Defining the Content for a Quality and Safety in Surgery Curriculum Using a Nominal Group Technique

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OBJECTIVE: There is growing awareness of the need to provide surgical residents with training in quality and safety. Previous studies have revealed a need for a formal curriculum, but the content and structure of such a curriculum has not been defined. Our objective was to develop a surgery resident curriculum using a consensus, team-building approach.

DESIGN: This study consisted of moderated, structured focus groups using a nominal group technique to guide discussion. Participants generated rank lists of topics to be included and answered questions regarding structure and design of teaching and assessment modalities.

SETTING: Two separate focus groups among 9 surgical residents and 10 faculty experts in quality and safety were held in conjunction with the American College of Surgeons Quality and Safety Conference in July 2017. A total of 16 institutions were represented.

RESULTS: A total of 35 topics were initially proposed by the resident group and a total of 41 topics were proposed by the expert group. After discussion, each group reached consensus on a final list of 9 topics. Most topics in the final lists fell into the broad areas of improvement science and nontechnical skills. Residents indicated that most topics were, on average, poorly covered by their current training program, however, a wide range was noted within each topic. Faculty indicated a preference for didactic instructional methods and assessment using multiple-choice questions.

CONCLUSIONS: Quality and safety are integral components of surgical training. Learners and experts agreed that topics within the domains of improvement science and nontechnical skills should be included in a formal curriculum. Learners reported wide variation on how well these topics are currently included in graduate medical education training programs. (J Surg Ed 76:795–801. © 2018 Association of Program Directors in Surgery. Published by Elsevier Inc. All rights reserved.)

KEY WORDS: Quality improvement, Patient safety, Graduate medical education, General surgery

COMPETENCIES: Practice-Based Learning and Improvement, Systems-Based Practice

ABBREVIATIONS: ACS, American College of Surgeons CLER, Clinical Learning Environment Review GME, graduate medical education NSQIP, National Surgical Quality Improvement Program NGT, nominal group technique QS, quality and safety QITI Quality In Training Initiative

INTRODUCTION

Surgery has a long history of commitment to improving the quality of patient care. Beginning with the end-results idea espoused by Dr. Ernest Codman, the American College of Surgeons was founded on the principles of quality improvement and patient safety.[1] Through the apprenticeship model and word-of-mouth, this deep commitment to our patients has been passed from generation to generation.

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Now, more than 100 years after the establishment of the American College of Surgeons (ACS), the need to provide surgeons with a formal education in quality and safety (QS) is of paramount importance. The political and regulatory environment along with the development of techniques in industrial safety science have collided with the modern healthcare delivery system. Clinicians now require formal training in these domains in order to champion their patients' needs and simultaneously measure and improve their own performance and that of the healthcare system.

Graduate medical education (GME) has also evolved during this time frame. The shift from experiential training to an outcomes-based model has revealed an opportunity for enhanced formal education of physicians in practice-based learning and systems-based practice.[2] Previous studies have revealed the need for a formal curriculum in surgical QS,[3,4] however, an iterative, consensus-building approach to identifying the key components of such a curriculum has not been performed in surgery. In this study, we used nominal group technique (NGT) to build consensus among learners and experts regarding the desired content of a surgical QS course and identify best strategies for implementation.

METHODS

Overall Strategy

In order to develop the content for a QS curriculum, we conducted focus groups of learners and experts in surgical QS using NGT. Each group was composed of individuals with significant experience or interest in quality and safety education identified through the Quality in Training Initiative of the ACS National Surgical Quality Improvement Program. The Quality In Training Initiative is a multidisciplinary collaborative of academic affiliates of National Surgical Quality Improvement Program interested in advancing quality and safety education among surgical training programs. Participant interest was defined by registration to teach or enroll in a course entitled, "Residents Leading Quality."

Education on Quality and Safety in Surgical Residency

Prior to meeting with the focus groups, a targeted review of the literature and other widely available materials used in the broad QS education domain was performed to identify common and critical topics. The reviewed materials included the Accreditation Council for Graduate Medical Education list of milestones for general surgery,[5] publications from the Clinical Learning Environment Review project related to patient safety,[6,7] the course list for the Institute for Healthcare Improvement Open School,[8] and the published results from a 2005 conference on patient safety in surgical training.[3] Based upon the review, a document was developed to include a broad and comprehensive list of in the domain of QS (see online Supplement).

Study Design

NGT is a qualitative method used to achieve consensus when the available evidence is insufficient for more quantitative methods.[9] This technique provides structure for discussions during in-person focus groups convened to answer a specific question, and drives discussion toward the development of a formal list of prioritized responses. Typically focus groups will have 6-12 participants who are stakeholders in the domain of study.

