Teaching and Training for Laparoscopic Colorectal Resection

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Key Points

- Several barriers exist to improving the education and widespread adoption of laparoscopic colectomy.
- An honest assessment of an individual surgeon's extent of colorectal-based practice is likely required to ensure adequate training, and assessment of proficiency is achieved.
- More uniform completion of technical skills assessment along with appropriate and timely feedback during training is required to improve overall surgical education.

Introduction

Prospective randomized trials have demonstrated that laparoscopic colectomy (LC) for benign and malignant disease can be performed with acceptable morbidity and mortality, as well as reductions in the duration of hospital stay [1–5]. Furthermore, patients undergoing elective segmental colectomy by laparotomy have suffered significantly higher complication rates when compared to laparoscopy [6]. Outcomes and technical pearls for LC have been assessed in nearly 3,000 publications. However, an astonishing low percentage of articles in peer-reviewed journals address education for safe adoption of this technology. More specifically, studies evaluating training methods for LC consist of a mere 0.01 % (31/2998) of the current literature. There have been several hurdles to the progression of LC, but the lack of well-designed scientific evaluations of training and assessment with validated metrics has clearly contributed to problems with dissemination of this technology.

Industry has made substantial efforts to reduce the learning curve. One company has informally reported spending approximately ten million dollars over the last 9 years on education for LC. Despite this investment, and that of several surgical societies and training institutions, the majority (65 %) of elective colon resections in the United States are still performed by laparotomy [7]. In this chapter we will address the current barriers to more widespread adoption of laparoscopic colectomy and methods available for the training and assessment of both residents and attending surgeons in performance of these procedures.

Barriers

Key Concept: *Different techniques*, *competing technology*, *changes in the surgical training environment*, *and a lack of consistent use of validated assessment tools all contribute to low rates of laparoscopic colectomy adoption*.

One significant impediment to the widespread adoption of LC is a disagreement amongst opinion leaders teaching this technique as to the best method of performing LC. After three pivotal randomized trials showed equivalence for laparoscopic colectomy for colon cancer-related outcomes, there was an immediate international interest to establish this method as the standard of care for colon cancer resections. Over the ensuing years, experts espoused one of two fundamentally different techniques. Therefore, conventional laparoscopy (CL) and hand-assisted laparoscopic approaches (HAL) evolved separately, rather than together. This division was readily apparent at both national forums and traditionally

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one-sided industry-sponsored mini-fellowships. This polarization amongst "experts" may have hindered training as surgeons and residents attempted to progress along the learning curve. As the HAL vs. CL debates waned, with advantages of each approach being accepted, surgeons performed and taught what they were comfortable with, and training the next generation became less ambiguous.

As surgeons continued to improve their ability at performing and teaching CL or HAL, robotics and single incision approaches for colorectal resection gained popularity. These technological "advancements" immediately became the new kids on the block, and we were immediately inundated with publications and presentations at regional and national meetings. Furthermore, some surgeons pushed their personal agendas forward, trying to claim their niche in the "latest and greatest" of laparoscopic colorectal resection. Industry has readily championed gaining any indication for these new devices, and as the debate amongst opinion leaders regarding the best approach forward takes precedence, education is again left on the sidelines. The theoretical and practical advantages of new technology in the appropriate spectrum should never be discouraged; however, constant re-evaluations of technique have impacted on training the next generation. National and institutional LC courses have become less focused on the most effective methods to learn and more concerned with satisfying industry's interest to gain exposure for their new equipment. This lack of consensus and commitment to an organized training strategy must be addressed. Diversity, in and of itself, is important to advance our surgical specialty; however, we must collaborate and make a conscious effort to ensure that advancements are not impediments to surgical education.

Another barrier in our efforts to offer elective laparoscopic colectomy to the majority of patients is our reluctance to categorize trainees. There are essentially four groups attempting to learn this technique: general surgery residents, colorectal residents, general surgeons, and colorectal surgeons, all of whom differ in their skill sets and long-term goals. The ever-changing landscape of general surgery residency, fluctuating requirements established by the American Boards of Surgery and Colorectal Surgery, and recent changes in health care uniquely impact each of these groups. Hospital administrators are now, more than ever, focused primarily on survival and reimbursement, impacting on teaching initiatives at most academic medical centers. Unfortunately, this new world of "do more with less" is unlikely to enhance minimally invasive colectomy training, unless specific initiatives are introduced to ensure training needs are appropriately addressed.

Lastly, and perhaps most importantly, methods for assessment of LC skills are practically nonexistent at most training programs. Numerous validated assessment tools have been evaluated and are available for LC, but are rarely implemented. Furthermore, the appropriate environment and subjects for their application remain unclear.

