Building a Framework for Self-Regulated Learning in Surgical Education: A Delphi Consensus Among Experts in Surgical Education

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OBJECTIVE: Practice-Based Learning and Improvement is a Core Competency for surgical residents. Self-regulated learning (SRL) skills are an important component of this competency, yet are rarely taught in surgical training. Before we can teach SRL skills to residents we must understand the attributes that are essential. The purpose of this study was to develop a framework for SRL for surgical trainees.

DESIGN: This mixed-methods study design utilized a two-round modified-Delphi approach to develop consensus among experts in surgical education regarding SRL in surgical training. Round One included SRL constructs derived from educational, professional, and medical literature. Based upon quantitative data and thematic coding of comments, these constructs were adapted for applicability in the context of surgical residency and reorganized using a constant comparative approach. Revised constructs and groupings were presented to the expert panel in Round Two. Further survey rounds were not needed as all items in Round Two reached the predetermined consensus level of 70%.

SETTING: The Delphi panel was a purposeful sample of nationally recognized experts in surgical education, including members of the Association for Surgical Education and the Association for Program Directors in Surgery.

PARTICIPANTS: Thirty-eight of 42 experts (90.5%) responded to Round One, representing 29 academic and community medical systems nationally. The response rate for Round Two was 92%, 35 of the 38 Round One participants.

RESULTS: In Round One, the SRL constructs were all viewed as important with median scores ranging from 50 to 99.5, on a 100-point scale. Two hundred and ninety-one comments were coded and used to refine SRL definitions into 7 domains for Round Two, which included self-awareness, task analysis, situation awareness, strategic planning, progress evaluation, learning and performance management, and goal attainment and refinement. All Round Two items reached greater than 70% agreement, and received 51 free response comments. Several key themes emerged: clinical prioritization over learning, learner's limited control, value and reliance on external resources, low use of metacognition, and complex goal orientation. Incorporation of common themes generated a novel multi-stage framework of SRL in surgical education.

CONCLUSIONS: Surgical residency represents a unique learning context, in which the ideal learner is one who understands their learning environment and utilizes available resources to optimize their own learning. Experts in surgical education believe SRL skills are important in training, and a novel framework of SRL is necessary to support a learner-centered model within the demanding environment of surgical training. (J Surg Ed 76:e56–e65. © 2019 Association of Program Directors in Surgery. Published by Elsevier Inc. All rights reserved.)

KEY WORDS: Surgical education, Resident education, Self-regulated learning, ACGME Core Competencies, Graduate medical education, Learning theoretical framework

COMPETENCIES: Practice-Based Learning and Improvement

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INTRODUCTION

The structure of surgical training in the United States has undergone a dramatic shift in the last century through diversification in subspecialty fellowships and early integration of specialty training in residency.[1,2] Because no 2 training experiences are the same, each learner must monitor, adjust and direct their own education to meet their individual learning needs. Under the Core Competency of Practice-Based Learning and Improvement, a resident must engage in "self-initiated, self-directed learning activities", and demonstrate the "ability to learn from the results of his/her practice".[3] However, many residents are not able to assess their own level of competency and program directors believe that many graduating residents are not capable of independent practice.[4,5]

Self-regulated learning (SRL) is purposeful, proactive, and learner-driven. Unlike self-directed learning in which learners follow a defined curriculum of learning objectives, SRL centers the learner in the entire learning process, from goal formation to appraisal of knowledge demonstration, and how successful or unsuccessful goal attainment shapes future learning experiences[6]; classically viewed as 3 cyclic phases occurring before, during, and after a learning episode.[7] However, existing SRL models correlate poorly with success in medical school and research in surgical residents have examined only a limited number of individual SRL components, such as goal setting,[8,9] technical assessment,[10,11] and self-reflection.[12,13]

We hypothesized that although SRL constructs have been established in other disciplines, the adaption and implementation of these skills are different within the educational environment of surgical residency. Given the extensive literature on SRL in other educational and professional settings, a modified-Delphi technique was chosen in which published SRL constructs were adapted by experts in surgical education to describe SRL for surgical residents. The research question addressed in this study was "what SRL attributes and strategies do experts in surgical education deem necessary for residents during surgical training?" The purpose of this exploratory study was to develop a framework for SRL in order to understand the attributes of SRL as they apply to surgical residents, with the goal to promote and enhance SRL within surgical training.

