1. In each of the reflective questions, the resident seeks a deeper level of understanding of what is happening or what they are observing that benefits from the expertise of the attending surgeon. The reflective questions asked by the PGY 1 and PGY 2 residents demonstrate a lower level of sophistication than those asked by more senior residents but seek a knowledge that is applicable beyond the current operative case. It is noteworthy that a single PGY3 resident was responsible for 3 of the 8 reflective questions.

We also identified multiple lesser themes for case-related and noncase related questions. Subcategories for case-related questions included operative technique, logistics, patient care, and other. Subcategories for questions unrelated to the operative case included social, professional but unrelated to the current case, and other. The taxonomy for the major and lesser themes is illustrated in Figure 1.

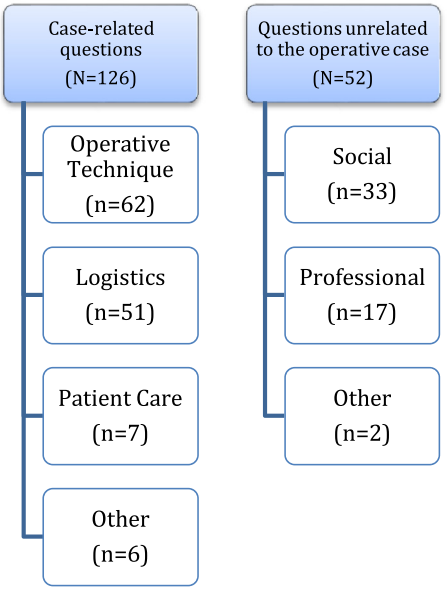

FIGURE 1. Taxonomy of questions asked by residents in the OR.

Case-Related Questions

Operative technique questions asked by the residents comprised 51% of questions in the case-related category and they were the most numerous question type residents asked overall (62/178, 35%; Table 2). Residents at all training levels asked questions about operative technique. Logistical questions related to the case were the next most frequently asked question type. There were 51 questions in this category, which comprised 41% of the case-related questions and 29% of all observed questions.

Case-related patient care questions mostly pertained to orders. For instance, "Should we start DVT prophylaxis on postop day one?" is an example of a question that related to the care of the patient on the operating table but not the technical skill or logistical aspects of the case. Seven questions (5.5% of case-related, 3.9% of all) fell into this category and were asked by junior and senior level residents.

Very few case-related questions did not fall into the operative technique, logistical, or patient-care related categories that we identified. Only 6 questions were categorized as "other" questions (e.g., "Do you see that?") that were still related to the case (4.8% of case related, 3.4% of all).

TABLE 1. Reflective Questions

Question	Resident Training Level
"What's the difference in classification?"	PGY-1
"So you would call this a direct inguinal hernia with a patent processus vaginalis?"	PGY-2
"Why do you prefer medial to lateral?"	PGY-3
"What would you do?"	PGY-3
"Would you do chest compressions as well?"	PGY-3
"So what is your suspicion of something bad?"	PGY-5
"Does this look like XXXXX?"	PGY-5
"But how did the contrast get out of the duct and into the hole?"	PGY-5

TABLE 2. Case-Related Questions

Subcategory	Representative Comments
Operative technique	"Should I clip that?" "Why do you prefer medial to lateral?"
Logistics	"Is it ok to turn on the spot lights?" "Will you remove this glove?"
Patient care	"Should we start the patient on a regular diet?" "Lovenox in the morning?"
Other	"What was your name again?" "Do you see that?"

Questions Unrelated to the Operative Case

Social questions were the preponderance of questions unrelated to the case, totaling 63% of the unrelated questions that were asked (n = 33; 18.5% of all questions; Table 3). Social questions were broad in nature, focused on the personal life of the individual being asked, and did not have any relationship to PGY level. Professional questions related to patient care or hospital activities but unrelated to the case at hand were the second most numerous subcategory (n = 17, 33% of unrelated questions, 9.6% of all questions). Finally, the remaining 2 questions that were not related to the case were categorized as "other."