Who to Teach, and Why?

Key Concept: *Surgeons and trainees must both be realistic about the volume of colorectal surgery that they are or will be performing in practice*, *and we need to maximize our efforts training these individuals appropriately*.

Effective methods to teach laparoscopic colectomy (LC) are dependent on both the experience and expectations of the trainee. Two critical elements are required to be successful at mastering LC. These include a two-handed advanced laparoscopic skill set and being very familiar with colorectal anatomy through a high volume of cases. As we continue to teach residents at all levels and attending surgeons without discretion, it is essential to ask "Why?"

Colorectal Residents (Fellows)

An important group on whom to concentrate LC training are colorectal surgery trainees. Performing LC independently will be an essential component of their practice and an expectation required for fellowship certification. In 2008, the American Board of Colon and Rectal Surgery (ABCRS) introduced new minimum case requirements with a 3-year grace period. The 2012 graduating class was expected to complete their 1-year residency with at least 50 laparoscopic colon and rectal resections. This minimum requirement is an advancement and an acknowledgement of the importance of acquiring these skills. However, this falls somewhat short, as it currently does not distinguish between site and indication for resection. For open procedures, requirements are clearly defined for right, left, sigmoid, and rectal resection. Intuitively, this should hold true for a minimally invasive approach as well, but doesn't at the present time. The lack of specific parameters for laparoscopic cases may permit significant imbalance amongst finishing trainees.

Quantifying the number of LC cases needed in training to become proficient is challenging and likely is both resident and case dependent. Individual variation in skills exists across all professions and within colorectal surgery often fluctuates depending on the procedure (i.e., stoma vs. colon vs. pelvic operations). Several papers have reported a broad learning curve of 30–75 cases for experienced surgeons, yet the appropriate number and case mix for colorectal residents is essentially unstudied [8–10]. A recent survey of graduates of colon and rectal surgery residencies was performed to investigate this question. The survey sought to both quantify the number of cases performed during colorectal residency and qualify resident experience by evaluating comfort performing the procedure independently upon graduation. The authors found that 80 % of residents are very comfortable performing laparoscopic colectomies after performing 10 laparoscopic right and 30 laparoscopic left colectomies during their residency [11]. However a large proportion of

residents in the survey did not perform enough cases to reach this benchmark. Fifty percent of residents performed less than ten cases during their year of colon and rectal surgery training, while only 1 in 6 residents perform greater than 30 of each type of surgery [11]. These trends demonstrate a wide discrepancy in laparoscopic experience of colon and rectal surgery residents and emphasize the need for more detailed operative standards. Furthermore, there is some debate on the importance of having a minimum number at all. Although some surgeons may demonstrate "mastery" of a particular operation after five procedures while others demonstrate mastery at 50, it is most important that the appropriate level of skill is eventually achieved. Conversely, another trainee who has performed 100 operations, but continues to lack the ability to successfully and safely perform the procedure, likely should not be accredited either. This highlights the need for a more detailed and validated operative assessment and demonstration of proficiency.

The variation amongst colorectal residencies in exposure to LC will likely decrease as more attending colorectal surgeons at training programs attempt to develop minimally invasive skills. Therefore, the primary objective going forward should be geared towards improving objective assessment. Validated assessment tools will be discussed in detail below. Program directors should strive to improve collaboration and develop consensus on a structured, mandatory assessment tool for the performance of LC. The recent introduction of a technical skills assessment (COSATS) that may 1 day become part of the ABCRS certifying exam will likely introduce an element of accountability in all areas of technical competence. Laparoscopic colectomy will almost assuredly be an integral part of this examination; yet ultimately, individual programs have the primary responsibility to ensure their trainees have adequate technical skill by incorporating a validated objective tool within their program.

General Surgery Residents

Structured curricula have been introduced during general surgery residency for learning basic laparoscopic procedures (i.e., FLS), yet there are few reports on dedicated programs for advanced techniques. Laparoscopic colorectal resection is an index case for advanced skills training; however, recent data from the ACGME resident case log system has demonstrated that graduates lack the appropriate volume to reach proficiency [12, 13]. More specifically, surgical chief residents averaged less than 9 LC cases during their final training year and 13 during their entire residency. The ongoing impact of this limitation is somewhat concerning when considering the recent data that 98 % of the colectomies for diverticulitis in the United States are performed by general surgeons who complete less than ten colectomies per year [14].

This environment has created concern regarding the likelihood of successful development of competence in essential colorectal surgery cases by trainees during their residency [15–17]. General surgery program directors are attempting to adjust to a new climate of education and an expanding curriculum, but reduced resources and economic pressures have made the transition challenging. Some now view fellowships as the time where graduates have their opportunity to "learn" specialized skill sets. Furthermore, we are starting to witness the introduction of "fellowships" in general surgery (i.e., "super-chief" years) in attempt to ease this transition.