METHODS

This study was deemed exempt by the USC Health Sciences Institutional Review Board. A modified Delphi survey technique was the methodologic framework used for this study.[14] The goal of a Delphi study is to achieve group consensus through a series of sequential surveys that are refined based upon the previous responses of the group.[15] Iterative rounds use quantitative and qualitative data to explore a complex topic, until group consensus is reached or topics have reached saturation. The predetermined consensus level for termination of this Delphi study was set at 70%.

Expert Panel

The Delphi panel was a purposeful sample of nationally recognized experts in surgical education, serving as members of the Association for Surgical Education and the Association for Program Directors in Surgery. Forty-two individuals were identified for the expert panel, with an aim to select enough individuals to capture a variety of teaching environments.

Survey Design and Analysis

SRL attributes and skills were identified from an extensive literature review of traditional educational, professional, and medical domains. In Round One, the panel was asked to evaluate 25 SRL characteristics for relevancy in surgical residency, and rate level of importance on a scale from 0 to 100. Space was provided for written comments for each item. Additionally, respondents were also asked to identify any aspects of SRL in surgical residency that may not have been included.

Quantitative analysis of Round One was used to provide a general sense of importance and agreement for each SRL stem. Consistent to using the mixed-method Delphi technique framework, these quantitative measures were not taken in isolation, but rather were used in conjunction with qualitative analysis. A constant comparative approach and a six-step model by Creswell were used for analysis of qualitative data.[16] Coded comments were used to modify SRL constructs from Round One, which were reorganized into 7 themes or novel domains to construct the survey for Round Two.

The purpose of Round Two was to capture the agreement of the expert panel with the surgery-specific SRL constructs developed during analysis of Round One. Respondents were asked to agree or disagree with the refined definition for each construct in the domain. Space was made available after each domain to provide overall comments or suggestions (see supplemental materials for surveys distributed in Round One and Round Two). A final framework for SRL was created based upon data from Round One and Round Two. The Delphi structure for data collection and analysis is presented in Figure 1.

Survey Distribution

Panel members were contacted by email; Delphi rounds were distributed via electronic survey, using Qualtrics

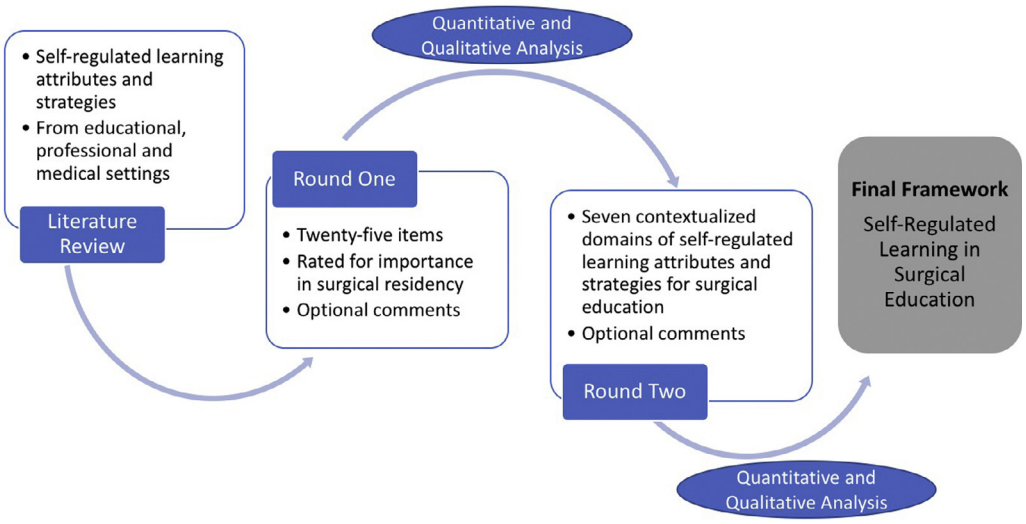

FIGURE 1. Delphi study structure for data collection and analysis. Building a framework for self-regulated learning in surgical education with a two-round modified Delphi survey.

online software (Qualtrics, Provo, UT, 2018), with each survey open for 2 to 3 weeks. Only the individuals who successfully completed the Round One survey were invited to participate in Round Two.