Participant Sampling

Two focus groups were planned on the same day just prior to the commencement of the ACS Quality and Safety Meeting in New York City in July 2017. All of the invited residents and faculty agreed to participate (100%). The first group included general surgical residents with an interest in quality and safety. There were 9 participants in this group representing 8 different training programs. Seven programs were located across the continental United States (DC, MA, NY, OR, PA, TX) and 1 from Canada (BC). Residents graduated from medical school between 2011 and 2015 and had completed 2-4 years of surgical training at the time of participation. The second group included surgeons with expertise in quality and safety as defined by leadership roles in their institutions and/or formal education in the domain. There were 10 participants in this group representing 9 institutions. Eight of the institutions were located in the continental United States (GA, IL, MI, NC, PA, TX, WI) and 1 in Canada (ON). All participants had completed training. On average, the participants had 9.3 years of practice (range: 0-22 years).

Nominal Group Meetings

Each group met independently for 3 hours with the same 3 facilitators (MMS, RRK, and CYK). Participants were presented with an overview of the process and instructed to address an explicit question. The resident group was asked "What quality and safety principles should all surgeons know at the completion of clinical training?" The faculty group was asked "What principles should be included in the curriculum of a surgical QS course?" Round-robin discussion format was used to develop a group-generated list of topics. Then, the prepared list of QS topics was distributed (see Online supplement), and the ACS handbook on optimal resources for quality and

safety[10] was reviewed. Participants nominated additional topics for consideration, and open discussion ensued to clarify questions or concerns. Topics were then organized by theme and redundant topics were consolidated. Participants were asked to silently list their top 10 topics. Lists were compiled and tabulated by the facilitators and reported to the group. Through additional open discussion, each group developed a consensus list of topics to recommend for inclusion in a formal curriculum. The number of topics to be included on this final list was not predetermined, and no effort was made to rank the final topics in order of importance.

Following the conclusion of the topic selection process, each group was asked 2 additional questions regarding their nominated topics. Residents were asked to rate the importance that the content developed for each topic be specific to surgical QS (as opposed to more general medicine or cross-industry topics), and to rate the current state of education for each topic in their individual programs. Faculty were asked to define the best way to present the topics to learners: video (distributed prior to the course, i.e., a flipped classroom approach), didactic (at course), facilitator-led small group discussion of a case-based scenario, student-directed small-group activity involving a case-based scenario), or other (open for participant suggestions). The faculties were also asked to identify the best assessment tool for each topic: multiple-choice questions, written case-based open ended questions, direct observation of learner activity, graded participation in institutional quality improvement or patient safety project, graded observation of simulation activity, or other.

TABLE 1. Resident-Proposed Topics for Graduate Medical Education Course on Quality and Safety in Surgery

Topics Nominated	Total Number of Votes (max = 9)
Culture	9
Data	8
QS methodology	8
History and background	5
Evidence-based medicine*	5
Personal and team assessment	5
Teamwork	5
Communication	4
Legal and political issues	4
Peer review	3
Professionalism	3
Basic vocabulary	3

The following items each received 2 votes: leadership, mentoring/coaching, privileging/credentialing, variation vs standardization, systems-based practice, how to use QS techniques in a local setting, transitions in care, statistics and analysis.

The following items each received 1 vote: challenges and barriers to QI, clinical learning environment, collaboratives, checklists and debriefs, cost, evaluating and implementing pathways, evaluations, event reporting, metrics and outcomes, pathway to improvement, personal assessment and improvement vs QS, practical tips on maximizing morbidity and mortality conference, QS vs research, who is in charge?, where to go for more information.

*Evidence-based medicine included evaluation of best practices, defining the standard of care and, implementation of pathways.

RESULTS

The complete list of topics proposed by residents and faculty for a quality and safety curriculum is listed in Tables 1 and 2, along with the number of votes each topic received. Data, QS methodology, history/background of QS, and teamwork all received votes from the majority of both residents and faculty. Residents gave the highest number of votes to culture, while this topic only received 3 votes from faculty. More than half of faculty voted for basic vocabulary and communication, while these topics received fewer votes among residents. Through open discussion, some topics were combined or redefined, and each group reached consensus on a list of 9 topics (Tables 3 and 4).

TABLE 2. Faculty-Proposed Topics for Graduate Medical Education Course on Quality and Safety in Surgery

Topics Nominated	Total Number of Votes (max = 10)
Data (sources and analysis)	10
Basic vocabulary and definitions	8
History of QS	8
Teamwork	8
Communication	7
QI methods	7
Implementation	5
Tools and techniques	5
Leadership*	5
Policies/regulatory environment†	5
How to develop a question	4
How to sustain results	4
Culture	3
Dissemination including scholarly work	3

The following items each received 2 votes: importance of quality improvement.