Academic surgeons must also ask "Why" should we teach general surgery residents advanced laparoscopic colorectal procedures? It is very unlikely that these trainees will be proficient at a laparoscopic sigmoid colectomy or low anterior resection at the completion of training. Furthermore, the majority of residents are pursuing additional fellowship training. Should we only teach those residents that plan on performing advanced laparoscopy as part of their practice? The answer to this question is probably "yes," but significant changes in residency curriculum would have to change on a widespread scale before this philosophy is embraced. Most notably, residency programs should consider both introducing elective rotations for senior level trainees in their area of interest and/or offering mini-mentorships with specific faculty. Or perhaps offer a structured curriculum with different areas of expertise being built into the program's core curriculum based on an individual trainee's interests? This system seems more appropriate in our current era of duty hour restrictions, but would require endorsement from the American Board of Surgery and the ACGME. Until then, all academic surgeons, as surgical educators by definition, should strive to maximize specific goals with each resident.

Attending Surgeons

Teaching LC to existing faculty members and community surgeons encompasses a different set of challenges. Senior colorectal surgeons may have excessive knowledge of the appropriate anatomy and steps of the operation, but may often lack in the two-handed laparoscopic skill set required to successfully perform the procedure. On the other hand, practicing general surgeons typically have two-handed laparoscopic experience, but typically are less familiar with the details of colorectal disease and tissue planes. Most practicing surgeons have considerable existing time constraints, necessitating prioritizing learning needs and willingness to invest time in meeting them. Therefore, prior to tackling the massive hurdle of learning LC, a surgeon must be honest with himself or herself. It is critical for general surgeons to have a reasonable volume of open colorectal procedures before attempting to develop LC skills. If other members or partners in their group are performing the majority of

colorectal procedures, it may be more efficient to promote the advancement of that individual's practice, rather than multiple surgeons having insufficient volumes. Without the opportunity for repetition and deliberate practice, LC cannot be learned appropriately. This situation must also be recognized and not exploited by our partners in industry by enrolling all willing surgeons in "hands-on" courses.

Colorectal attending surgeons that trained prior to the era of minimally invasive techniques must also be realistic. They likely have the volume of colorectal cases but must commit the time to developing two-handed laparoscopic skills and proficiency in LC techniques. They must also recognize whether the laparoscopic or open technique is most suitable for their practice and minimize the impact of their attempt to learn new skills on the operative experience of their trainees.

Effective Training Methods

Key Concept: *Effective surgical training requires time spent prior to the operation learning the skills and discussing the case*, *in the operation with real-time feedback and open discussion and nonthreatening and honest feedback postoperatively*.

Introduction

The three essential elements to achieve successful outcomes in surgery are preoperative, operative, and postoperative detailed patient care. If one of these steps is neglected, patients are at increased risk for complications. This model should be embraced and applied to surgical education. The technical demands and protracted learning curve specifically for LC can be reduced when this three-phase approach is considered. Preoperative preparation, improved intraoperative communication, and immediate objective postoperative assessment with a validated tool will enhance training. Gary Dunnington and his colleagues at SIU (Southern Illinois University) describe this approach as "capturing the teachable moment" and outline their system as B.I.D. ("briefing, intraoperative teaching, and debriefing") [18]. The immediate discussion below will pertain to residents and fellows, as attending surgeons are trained separately through advanced laparoscopic courses. That will be addressed at the end of the chapter.

Preoperative Preparation

Successful preparation for LC requires the trainee to embrace both traditional and nonclinical methods. The necessary approach to reduce the aforementioned barriers and to increase the volume of quality cases performed by residents is often debated. However, surgical educators uniformly agree that nonclinical technical skills exercises, designed to optimize a resident's experience with each operation, will play a critical role. The American College of Surgeons Review Committee for Surgical Education has made it mandatory that all surgical training programs have a means of training outside the operating room [19]. Therefore, simulation and surgical skills laboratories will continue to play a role in training for general and procedure-specific laparoscopic cases (Fig. 37.1). In its broadest terms, simulation is defined as the act of imitating the behavior of some situation or some process by means of something suitably analogous. Therefore, the majority of nonclinical technical skill exercises, regardless of the model, qualify as "simulation." Current platforms vary considerably in level of fidelity, from box trainers to technologically advanced virtual reality (VR) programs.