RESULTS

All participants were members of a national organization involved in resident education (Association for Surgical Education, Association of Program Directors in Surgery), and were actively involved in educational research. Thirty-eight of 42 experts (90.5%) responded to Round One, representing 29 medical systems nationally. Six (14.3%) were recruited from community hospitals. The response rate for Round Two was 92%, 35 of the 38 Round One participants.

Round One Results

Quantitative analysis of Round One demonstrated a high overall value of SRL attributes and behaviors in surgical education. All 25 stems received a median score of 50 or greater for the importance to surgical residency, on a scale from 0 to 100 (Not Important to Very Important). Many comments suggested that experts rated items lower because the language used in educational psychology could not be applied to the surgical trainee directly. The ratings of each item are shown in Table 1, and were used in conjunction with qualitative data to build the survey for Round Two. Two hundred and ninety-one comments from the SRL constructs and 59 free response comments were coded and used to refine SRL definitions to improve relevance to surgical training. Based upon these results, the SRL constructs were organized into 7 domains for Round Two: self-awareness, task analysis, situation awareness, strategic planning, progress evaluation, learning and performance management, and goal attainment and refinement.

Round Two Results

Overall, there was 94% agreement by the expert panel to the items on Round Two. All items reached the predetermined consensus level of 70% agreement, as demonstrated in Table 2. With consensus obtained for all items, and after review of the 51 comments, it was determined that saturation had been reached and additional rounds would not be necessary. Only one participant agreed with less than 70% of the items (64%), in comparison to those in strong agreement, 30 participants (86%) who agreed with 90% or more of the items. Compared to comment coding in Round One that focused on adjusting SRL definitions for surgical education, Round Two comments were analyzed thematically, with several key themes emerging from the data. Upon further review, many of these themes were also reflected in the original comments from Round One.

Qualitative Theme: Clinical Priorities Supersede Individual Learning

Many SRL behaviors were related to executive functioning and awareness of one's learning environment, managing multiple tasks, and attention control. However, multiple experts emphasized labeling patient care as its own entity and not just simply another task. Patient care as a priority that superseded individual learning was a recurrent theme across multiple constructs in Round One. This theme was incorporated into the situation awareness domain of Round Two. In the final

TABLE 1. Round One Survey Results

Rank	Median	Range	Round 1 Item	Coded Comments
1	99.5	60-100	Utilize feedback: Receive, analyze and incorporate feedback	7
2	95	51-100	Time management: Prioritize and manage competing demands	9
3	90	50-100	Planning: Analyze and develop a plan to accomplish their learning goals	17
4	91	50-100	Effort: Work hard, and persist through adversity	8
5	91	25-100	Help-seeking: Know when and how to ask others for help	11
6	93.5	25-100	Goal setting: Establish their own learning goals	32
7	84.5	50-100	Attention: Concentrate and direct their focus	8
8	80	40-100	Self-efficacy: Have confidence in their ability to complete a task	12
9	78.5	40-100	Monitoring: Track their progress toward goals, and adapt as necessary	7
10	78	26-100	Attribution judgments: Identify reasons for good or bad outcomes	11
11	82	0-100	Evidence-based: Uses evidence-based medicine to inform practice	6
12	75.5	26-100	Efficiency: Work smart to accomplish goals in a timely manner	5
13	79	10-100	Self-reaction: Accept or forfeit rewards based upon success, progress, or need to delay gratification	5
14	75	23-100	Emotional control: Monitor and regulate their emotions	10
15	75	25-100	Use of models: Learn by watching people who are more skilled than them	10
16	75.5	25-100	Outcome expectations: Visualize and articulate the final product of their efforts	16
17	75.5	1-100	Collaboration: Able to learn and grow when working with others	7
18	66.5	25-100	Environmental structuring: Choose settings that enhance their learning	17
19	67	10-100	Metacognition: Monitor their thought processes and how they are affected by their own actions	10
20	62.5	20-100	Performance calibration: Accurately match their confidence with performance	7
21	68.5	1-100	Strategic use: Use learning strategies to reach their learning goals or complete a task (such as checklists, mnemonics, or reminders)	13
22	59.5	21-100	Motivation: Know what motivates them to pursue a learning goal	9
23	68	25-100	Goal orientation: Choose goals based upon mastery of the content rather an a need to demonstrate ability	27
24	60	1-100	Innovative: Be open to using new technology or techniques	8
25	50	24-100	Value appraisal: Make choices based upon their interests, as well as the perceived costs and benefits of learning	19

framework, patient care was listed as an independent factor that must be weighed against other competing responsibilities, and with limited time and resources.