The following items each received 1 votes: adverse event report, audits, change management, Choosing Wisely, coaching, control charts, current state, disparities, handoffs, health system, how to create an aim, how to design an intervention, how to design a study, how to find more resources, how to interpret metrics, how to monitor a QI project, how to start the QI process, human factors, identification of best practices, measurement, morbidity and mortality conference, overcoming barriers, safety science, sources of evidence, stakeholder engagement, why it matters.

*Leadership included self-awareness and personality assessment tools.

†Policies/regulatory environment included the broader health system, local infrastructure, political, and regulatory environments.

TABLE 3. Consensus List of Resident-Proposed Topics

Topic	Examples of Included Components	Importance of Developing Surgery Specific Content 1-Very Important 4-Not Important Mean (Range)	Current State of Inclusion in Training: 1-Completely Covered 4-Not Covered Mean (Range)
Assessment	Techniques to assess self, team, hospital; peer review	1.44 (1-3)	3.33 (3-4)
Communication	Best practices for handoffs and transitions in care; conflict resolution; giving and receiving feedback; learning effective collaborative practice	1.22 (1-2)	2.44 (1-4)
Culture	Defining and creating a good working environment; understanding behavioral motivators; examples of safety culture in other fields	1.11 (1-2)	3.33 (2-4)
Data	Types and sources of data; analysis techniques	2.00 (1-3)	3.11 (2-4)
Evidence-based medicine	Defining best practices; use of guidelines and pathways; role of standardization vs variation	1.78 (1-3)	2.56 (2-3)
History and background	History of QS (in medicine and industrial roots); current practices in different settings; national discussions regarding healthcare; overview of hospital system structures; navigating local QS infrastructure	1.89 (1-4)	2.89 (2-4)
Legal/political	How malpractice and reimbursement affect QS; relationship between QS and effective patient advocacy; managing patient privacy in QS	2.22 (1-3)	3.67 (2-4)
QS methodology	Identification of a QS problem; writing aims statements; tools used in QS projects; defining the process of QS; selecting measures/metrics; understanding the difference between QS and research	2.11 (1-3)	3.33 (2-4)
Teamwork and leadership	How to be effective leader and teammate; personality types and leadership styles; multidisciplinary vs interdisciplinary care	1.33 (1-2)	2.56 (1-4)

Surgical Residents

Several dominant themes were identified in the consensus list of topics developed by the resident group (Table 3). Many of the topics identified by this group involved nontechnical skills such as communication, teamwork, professionalism, and development of good safety culture. Another set of topics was grouped under improvement science including basic QS vocabulary, specific methods, and the use of data. The resident group also placed importance on the application of continuous improvement principles to individual and team practice, including application of evidence-based medicine, personal and team assessment, and peer review. Finally, there was consensus around the importance of understanding and analyzing the role of the broader healthcare system as indicated by the inclusion of topics such as the history of QS (both in industry and specifically within medicine) and legal/political issues on the list.

The residents expressed moderate preferences for surgery specific examples for all topics but noted the need to draw knowledge and perspective from the QS experiences of other industries and disciplines, given the newness of the field in medicine. Residents indicated that most topics were, on average, poorly covered at the current time. However, a wide range was noted within each topic. For 8 out of 9 topics, at least 1 resident indicated they were not aware of any formal training within their residency. Similarly, for almost all topics at least 1 resident indicated that it was completely or somewhat well covered currently.

Surgical Faculty

Topics nominated by the surgical faculty (Table 4) clustered around improvement science (data, QS methodology, QS tools and techniques, QS history) and nontechnical skills (teamwork, communication, and leadership). One topic straddled both domains (change management).

When asked to record their most preferred way for teaching each topic, the most common answer overall was didactics. This was the most frequent answer for many of the improvement science topics (data, methods, tools/techniques, and change management), and was tied for most frequent answer for the additional topics of communication and teamwork. For most topics, 3 or 4 teaching methods all drew votes, and when allowed to list more than 1 method faculty demonstrated a greater degree of preference for diverse and mixed methods (data not shown).

Regarding preference for assessment methods, MCQs were the most preferred method for 4 of the topics (data, history, methods, and tools/techniques). One participant suggested and described an alternative assessment method, consisting of having learners watch a video of a standardized or simulated incident and then answer MCQs. After discussion, this became the most-preferred method for assessing nontechnical skills. However, the feasibility of using this technique in isolation was called into question.

DISCUSSION

This qualitative study examined learner and expert views on topics to be included in a quality and safety curriculum designed for surgical residents. We found broad agreement between the 2 groups on the overall scope of topics that should be included in a curriculum devoted to quality and safety in surgery. These included the background and methodology of improvement science and nontechnical skills such as teamwork and professionalism.