Simple box trainers for laparoscopic skills such as the validated MISTELS (McGill Inanimate System for Training and Evaluation of Laparoscopic Skills) are effective at the junior trainee level and should be readily incorporated into any laboratory curricula. VR platforms have also been shown to improve performance in the operating room. More specifically, dedicated practice with VR simulators has correlated with improved operative times and efficiency of movement for clinical laparoscopic cholecystectomy [20]. Seymour et al. evaluated 16 residents of varying levels and compared clinical laparoscopic cholecystectomy outcomes between residents who received training on a VR system and those who did not. They found no difference in baseline assessments between the two groups, but found that residents who trained on the simulator were faster, made fewer errors, and were less likely to injure the gallbladder in the operating room [20]. Grantcharov et al. also evaluated 16 residents and compared training on a VR simulator to a control group. They found improved economy of movements and fewer errors in residents who were trained on a VR simulator [21]. Beyer and colleagues evaluated transfer of skills from simulators to the operating room using the Global Operative Assessment of Laparoscopic Skills (GOALS), a validated laparoscopic skills assessment model [22]. Their prospective trial involving 19 residents found improved GOAL scores in residents who were trained on a simulator when compared to those who were not.

Simbionix (Cleveland, OH) offers a VR (LAP Mentor) model for laparoscopic sigmoid colectomy that more accurately portrays resection in the operating room than previous hybrid systems [23]. Of the five types of validity, face, content, and construct have been established for general procedures with the LAP Mentor VRS [24, 25]. More recently, construct validity, i.e., the ability of the simulator to distinguish between different levels of skills, was established for

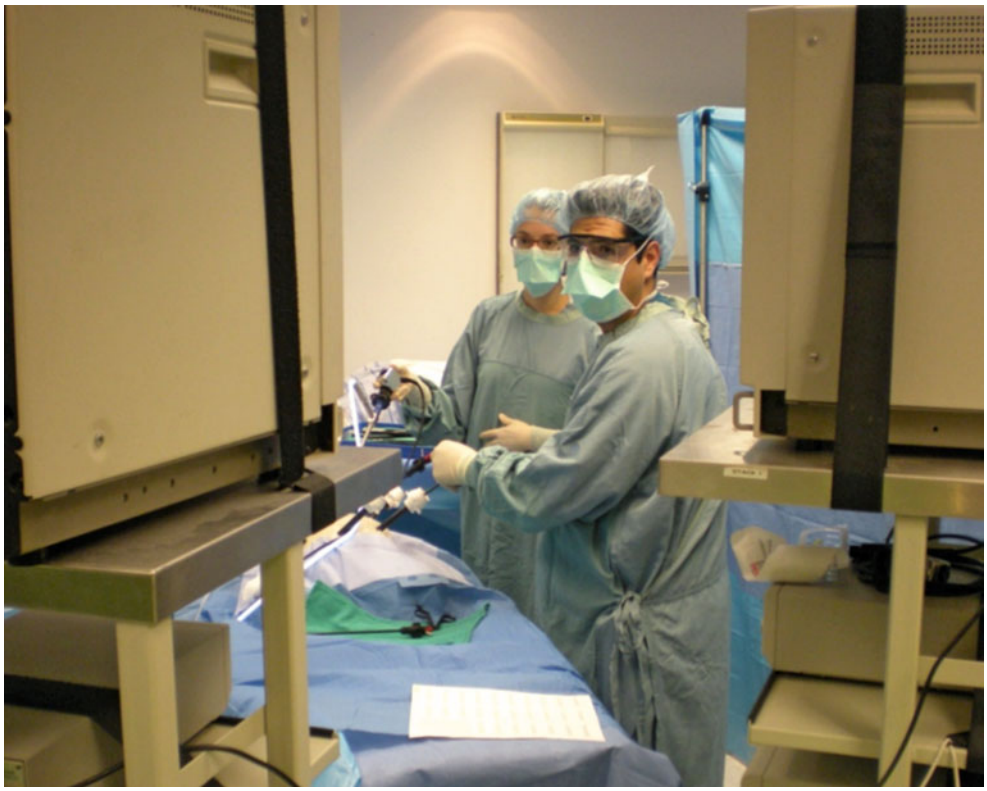

Fig. 37.1 Laparoscopic colectomy in a porcine model

certain metrics specifically with the laparoscopic sigmoid model [26]. In this study, the metrics assessing the instrument path length, the accuracy of the medial peritoneal mobilization, and the quality of the IMA dissection demonstrated the strongest ability to differentiate between general surgeons and laparoscopic colorectal surgeons. However, construct validity was not established for technical errors, as the model could not distinguish between experts and novice surgeons.