Qualitative Theme: Limited Learner Control

Experts reiterated throughout both rounds that resident learners have little control over their learning topics and learning environment. One of the lowest ranked items of Round One was the SRL behavior "environmental structuring", and although it was valued in theory, experts emphasized that residents have limited control over their learning, clinical, and working environments. Respondents from Round One stated "it is likely helpful to be forced into sub-optimal environments," that "sometimes the learning needs to be fitted into existing life conditions," and that "the learner must be able to adapt to the situation."

Transitioning from a choice in learning environments to learner adaptability was incorporated into multiple domains for Round Two, including situation awareness, strategic planning, and learning and performance management. Qualitative analysis of Round Two indicated that experts had difficulty accepting this construct as presented, with some experts stating again that this is out of the control of the resident. Few solutions were offered for situations deemed a poor learning environment.

Qualitative Theme: Value and Reliance on External Resources

Awareness, utilization, and reliance on external resources were themes common to several SRL domains in Round Two. One of the participants emphasized that self-awareness cannot be limited to self-assessment, that self-regulation involving self-awareness includes the awareness of external assessment and calibration. Elements of utilizing external assessment were present in Round Two, but the behavior "performance calibration" was deemed to be confusing and was rated similar to environmental structuring which received a low median score in Round One.

TABLE 2. Round Two Survey Results

Round Two Level of Agreement	
Self-awareness: Awareness of one's own skills and deficits, as well as their cognitive, emotional, and motivational states	Overall: 95%
Recognizes current knowledge and skill level, based upon self-assessment and external evaluation/measures	100%
Cognizant of personal limitations	97%
Aware of personal learning strategies that have been previously successful	100%
Metacognitively aware of personal patterns of thought, emotion, and motivation, and mindful of their effects	83%
Task-analysis: Appraisal and development of one's goals for an activity, as well as its learning value and expected outcomes	Overall: 92%
Appraises task level and need for guidance	97%
Establishes specific, achievable, and progressive individual goals to guide learning, in alignment with known standards, such as established curricula or national mandates	100%
Utilizes mentors to refine goals based upon current performance and trajectory	97%
Visualizes and articulates success	85%
Seeks published empiric evidence or consensus data to inform current practice when relevant	94%
Understands the costs and benefits of task engagement, balance intrinsic interest and external demand	77%
Situation awareness: Understands and appreciates concurrent responsibilities and patient care, resource and time availability, and interpersonal aspects of their environment	Overall: 92%
Prioritization of competing demands	97%
Aware of time constraints	97%
Knows or researches available resources	89%
Understands team roles, strengths/weaknesses, and dynamic	86%
Strategic planning: Incorporation of personal, task and environmental factors to define goal orientation, mental and physical resource allocation, self-preparation, and process planning	Overall: 91%
Develops specific steps for goal achievement, seeking guidance when necessary	100%
Identifies learning and performance strategies, such as self-instruction, checkpoints, mnemonics, or teaching	89%
Alternates between a performance goal orientation if needing to demonstrate ability, and a mastery or growth orientation during skill/construct development	83%
Actively shapes the learning environment by communicating goals, and requesting autonomy, teaching, and/or feedback	91%
Progress evaluation: recognizes discrepancies between goals and current state, and appraises the situation to determine the cause	Overall: 97%
Observes and tracks performance toward a goal	97%
Identifies gaps in knowledge, skill, or motivation	97%
Appropriately attributes errors or success to internal and external factors	97%
Incorporates success and failures into future goal generation	100%
Determines the need to adhere or adapt current learning strategies or goals, based upon effectiveness and need for deeper learning	94%
Manage learning and performance: utilizes individual and systemic strategies for improvement	Overall: 95%
Seeks and uses available resources	97%
Actively seeks assessment and feedback from multiple sources, including peers	100%
Evaluates quality and relevancy of feedback, and incorporates appropriately	94%
Differentiates help based upon the demands of the task and specific deficits	83%
Finds, observes, and learns from peers or experts to develop appropriate mental and motor skills and coping strategies	97%
Evaluates current knowledge or processes, and adapts practice when necessary	100%
Identifies, selects, and adapts learning environments to increase goal attainment as circumstance permits	83%
Concentrates and directs focus to the most pressing task, and manages distractions	94%
Regulates emotional response to maintain focused performance and learning	97%
Identifies individual weaknesses in motivation, effort, or efficiency	100%
Goal attainment and refinement: Uses specific short-term goals to develop mid-term goals, which ultimately build upon long-term goals or a main driving principle.	Overall: 98%
Continually references or builds an overall mission or long-term goal, and uses this to persist through adversity and find career purpose	94%
Develops strategic goals to reach long-range goals, with the assistance of mentors and self-reflection	100%
Creates, refines, and adapts short-term goals depending on environmental circumstances, and availability of personal and external resources	100%