Discussions within each focus group revealed differences in the perception of each domain across the 2 cohorts, with residents placing a greater focus on techniques to develop a robust safety culture and practical application of evidence-based medicine principles. Faculty did not include the broad category of safety culture in their list of consensus topics but did include the more focused topics of implementation and change management. Faculty also did not include evidence-based medicine principles but agreed on the importance of integrating these principles into training. This gap may reflect the lack of evidence on best practices across the broad field of general surgery. A significant amount of surgical care, and thus surgical training, is based on experience rather than a rigorous evidence base. As residents advance in their training, they may look to the field of QS for education on evidence-based practice and ways to integrate existing knowledge into standardized care pathways that lend themselves to rigorous assessment.

The current state analysis performed by the residents demonstrated tremendous variability in the training on QS. Notably, 2 residents from the same residency program gave different responses for many of the topics,

TABLE 4. Consensus List of Faculty-Proposed Topics Including the Results of a Vote on the Best Method for Teaching and Assessment

Topic	Example of Included Components	Best Method to Teach (# Votes)	Best Method to Assess (# Votes)
Change management	Stakeholder engagement; maximizing morbidity and mortality conference; human factors principles	Didactics (5)	Open-ended questions (4) Graded participation (4)
Communication	Basic QS vocabulary	Didactics (3) Small group (3)	Simulation-based MCQ (9)
Data	Sources; measurement; analysis	Didactics (9)	MCQ (9)
History	Industrial background, Codman's "end-results"; current landscape; policy and regulations; local and national infrastructure	Video (7)	MCQ (10)
Implementation	Sustaining results; implementation science principles; SQUIRE guidelines	Small group (5)	Open-ended questions (7)
Leadership	Emotional intelligence; situational awareness; personality assessment tools; identification of institutional resources	Video (4)	Simulation-based MCQ (5)
Methods	How to develop a question; how to create an aim statement; project design; driver diagrams; rapid cycle innovation; plan-do-study-act; lean manufacturing; 6-sigma	Didactics (9)	MCQ (7)
Teamwork	Team structure; assigning roles; engagement	Didactics (3) Activity (3)	Simulation-based MCQ (10)
Tools/techniques	Audits; coaching; control and run charts; dashboards; peer review; root cause analysis	Didactics (7)	MCQ (8)

indicating how inconsistent training in these topics is even within the same institution. This high degree of variation is consistent with the existing literature within graduate surgical education. Only a handful of published single-institution experiences with teaching QS exist,[11-16] without a standardized comprehensive curricula available to program directors.

Consistent with the findings from an earlier systematic review,[4] our faculty demonstrated the most comfort with traditional methods of education and assessment, specifically didactics and MCQ assessment. While the use of alternative educational techniques such as simulation is growing within GME and surgery,[17,18] the focus on more traditional pedagogy likely reflects the level of familiarity with alternative techniques among our participants (and likely, the broader surgical community). With the growing national focus on competency-based education, faculty development in alternative teaching and assessment modalities will likely be necessary.

Training in quality and safety domains is crucial to the education of surgeons able to provide effective, appropriate, and efficient care following the transition to independent practice. While this need has been recognized by the surgical education community for more than 10 years, there is not yet a comprehensive curriculum available for use. Meanwhile, there is a growing national mandate to formalize QS training, including the ACMGE common program requirements and the recommendations of the Clinical Learning Environment Review program. While an assortment of materials related to QS is available, few are specific to procedural specialties, which face unique challenges in incorporating these concepts into training.

This study highlights the existing variability in current QS training and provides a concrete outline for the content and structure of such a curriculum. To our knowledge, this is the first study to separately collect input into QS domains in surgery from both learners and experts, an important step to identifying both anticipated and unanticipated gaps in current training. By conducting our focus groups within the context of a national meeting, we were able to bring together learners and experts from a diverse set of geographic backgrounds, specialties, levels of experience, and institutions. Our hope is that these results allow for the necessary next steps in developing a resident curriculum on quality and safety. For this to occur, the medical education governing bodies must agree on the goals of such a curriculum. At the present time, the importance and need for QS education is clear, but the focused goals and objectives of a national curriculum have not been clearly elucidated. Are we teaching residents the knowledge and skills to succeed as a surgeon within a modern "learning" healthcare organization, or are we training them to lead quality and safety efforts within such an organization? The answer to this question will enable us to translate the findings from this study and other work in this domain into a standardized curriculum for use in surgical education.

As in other qualitative research, our findings are limited by the size of our focus groups. While we included participants from a wide range of institutions, they may not represent the wider surgical GME community. There may be important components of QS training that were not captured in our discussions.

CONCLUSIONS

Quality and safety are integral domains of surgical training. Despite over 10 years of attention in the surgical education literature, there is not yet a comprehensive curriculum available. Focus groups with current residents and QS experts identified topics to be included in such a curriculum and outlined answers to important questions such as teaching and assessment methodology. These findings can be used to guide further development of a standardized curriculum within surgical residency.

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SUPPLEMENTARY INFORMATION

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