The successful application for procedure-specific training with VR systems has recently been demonstrated in two randomized trials. Grantcharov et al. developed a comprehensive ex vivo preoperative training curriculum that improved performance for LC [27]. Calatayud et al. tested "warm-up" with a VR system prior to laparoscopic cholecystectomy and found that OSATS global rating scales were better after practice [28]. The colectomy study involved preparation with simulation, cognitive training, and participation in a cadaver lab. In this study, residents were PGY-2 through 4, having previously completed FLS and possessing some advanced laparoscopic experience. Using an entire curriculum that addressed multiple aspects of performance, which included procedure-specific simulation, overall LC skills were enhanced. This impressive approach was successful; however, having all trainees perform this labor intense program prior to the procedure may not be practical. The cost and time requirements of the model are likely not likely sustainable in most training programs outside of a trial. However, this well-designed trial most importantly demonstrates that preparation can improve performance for LC. Each academic institution may choose to incorporate one of these preparation models or a variation on this theme. The VR studies for basic laparoscopic skills training have routinely incorporated a proficiency-based model, whereby trainees have proficiency targets to meet, rather than time on task as a training goal [20, 27]. For the cognitive component of procedures, different modalities have been used. For example, in an effort to simplify this "rehearsal" and hasten the learning curve for laparoscopic right colectomy, we designed an ongoing multicenter trial with an edited 15-min "voice-over" instructional video for residents to review before performing laparoscopic right colectomy. The results are unknown, but the early feedback has been encouraging.

In addition to simulation and nontraditional preparation, several very basic but underutilized modalities should be considered to improve the educational quality of each LC case for the trainee. Residents must fulfill their responsibility by coming to the operating room with a detailed knowledge of the relevant anatomy, the indications for surgery, steps of the procedure, and the potential complications. Additionally, they should possess, to a certain degree, the skills required to do a portion of the case. As faculty, we often know how to access the best video or atlas that most accurately depicts the appropriate steps of the procedure. Ideally, a curriculum-based approach will include resources for residents to access to enable them to efficiently acquire this knowledge [27].

The trainer should become familiar with the skill level of the resident and be sure they understand the degree of complexity for each case. It is also important to verify that the trainees are being informed about case coverage in advance. It is critical to be an advocate for your trainee by helping them identify the appropriate resources that may help them prepare. Lastly, and most importantly, preoperative communication must improve. In the SIU B.I.D. model, the briefing is a short interaction at the scrub sink [19]. The purpose of this interaction is to both assess the needs of the learner and to establish learning objectives for both learner and teacher for that particular case. This conversation forces a review of past experiences and helps formulate needs and deficits. Furthermore, learners automatically integrate the experience making it more retrievable at a later date. Unfortunately it seems that this interaction seldom occurs. In a recent survey of nearly 5,000 residents, only 18 % felt that the educational goals of the case or details of the procedure are discussed preoperatively [29]. Adoption of this simple yet effective communication strategy, outlined above, may have a dramatic impact on your current trainees.

Intraoperative Training

Preoperative preparation and postoperative assessment for laparoscopic colectomy may be underutilized, but they are both definable and have been evaluated. General intraoperative teaching methods and procedure specific approaches are nebulous. More specifically, each LC entails numerous variables that can hinder consistent and effective training. Three of these variables routinely inhibit a trainee's ability to master laparoscopic colorectal resection, and two are specific to laparoscopy. First, several attending surgeons are not comfortable with their own ability to perform LC. Second, the window between the correct and inaccurate dissection plane is similar to open surgery, but the trainer's ability to control precision and prevent potential problems is slightly compromised with laparoscopy. These two variables are prevalent in academic surgery, but will likely wane in time as the generation of minimally invasive surgeons continues to progress. Lastly, several faculty surgeons frankly have no interest in teaching residents the basics or details of laparoscopic colorectal resection. Unfortunately, the reasons or excuses for this are plentiful and were outlined above (individual, systemic, time constraints, error avoidance, report cards, etc.).

Several conventional and previously studied methods of training residents in the operating room have been described but are less effective for LC. *Scaffolding* involves conscious or unconscious individualized support during surgery relative to a trainee's abilities [30–32]. This style was historically effective, yet the reduction of case volume amongst trainees and lack of consistent faculty-trainee interaction have diminished its role. The Halstedian apprenticeship model also relies significantly on experience acquired in the operating room with graduated responsibility for trainees as they progress. The majority of trainers accomplished in LC learned with these methods, but have failed to recognize that the new landscape of residency likely requires more focused educational opportunities to achieve the same result.