Both of these elements are traditionally described as learner initiated, yet comments in opposition reported greater value on the program's ability to provide external assessment of the resident rather than the skill of an individual resident to identify appropriate resources.

Overall, comments placed more emphasis on the infrastructure that supports the resident, rather than the resident's self-initiated use of external resources. One responder stated that a learner's recognition of his or her own knowledge and skill level "obviously requires a residency [program] that is supplying appropriate, meaningful, and timely external evaluation." Another suggested a rephrasing of a learner-initiated search for available resources, to learner appraisal of "value and limitations" of resources provided. Although this is slightly nuanced, the comment suggests that the learner's role is more receptive, and that it is the residency program's responsibility to make resources available to the learner.

Qualitative Theme: Limited Metacognition in the Field of Surgery

A major aspect of SRL is one's ability to recognize his or her own thoughts, actions, and patterns. Throughout both rounds, and in multiple domains, metacognition was viewed by the experts as a lofty goal and one not learned in residency or by many practicing surgeons. Comments stated that "metacognition is acquired over years of self-reflection... I doubt that many people...are especially good at that", and that "the majority [of people don't] really get there." The concept of partial metacognition was the theme of a few comments: "an emerging awareness," "a partial awareness," or awareness but not "the ability to modify their metacognitive attributes."

Qualitative Theme: Complex Goal Orientation

Statements surrounding goal orientation remained too nebulous for many respondents, receiving a low median score in Round One, and many comments in both rounds. Goal orientation was described as "way too dense of a construct", with "too much verbiage." The dichotomy between performance and mastery orientation was a concern for the panel. It was expressed that "mastery orientation is not inconsistent with needing to demonstrate an ability." Given this finding, it is possible that the psychology term "mastery" is misinterpreted in this study as reaching a level of autonomy. One participant stated that "residents achieve relatively little true mastery in their GME years, but must develop many skills to the level of basic ability," while another clearly stated, "mastery of content could mean ability to perform independently... there are very few opportunities for surgery residents to function independently."

Overall Framework

Figure 2 provides a visual representation of the overall framework for SRL in surgical education which attempts to address the ever-changing learning environment in