DISCUSSION

The important interactions that occur in the OR are well-described in prior studies. Two distinct bodies of research emerged, 1 around communication in the OR and the other around intraoperative teaching, typically from the perspective of the attending surgeon's teaching behaviors. Prior to our study, resident questioning behavior as a component of learning in the OR was not described. Using direct observation, we were able to document resident questions in the OR and use thematic analysis to identify dominant concepts that emerged, including a paucity of reflective questioning by residents during operative cases. In the early years of training, intraoperative questioning is more likely to flow from attending to resident as the attending helps the resident to with basic mastery of technical skills and medical knowledge. Further, junior learners may fear the repercussions of asking questions if they are perceived as having knowledge deficits that would subsequently limit their entrustability by faculty. The ability to frame meaningful reflective questions demands basic proficiency in an operative case; once a resident has achieved that basic level of proficiency she has the capacity to take the initiative to expand her learning to include management of unexpected findings and complications. Based upon the observed difference in the complexity of reflective questions based upon PGY level, we believe it is probable that future research will identify differential impacts of questioning on entrustment based upon the resident's training level.

TABLE 3. Questions Unrelated to the Operative Case

Subcategory	Representative Comments
Social	"How's your new diet going?" "You're living, breathing hockey right now, aren't you?"
Professional	"Was the page anything urgent?" "What happened to the next case?"
Other	"What are you writing over there?"

Verbal communication during procedures affects an operation on many levels, including team performance, logistics, and education. In surgical education, feedback and instruction are given using both verbal and nonverbal communication. Different studies have aimed to classify communication in the OR to gain a better understanding of the important processes that occur there. Hauge described a tool to distinguish between informing, questioning, responding, and tone setting behavior.[7] Blom went further to describe a classification model for different types of verbal communication (explaining, questioning, commanding, or miscellaneous) in the OR and suggested that the use of a communication classification system could provide insight into teaching processes so that improvements could be made.[8] In each of these studies, questioning behavior was identified as a key component within communication. However, the emphasis on questioning in both of these models focused on questions asked by the attending surgeon rather than those asked by the learners, and a detailed description of those questions is absent.

Teaching behaviors employed by attending surgeons are viewed as critical to learning in the OR. Roberts, et al. described intraoperative teaching interactions using grounded theory methodology, many of which arose spontaneously either to correct a resident behavior or in response to a question.[9] "Teachable moments" like these are based upon skill or knowledge gaps held by the learner, meaning that resident questions can help faculty to guide learning based upon needs identified by the resident. Questioning has also been identified as a means of prompting instruction from attending surgeons and represents a form of verbal exchange between resident and faculty.[10] Of note, physical teaching behaviors were also described and found to be a crucial part of the intraoperative learning process.[11] In our study, many technical skill questions related to physical actions either prompting the question or in response to the question. Additionally, questions posed by the attending surgeon were not tracked, unless to indicate a question asked by the resident was in regards to the previous question posed. A helpful future direction for research might establish how the questions in

the OR may vary based upon style and method of attending interrogations and if attending surgeons can be trained to encourage residents to follow-up transactional questions with cognitive of metacognitive questioning.

Our study provides an important addition to the existing body of literature on intraoperative communication by describing types of resident questioning that occur in the OR. We were encouraged when we found that the vast majority of the questions were case-related and that many questions related to operative technique. It is not surprising that a majority of the questions asked were case-related, but the simplicity of the questions was surprising. For instance, many of the operative technique questions involved clarifying simple directions. Examples include: "Should I cut here?" and "Is this too short?" These questions relate directly to the operative task at hand, but do not indicate reflective questioning. The patterns of questioning in this study, in which the preponderance of reflective questions were generated by more senior residents, indicate that as residents progress with technical skill acquisition they are better able to consider future application in real-time. Comprehension-monitoring, which is associated with encoding of information, was absent in many of the questions asked by residents in our study.[2] Residents are asking "how?" or "what?" without including the "why?" or "what if?" questions consistent with developing a deeper level of understanding that would facilitate faculty entrustment of residents in the operating room.