A significant amount of the communication during LC is ineffective. As first assistants, trainers have lost the ability to direct with an instrument or their finger and therefore depend on verbal and nonverbal cues. Roberts et al. provided in an in-depth theoretical analysis of communication in the operating room in an effort to highlight teachable moments [33]. They thoughtfully categorize four types of interaction in the operating room (Table 37.1) [33]. *Instrumental* interactions are the most common form of interaction in the operating room. The goal of the faculty surgeon with these interactions is simply to perform the case as efficiently and safely as possible, with little attention to teaching. All surgeons desire safe and efficient outcomes for their patients; however, to also incorporate teaching surgeons must replace *instrumental only* interactions with *instrumental/teaching* communication, when appropriate. This goal is achievable when an appropriate understanding of mutual expectations and familiarity is established before the procedure. This discussion should also include an explanation by the attending regarding their method of instruction on the two-dimensional monitor that both are viewing. This will decrease *banter* and noneffective interactions.

In addition to improving communication both preoperatively and during the case, surgical educators agree that deliberate practice is critical to master a technical skill. Ericcson explains deliberate practice as identifying an area of performance that is to be improved and then providing immediate detailed feedback during performance [34]. This

Table 37.1 Concepts of intraoperative surgeon-resident interaction outlined by Roberts and colleagues

Intraoperative communication category	Description
Instrumental	Goal of interaction is to move the case forward Termed instrumental because the surgeon often uses the learner like an instrument, as a means to an end
Pure teaching	Intended primarily to benefit the learner through providing educational value
Instrumental and teaching	Intended to achieve the pragmatic goal of moving the case forward while also conferring teaching
Banter	Conversation unrelated to the procedure

From Roberts and Williams [18]

approach is most useful for LC cases when the procedure is deconstructed into steps. Having the trainee master the dissection of the inferior mesenteric artery prior to attempting the pelvic dissection is an example of this. However, the operating room with the inherent variability in disease and patient anatomy, as well as other constraints, may diminish the ability of residents to engage in deliberate practice. Thus, mastery of skills that have ex vivo models available for practice should be transferred to a skills laboratory, reserving operating room learning for fine-tuning of performance.

Guidance and/or supervision in the operating room is critical to learning LC skills; however, it may be suboptimal. A national survey of 125 surgical residency programs addressed resident satisfaction with teaching and showed that 40 % of residents *sometimes* felt "over-supervised" in the operating room and 21 % *always* felt "over-supervised," both contributing to decreased satisfaction [35]. Optimally, the supervising faculty reduces the amount of guidance as trainees ascend along the learning curve and demonstrate improved skills, safety, and confidence. The amount of supervision in the operating room is largely influenced by the complexity of the case, resident experience, attending skill, and desire to teach. This variability will always exist, but the group at Southern Illinois University (SIU) attempted to analyze and investigate operative supervision [36]. To accomplish their goal they used an operative performance rating system and blinded external experts to rate the amount of guidance for videotaped procedures [36]. As expected, the researchers found variability amongst the supervising surgeons and witnessed a reduction in guidance with upper level residents. Furthermore, they discovered that the faculty surgeon typically underestimates the amount of supervision that they provide [36]. This finding requires further exploration and dramatically influences to the ability of faculty to objectively assess a resident's operative performance and ability to ultimately perform the operation independently. This problem is likely enhanced during performance of LC. An experienced faculty member can practically operate with a trainee's hands and tactfully expose the correct plane of dissection. These nonverbal clues are further assisted when the trainer holds the camera and subconsciously orients the line of dissection in the center of the monitor. Ideally, as the trainee becomes more accomplished, a second learning curve develops. This second tier of difficulty is readily exposed when the trainer is replaced with a junior resident. The junior resident is capable of holding the camera and another instrument, but all of the nonverbal guidance and direction are absent. Therefore, as we prepare our trainees to operate independently, we must find a balance between maintaining patient safety and fostering independence. This in essence is the art of surgical education.

Assessment

The structured stepwise approach to LC and ability to video record cases make this an ideal procedure for objective assessment. Prior to the development of validated scoring tools, studies evaluating the performance of trainees in the operating room for LC lacked detail about the complexity of the case, the role of the trainee, and appropriate end points. Conversion rates and operative times were used to assess performance, yet they are likely more reflective of the attending surgeon, not the resident.

After the OSATS (objective structured assessment of technical skill) was developed and validated [37], numerous applications and variations of this tool were introduced for almost every subspecialty (Fig. 37.2). We have now been inundated with validated scoring systems containing both generic and procedure specific metrics, with several measures developed specifically for LC. Unfortunately, it has been demonstrated that substantial time often elapses between performance in the operating room and the completion of an evaluation tool [38]. Ideally, the faculty should complete a technical evaluation at the end of every case, or at least within 24 h. As faculty, we must become familiar with the validated specialty-specific tools for LC that are available for the assessment of trainees. Utilization of a validated assessment tool not only stimulates a post-procedure conversation but also ultimately involves procedure-specific feedback as well areas for improvement and practice.