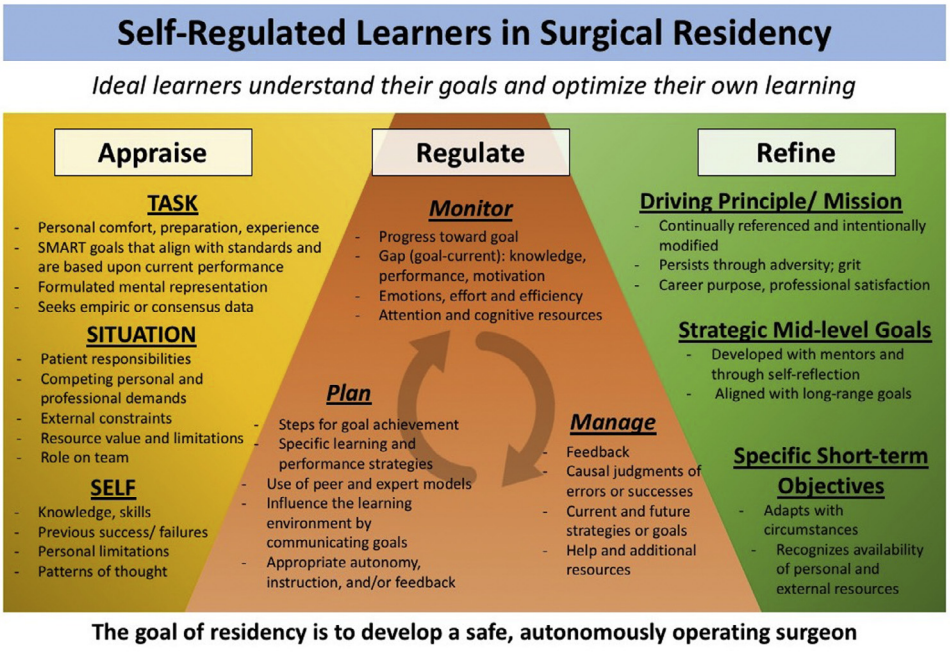

FIGURE 2. Self-regulated learning framework in surgical education. Self-regulated learners in surgical education must appraise the task, the situation, and be self-aware; regulate their learning in a proactive, adaptive, and reflective manner; pursue and refine hierarchical learning goals.

which surgical residents must continually appraise, regulate, and refine their approach to learning. During activity shifts or with the introduction of new tasks, learners must reappraise their required tasks, how these tasks fit within their broader situation and responsibilities, and ultimately assess their own ability to be successful given their current resources. While actively engaging in patient care or individual learning, residents must continually regulate their processes by developing appropriate plans, monitoring their progress and own thoughts and behaviors, and ultimately managing and adapting their behaviors or goals based upon self-evaluation and feedback from others. All of these actions must be guided by short, medium, and long term goals, while being mindful of formally- and informally-set competency levels. Through self-reflection and work with mentors and career advisors, residents need to continually refine these goals and ensure alignment of hierarchical goal structures to individual overarching career goals. While this fluid model attempts to capture the complexity of SRL in surgical training, it must be appreciated that many of these elements are changing on a daily or hourly basis, in a fast-paced hospital environment in which outcomes are multifactorial and often outside of the control of the learner. Furthermore, as emphasized by the expert panel, resident learning and performance goals are contingent upon competing patient care needs.

DISCUSSION

Surgical education has evolved from a pure apprenticeship model to one that attempts to maximize the training of many residents in a diverse set of training environments and instructors.[17,18] This shift has coincided with a change in how regulatory agencies view accreditation, from evaluating programs directly, to now assessing the products of these training programs, the trainees themselves.[19] To accommodate the growing diversity of training paradigms and the ever-changing body of knowledge, the medical education community has seemingly embraced the concepts of learner-centered education and lifelong learning.[3,20] As one of the 6 ACGME Core Competency domains, Practice-Based Learning and Improvement defines several skills required of lifelong learners that fall within the broader concept of SRL, such as self-assessment, recognition of personal skills and limitations, establishment of learning goals, reflection on practice, and incorporation of feedback for personal improvement.[21] Therefore, SRL offers an ideal conceptual framework for teaching and evaluating Practice-Based Learning and Improvement in surgical education.

In order to promote SRL in residents, surgical educators must first understand SRL attributes within the context of surgical residency. This study confronts prior discouraging results of studies examining SRL behaviors in medical students. The results have been inconsistent when SRL behaviors that were previously defined for non-medical populations are studied in medical students,[22] with decreased utilization of some behaviors during training,[23,24] and poor correlation of SRL use with defined measures of success.[25] Therefore, we aimed to develop a framework that captured the context-specific aspects of SRL for surgical trainees.

The methodology chosen for this study was the Delphi survey technique, which is a unique form of mixed-methods research that fosters collaborative discussion and protects individual participant anonymity, while simultaneously moving the group toward consensus. In a Delphi method, the validity and value of the results depend upon the panel of experts, their commitment to the research, and adherence to core principles of the Delphi method,[26] including use of a purposeful sample, iterative rounds, controlled feedback of previous results, and incorporation of panel suggestions. In this study, the panel captures significant expertise from the field of surgical education, with over 20% of the panel serving as a president of either the Association for Surgical Education or the Association for Program Directors in Surgery. The panel demonstrated commitment to the research, with response rates for both rounds exceeding 90% and over 350 written comments. In Round One, although all original 25 SRL constructs were felt to be at least somewhat important, there was decent variability among respondents with 80% of items receiving at least one score below 50 on a 100-point scale. After restructuring the SRL constructs and framework to include appropriate surgical education language and opinions from Round One, 75% of the items received over 90% consensus, and all items had greater than 70% agreement. A movement from 20% to 75% agreement represents a significant methodologic success,[27] achieving the goal of moving a group of individuals toward a consensus without allowing conversation to be dominated by a few individuals.[14] Figure 3 demonstrates the specific design and results of the Delphi technique in this study.