Social questions were also very common. Of the questions not related to the case, almost two-thirds were social questions. While social questions do not add to the process of delivering or encoding case-related data, they do relate to the culture and learning environment in the OR. Studies have been performed to describe team interactions in the OR, and those with better communication had enhanced performance in the OR.[12] Social questions can be useful in fostering trust and interpersonal relations between faculty and residents as well as with other members of the operative team.

The primary limitation of our work is that this was a single center study. It is possible that the questioning behavior of residents at this institution is influenced by the culture of the training program. Similarly, the faculty surgeons may share teaching methods that may have influenced resident behavior in the OR. While a variety of residents and faculty from this institution were observed, expanding the study to include other teaching hospitals may provide a broader sample of resident questions and more insight into the depth of and the types of questioning that occur.

An additional limitation is that the observers only recorded statements that they identified as questions at the time of observation. While the observers were trained, questions that were not effectively communicated by the resident may not have been identified. In some instances, the distance between the observers and surgical team members made it difficult to hear questions posed, in such situations as these, inferences were made as to what the question was in a contextual manner based upon the responses given. Finally, the dialogue that occurred before and after the question was not included in the transcribed data, meaning that some of the questions may have been categorized differently if the full dialogue were included for analysis. Along these same lines, while subjective notes were made during the procedures regarding nonverbal communication, no attempts were made to interpret such communication.

A final limitation was that the trained observers were physically present in the OR for data collection and the subjects knew that they were being observed for an education study. It is difficult to know if this resulted in a Hawthorne effect but it was not possible to hide the trained observers from the subjects being studied. While the subjects knew they were being observed, they did not know the specifics of what the trained observers were investigating.

CONCLUSIONS

While our study provides insight into the types of questions asked by residents in the OR, our findings generate a series of additional questions. In a healthy educational environment, interns and residents should feel empowered to ask questions with the understanding that they are not expected to be all-knowing. Our characterization of resident questions provides a foundation for creating tools for teachers and learners to enhance the operative learning experience. Faculty development might foster "coaching" of residents in their questioning behavior, either during the case or following during a debrief, to encourage more complex reflective questioning that capitalize upon future application of the intraoperative learning experience.[1,2] Training of both residents and faculty in motivational techniques could result in a mutually beneficial dynamic with increased focus on learning and teaching in the OR.[13] A system with formal preoperative goal-setting discussions and postoperative debriefs might also improve resident questions, both in terms of process and content, in a way that would enhance encoding of information for future application.[14] As we look toward an education system based upon autonomy and entrustment, reflective questioning by residents is likely to provide an essential role in recognizing their readiness for further entrustment.

In addition to finding ways to improve the structure and content of questions, the learning environment within the OR must be considered because of its impact on all aspects of resident learning.[15] Residents in 1 study described experiences that were ineffective when the surgeon "took away the case as an alternative to explaining to the resident what

they should be doing."[16] If residents feel questioning behavior is unwelcome or sense that they are being "shamed" for asking questions, they are less likely to ask for the information that they need. Focusing attention on basic questions that do not demonstrate encoding of complex data provides challenges for attending surgeons who want to provide appropriate autonomy to the resident; both faculty and resident development efforts to enhance and encourage reflective questions wound likely benefit entrustment relationships. Attending surgeons who create a supportive learning environment do so by being respectful to patients as well as learners, remaining calm and courteous, and providing feedback without belittling. Most importantly, teachers who showed interest in teaching were found to be most effective.[17] Creating a climate centered focused on best patient care while optimizing learning opportunities is crucial if residents are to be life-long learners who can ask appropriate questions to direct their own learning.

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SUPPLEMENTARY INFORMATION

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