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Quantitative and qualitative analysis of performance during advanced laparoscopic fellowship: a curriculum based on structured assessment and feedback



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Assessment;
Instruction;
Operative performance analysis;
Reflective practice;
Feedback

Abstract

BACKGROUND: The objective of this study was to examine the acquisition of advanced laparoscopic technical and cognitive skills during a fellowship.

METHODS: During a yearlong fellowship, consecutive assessments were completed by a fellow and 1 attending for 3 advanced procedures. The Global Operative Assessment of Laparoscopic Skills, Objective Structured Assessment of Technical Skills, and procedure-specific rating tools and free-text feedback were used. Descriptive statistics, the *t* test, linear mixed-effects regression, and qualitative analysis of feedback were performed.

RESULTS: Seventy-six cases were included. Average ratings increased for each assessment area every month ($P < .001$). There were significant differences between ratings by assessors with more stringent ratings by the fellow. While the attending focused on efficiency and safety, the fellow focused on technical issues, with later expanded attention to advanced cognitive aspects.

CONCLUSIONS: These assessment tools can be used as a quantitative index to monitor fellows' learning curve. In combination with narrative feedback, such data can provide measures to direct improvement during self-directed learning.

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Advanced minimally invasive surgery fellowships, such as those accredited by the Fellowship Council, were established to provide fully trained general surgeons the opportunity to develop further experience in minimally invasive surgical management of complex surgical issues.¹ Such fellowships depend on an apprenticeship model, where stepwise development of competency occurs through observing, assisting, and eventually taking the role of lead surgeon at the end of training. To guide the acquisition of

competency, the Fellowship Council developed specific standards and learning objectives to direct fellows' education toward achieving competency in the subspecialty.¹ In addition to mandatory case logs, the council proposed a curriculum that is built on Accreditation Council for Graduate Medical Education competencies.² One of these competencies is "practice-based learning and improvement," where fellows are required to use feedback from faculty and their own self-assessments to develop a plan for filling gaps in knowledge or skills.¹

Fellows usually perform a large number of a few index cases and have daily interaction with a small group of attending surgeons. These attending surgeons provide most feedback and instruction during operations. Fellows are required to work on weaknesses using textbooks and other resources to prepare for similar operations in the future. This self-improvement activity is often unguided and without established postoperation performance analysis.

In recent years, the paradigm shift toward competency-based surgical training has also led performance assessment to become an important research topic.³ Valid assessments are also required to better plan instruction and assess the efficacy of curricular interventions.⁴ Much of the research on instructional aspects of surgical training has been conducted in a simulated environment with the main focus on basic surgical skills.⁵ No study, to our knowledge, has investigated the learning experience of an advanced surgical trainee using objective operative assessments, immediate feedback, and structured instruction in an apprenticeship-based training model.

The objectives of this study were to examine the acquisition of advanced laparoscopic technical and cognitive skills during a laparoscopic fellowship and to determine whether there was an association between self-assessment by a fellow and that of a faculty member using a single-subject design in a structured training curriculum.

Materials and Methods

During a minimally invasive surgery fellowship at the University of North Carolina at Chapel Hill, a fellow completed daily self-assessments and reviewed video recordings of the operations in which he participated. The attending also completed assessments of the fellow's performance. Three commonly performed advanced laparoscopic procedures in the fellowship were selected: Roux-en-Y gastric bypass (RYGB), paraesophageal hernia repair with Nissen fundoplication (PEH/NF), and Heller myotomy (HM).

This study was a single-subject design in which yearlong consecutive assessments by the fellow and the primary attending were prospectively collected. Single-subject designs are widely implemented in education and in psychology and use the participant (unit of analysis) as his or her own control.⁶ Data from secondary attendings were excluded to ensure consistency of instruction and assessment, as were reoperative

cases, and assessments completed more than 24 hours after the operation. No patient information was included.

Instructional methods

During a research year before the clinical year, the fellow watched videos of the common procedures to become familiar with the methods and techniques used in the fellowship. After starting his clinical training and initiating this study, the fellow completed self-assessments before reviewing the videos of his performance at the end of each day. The attending made his comments based on the live cases. Then, once the attending's text feedback was available for review, the fellow reviewed the important steps of each procedure with particular attention to identified areas of difficulty or technical challenge in a low-stress environment. The attending and fellow spent 5 to 10 minutes to complete each assessment. In addition, the fellow watched the important steps of each procedure he performed for an average of 60 to 90 minutes per day. In the beginning of the fellowship, the fellow spent about of 5 to 6 hours per week to review and analyze his performance. As he progressed in the fellowship, he was able to primarily focus on the areas in which he faced challenges during the operation. This decreased the amount of time spent watching the videos to 5 to 10 minutes for each procedure (an average of 30 to 60 minutes per week). The fellow and attending discussed the feedback regularly to ensure clarity in the message.

Assessment of operative performance

The Global Operative Assessment of Laparoscopic Skills⁷ (GOALS; [1] depth perception, [2] bimanual dexterity, [3] efficiency, [4] tissue handling, and [5] autonomy) and the Objective Structured Assessment of Technical Skills⁸ (OSATS; [1] respect for tissue, [2] time and motion, [3] instrument handling, [4] flow of operation and forward planning, and [5] knowledge of specific procedure) tools were used to assess general laparoscopic skills during HM and RYGB. In addition, procedure-specific assessment tools for PEH/NF⁹ ([1] initial assessment, [2] retraction of liver lobes and stomach, [3] identification of esophagus, [4] dissection of the esophagus from crura, [5] hiatal closure [6] wrap of the fundus posterior to the esophagus, [7] placement of 3 sutures through stomach and esophagus, and [8] final assessment of wrap) and the jejunojejunostomy portion of RYGB¹⁰ ([1] laparoscopic stay suture placement, [2] enterotomy, [3] stapling, and [4] enterotomy closure) were used. The HM assessment tool was constructed from a modified PEH/NF assessment tool in which 2 items assessing esophageal and gastric myotomy portions of the procedure were added ([1] initial assessment, [2] retraction of liver lobes and stomach, [3] identification of esophagus, [4] dissection of the esophagus from crura, [5] gastric myotomy, [6] esophageal myotomy, [7] hiatal

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