The rich comments from the expert panel allowed qualitative analysis of the learner (surgical residents), the learning environment (patient care settings), and the educational system (faculty, residency training programs, and governing agencies). Compared to traditional models of SRL that support learner agency to direct his or her own learning, the expert panel identified unique constraints of the learning environment in surgical residency, which must also function as a work environment delivering excellent patient care. In this environment, experts expressed significant limitations to having learners modify their learning environment, or independently set learning goals without guidance from faculty.

According to the ACGME, both faculty and residents must recognize that work and patient care supersedes

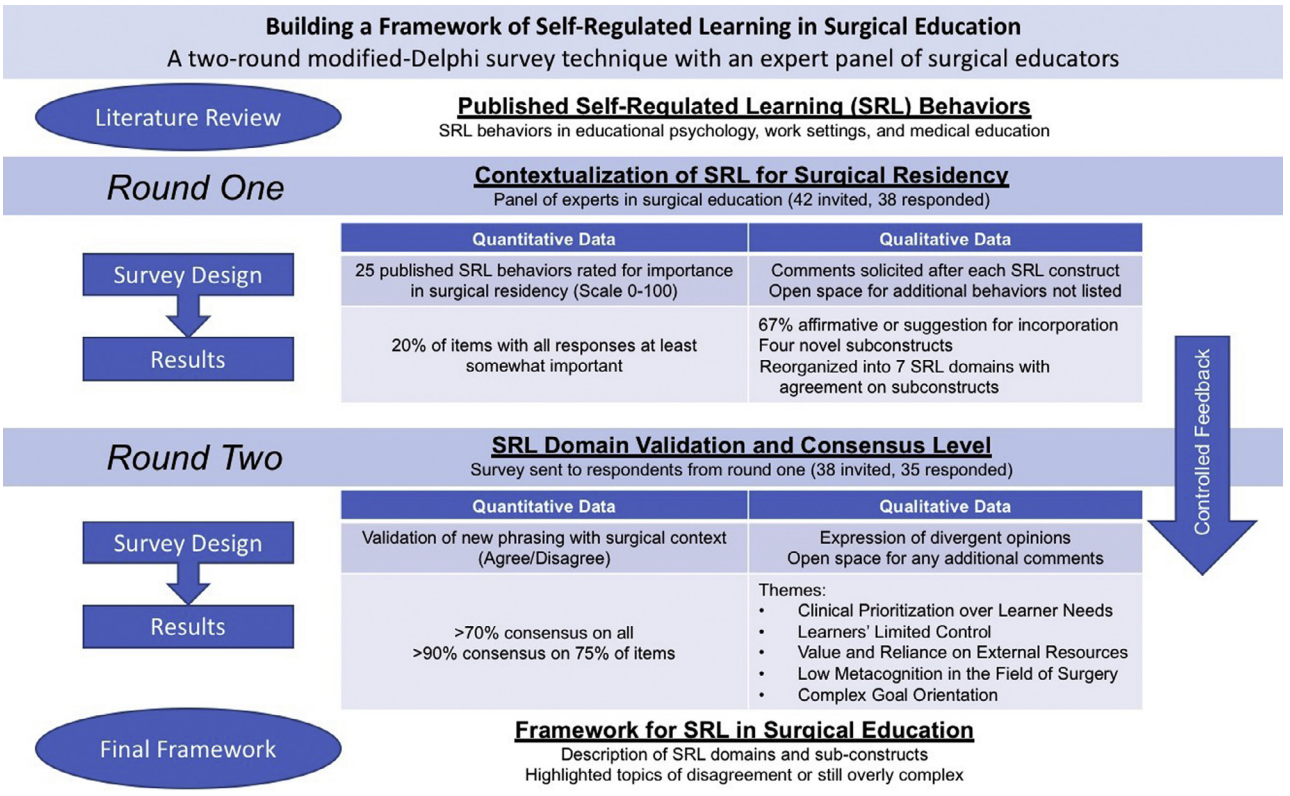

FIGURE 3. Quantitative and qualitative results. Each Delphi survey round assessed and provided unique quantitative and qualitative data, with incorporation of panel feedback after each round.