The GAS (general assessment scale) developed specifically for LC is a great example of this concept (Fig. 37.3) [39]. This validated tool creatively incorporates the amount of verbal/nonverbal support needed for the trainee to complete the steps of the procedure [39]. GAS is ideal for the

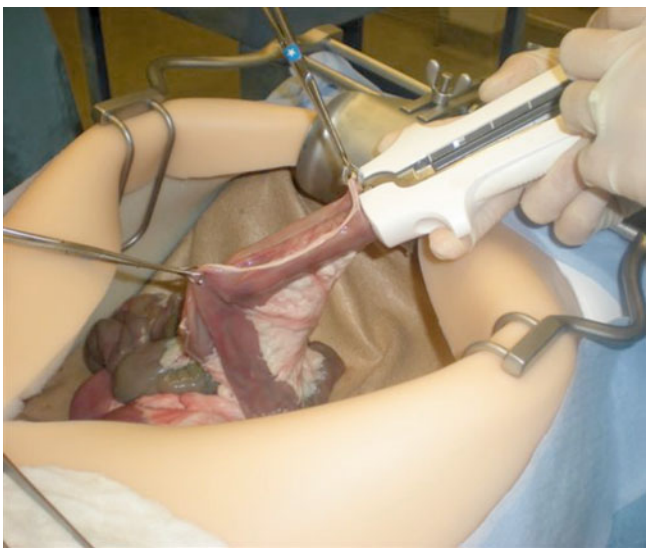

Fig. 37.2 Simulation model for bowel anastomosis

National Training Programme
in Laparoscopic Colorectal Surgery

FORM A

GLOBAL ASSESSMENT BY TRAINER (GAS)

A. PRECEPTOR

A1 Name of Preceptor

A2 Name of Trainee

A3 Patient ID

B4 Operating date ☐☐/☐☐/☐☐☐☐

B. ASSESSMENT

1 Not performed, step had to be done by trainer
2 Partly performed, step had to be partly done by trainer
3 Performed, with substantial verbal support
4 Performed with minor verbal support
5 Competent performance, safe (without guidance)
6 Proficient performance, couldn't be better

EXPOSURE						
B1 Correct theater setup	1☐	2☐	3☐	4☐	5☐	6☐
B2 Appropriate patient positioning	1☐	2☐	3☐	4☐	5☐	6☐
B1 Safe access technique	1☐	2☐	3☐	4☐	5☐	6☐
B4 Exposure of operating field	1☐	2☐	3☐	4☐	5☐	6☐
VASCULAR						
B5 Safe dissection of vascular pedicle	1☐	2☐	3☐	4☐	5☐	6☐
B6 Dissection of mesentry (retrocolic)	1☐	2☐	3☐	4☐	5☐	6☐
B7 Safe identification of ureter or duodenum	1☐	2☐	3☐	4☐	5☐	6☐
MOBILISATION						
B8 Dissection of hepatic or splenic flexure	1☐	2☐	3☐	4☐	5☐	6☐
B9 Mesorectal dissection (where applicable)	1☐	2☐	3☐	4☐	5☐	6☐
B10 Safe dissection of bowel	1☐	2☐	3☐	4☐	5☐	6☐
ANASTOMOSIS						
B11 Safe evacuation of specimen	1☐	2☐	3☐	4☐	5☐	6☐
B12 Anastomosis	1☐	2☐	3☐	4☐	5☐	6☐
OVERALL PERFORMANCE						
B13 Overall Performance	1☐	2☐	3☐	4☐	5☐	6☐

C. ASSESSING THE ASSESSMENT

C1 How dificult was this operation (1=very easy, 6=very difficult) 1☐ 2☐ 3☐ 4☐ 5☐ 6☐

C1 How useful was this form for the assessment of this particular case?

Not useful☐ Mainly not useful☐ Partly not useful☐ Partly useful☐ Mainly useful☐ Very useful☐

C2 How long did it take you to fill in this form? ☐☐minutes

Version 1/ 16.09.2008 REC Ref number 04/Q040354

Fig. 37.3 National Training Programme in Laparoscopic Colorectal Surgery (Modified from Miskovic et al. [39])

assessment of trainees and can be effectively modified for any laparoscopic colorectal resection or resident level. It produces an objective score but also can be used to foster communication about each step of the case between the faculty and trainee. The degree of nonverbal communication and guidance is often underestimated during a laparoscopic procedure. The GAS model helps remind the trainee that supervision and completing the case can be all perception!