learning and personal interest in surgical residency.[21] However, without internal restructuring to accelerate resident learning, evolving external constraints create a zero-sum environment that must balance service and education. Increased duration of training through fellowships and use of simulation are some examples of efforts used to combat external constraints that interfere with resident education, including work-hour restrictions, the expanding amount of required skills and surgical knowledge, as well as increased demands on faculty and residents. Slowly, governing bodies have recognized the diversity of surgical practice, and new models for individualized resident training are emerging, such as integrated specialty programs, and the expansion of independent board certification to allow specialty training without core general surgery. Yet, many trainees still feel unprepared for independent practice,[28] and program directors request effective, efficient training with a structure that uses the curriculum more wisely, and has evidence to back up theory-based curriculum.[29,30]

From a regulatory standpoint, the surgical community has embraced the transition from a teacher-centered, process-oriented teaching approach to a learner-centered competency-based educational model.[31] Yet our study demonstrates that experts in surgical education struggle with the application of many SRL concepts, and identify aspects of training which limit SRL in surgical education as it currently exists. Learner-directed educational models have failed to account for the patient at the center of the surgical environment, ultimately creating an incomplete picture of the learning environment for surgical faculty, trainees and governing bodies. Although the panel of experts valued SRL, these leaders in surgical education emphasized the need for a process-oriented teaching philosophy, reliance on external structure, and the inflexibility of the learning environment. The final framework highlights the complex interplay of patient-care prioritization, an unpredictable clinical environment, and the requirement for surgical trainees to perform and learn despite competing demands and limited resources.

There are specific limitations of this study which are inherent to its design. The results of this study are the opinions of the panel, and would classically be described as nongeneralizable. However, the intent of this study was to provide guidance for educators and learners who seek to understand and apply SRL in a surgical context. The methodology of this study was deliberately selected, in addition to the analysis and presentation of data. Although the opinions expressed here are those of the distinct panel of experts and the development of constructs through iterative rounds, the hope is that the reader recognizes this not

singularly as a limitation but also as a powerful representation of consensus among experts in the field of surgical education. Furthermore, the use of iterative rounds provides unique validation of the qualitative interpretation of data from Round One.

This study also represents a needs assessment for learner-centered education in surgery. Governing bodies have mandated inclusion of many SRL principles into surgical curriculum, including self-assessment, recognition of one's own limitations, creation of learning goals based upon these deficits, individualized learning plan development, and reflection on individual practice. This study affirms that expert surgical educators perceive value in these SRL behaviors. However, the available research for medical school and medical specialties suggests that the surgical community poorly teaches and evaluates SRL behaviors. We hope that the results of this study will be used to guide further exploration into specific SRL behaviors, leading to the development of more refined learning objectives, curriculum, and assessments, as well as programs for faculty and staff development. As emphasized by our expert panel, implementation of SRL behaviors must recognize and value the unique patient care aspects of the surgical educational environment.

CONCLUSION

This study is the first of its kind to systematically assess SRL for surgical residents from the perspective of the educator. The methodology has demonstrated the importance of SRL behaviors in surgical residency and is coupled with overwhelming and unanimous support from experts in surgical education from a diverse set of teaching environments, both geographically and in regard to academic affiliation. As a consensus study we provide a distinctly new framework tailored for SRL in surgical residency. With this in mind, this study should serve as a foundation for future work to validate and elaborate upon the utility of SRL in this context-specific manner. Further exploration of SRL constructs and curriculum for specific SRL behaviors in surgical education may provide additional guidance for educators and learners during the transition to competency-based surgical education, while also supporting the call to develop surgeons as lifelong learners.

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SUPPLEMENTARY INFORMATION

Supplementary material associated with this article can be found in the online version at doi:10.1016/j.jsurg.2019.06.012.