Several other validated tools exist for the assessment LC, including OCHRA [40] (Observational clinical human reliability analysis). This software program can be used by surgeons or non-surgeons to evaluate operative videos in colorectal surgery. This may be an attractive approach when surgeons are unable to devote significant time to assessment of their trainee's video performance. The Toronto group also developed an objective tool using Delphi methodology. In this study, Grantcharov et al. determined consensus for the essential steps to be included on a tool designed to measure technical competence for LC [41]. The reliability and validity of this model will require further validation, but it has potential for the evaluation of training and practicing surgeons.

To effectively incorporate meaningful assessment tools into residency, department chairs, general surgery program directors, and colorectal program directors must mandate their usage and study their effectiveness. The lack of consensus on a national scale and even within colorectal surgery is a major impediment. Agreement on a validated comprehensive assessment tool for LC will require considerable investment. However, without formative assessment, technical deficiencies will persist, and both general and colorectal residents will continue to struggle with LC. Procedure-based assessments are mandated in training programs in the United Kingdom. These operation-specific tools cover all components of a procedure from the preoperative assessment and consent to the operative steps. This strategy is excellent for formative feedback, yet multiple evaluations of the resident on each procedure are required for reliable assessment (Fig. 37.4).

Laparoscopic Courses, Training Attending Surgeons

Key Concept: *Unique barriers exist when expanding training to attending surgeons*, *especially with regard to determining competence with short* "*hands-on*" *courses*.

Over the last decade innumerable laparoscopic colectomy "hands-on" courses have been offered at academic institutions and society meetings. The average annual budget for the two largest companies sponsoring these programs has been reported at approximately $500,000/year. Early success was measured by determining if the attendees returned to their home institution and attempted LC [42]. However, data tracking either long-term adoption of LC into practice or patient outcomes for these cases has never been reported. Over the years, SAGES and ASCRS provided "guidelines" for these postgraduate courses, but the enforcement or adherence to these recommendations has not been evaluated. The guidelines highlight the importance of performing greater than 25 resections per year and the need for follow-up mentorship. Ho et al. recently reported that approximately 46 % of surgeons attending courses at their institution over the years have no access to mentors [43]. The authors recommended tele-mentoring as a potential avenue to improve training for those attending LC courses; however, currently the medicolegal implications and reimbursement for this type of approach have not been addressed.

Optimizing the training experience for an attending surgeon attempting to learn LC at a 2-day course also requires significant preparation. Surgeons with a variety of

Fig. 37.4 Attending surgeon evaluation and constructive feedback at a skill station

backgrounds and skill often participate in the same sessions. Course directors and their industry partners rarely scrutinize the participants prior to the day of the course, and the needs of each attending surgeon vary tremendously. It is not uncommon, within the same course, to have one surgeon learning how to use both hands with another inquiring about low rectal transection and single incision techniques. This can be improved by performing a more careful survey of potential attendees and categorizing applicants based on experience and goals.

Both cadaveric and porcine models have been used successfully during these workshops. Cadaver labs offer a more realistic anatomical approach, but they are expensive and at times inconsistent. The porcine model is excellent for laparoscopic sigmoid colectomy, but they lack a right colon, limiting the overall experience. Participants continue to rate the "live OR" experience as the most meaningful section of the course. Furthermore, attendees frequently request the actual videos and power point lectures that are given during their visit. If the course director's goal is to optimize uptake of LC, these resources should be made readily available for participants.

In addition to pre-course surveys, participants should agree to send their follow-up operative videos for blinded assessment. Previous studies have shown that surgeons consistently overestimate their own performance during or after their participation in a course [44]. Industry should budget longitudinal mentoring with both video assessment and potentially a second visit from either the trainee or trainer. The validated CAT (Competency Assessment Tool) and OCHRA, both described by Miskovic et al., could be used for the objective assessment of videos with this method [45].

Summary Pearls

Maintaining a standard of excellence for LC requires a comprehensive and consistent approach to surgical education. Faculty in academic institutions must continue to fight for the appropriate resources and incentives needed to train the next generation of surgeons. The impact of health care on education with the inevitable push to provide less expensive but equivalent and more efficient care must be carefully considered.

Recent studies with simulation have shown promise for training as a pre-procedure "warm-up" and also for potential assessment. However, we must continue to ask, "At what cost?" If less expensive, but as effective methods exist, they should be utilized. Faculty surgeons must also strive to vastly improve day-to-day communication with trainees before the procedure, intraoperatively, and with assessment postoperatively. Several validated metrics and tools of assessment exist for LC, but as a surgical specialty we must collaborate and reach consensus to improve their widespread utilization. Lastly, the technological advancements particular to minimally invasive surgery must also be scrutinized more effectively. As leaders in the world of surgical education, we must ensure that our trainees are not overlooked in place of personal or professional gains.

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