Surgical Endoscopy (2019) 33:3062–3068
https://doi.org/10.1007/s00464-019-06900-0

SAGES COLECTOMY COURSE

Something for everyone: the benefits of longitudinal mentorship with the application of the acquisition of data for outcomes and procedure transfer (ADOPT) program to a SAGES hands-on colectomy course

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Received: 3 May 2019 / Accepted: 5 June 2019 / Published online: 19 June 2019

Abstract
Continued professional development of surgeons remains a challenging and unstandardized enterprise. The Continuing Education Committee of SAGES created the Acquisition of Data for Outcomes and Procedure Adoption (ADOPT) program, incorporating a standardized training approach into hands-on courses with a year-long longitudinal mentorship experience. To evaluate the program's transferability to other procedures following its successful application to a SAGES hernia course, the ADOPT method was applied to the SAGES 2017 laparoscopic colectomy course. Participant data included demographics, training and experience, as well as pre-and post-course self-reported colectomy case volumes and procedure confidence. Confidence levels were for techniques taught in the course using a 5-point scale: 1 = not confident at all to 5 = completely confident. Participants reported confidence in the following skills for laparoscopic right and left colectomy: (1) formulating an operative plan, (2) identifying proper anatomical planes and isolating anatomic structures, and (3) competently conducting the technical steps of the procedure. A total of 18 surgeons enrolled in the SAGES 2017 Colon Program, 10 of whom completed the 6-month post-course questionnaire (56%). Participants reported significantly higher confidence in all skills at 6 months compared to pre-course ($p \leq 0.015$). Most participants (60%) reported an increase in the number of procedures performed. The lowest pre-course case volume group (≤ 5 annual cases, $n = 5$ 6-month survey responders) demonstrated a trend for increased procedure volume post-course (5.6 vs. 2, $p = 0.057$). The overwhelming majority of survey respondents (90%) felt either "confident" or "extremely confident" performing the procedures learned (range 80–100% across tasks). Participants found the program to be an advantageous method of becoming competent and confident in performing these procedures. The application of the ADOPT program to the laparoscopic colectomy course was successful in increasing surgeon confidence and demonstrated a trend in improving surgeon procedure counts in the novice participant group.

Keywords Education · Mentorship · Colectomy

The continued professional development of a surgeon remains a challenging and unstandardized enterprise. The continuous introduction of new procedures and technologies in surgical specialties has forced a re-evaluation of the most effective and efficient educational methods to enable surgeons to incorporate rapidly, comfortably, and safely such changes to their practice. In response to such challenges, the Continuing Education Committee (CEC) of the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) created the ADOPT (Acquisition of Data for Outcomes and Procedure Adoption) program, which incorporated a standardized training approach into hands-on courses and expanded their content to include a year-long

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longitudinal mentorship experience. First as a pilot, then as an entire course, the ADOPT program succeeded in increasing surgeon volume and confidence for hernia repair [1, 2]. To see if the findings from these experiences were transferrable to teaching other procedures, the ADOPT method was applied to the laparoscopic colectomy course at the SAGES 2017 Annual Meeting.

Methods

Course implementation

As with previous ADOPT courses, [1, 2] all faculty underwent a one and half day training session in the Lapco TT method to standardize instruction during the Hands-On Colectomy course [3]. The ADOPT program was structured similarly to previous years (Fig. 1). The Lapco TT method originated in the United Kingdom in order to ensure uniformity of mentoring practices while training colorectal surgeons to transition to the laparoscopic approach [4]. It focuses on a learner-based briefing, dialogue, and debriefing technique.

Ethical considerations

This assessment of the ADOPT program effectiveness was designated by the Inova Health System Institutional Review Board (IRB) as exempt under Category 1: Educational Practices.

Data acquisition

A mixed methods approach was employed to assess program effectiveness using the Kirkpatrick model (Table 1) [5]. Participation, Level 1 effectiveness, was determined

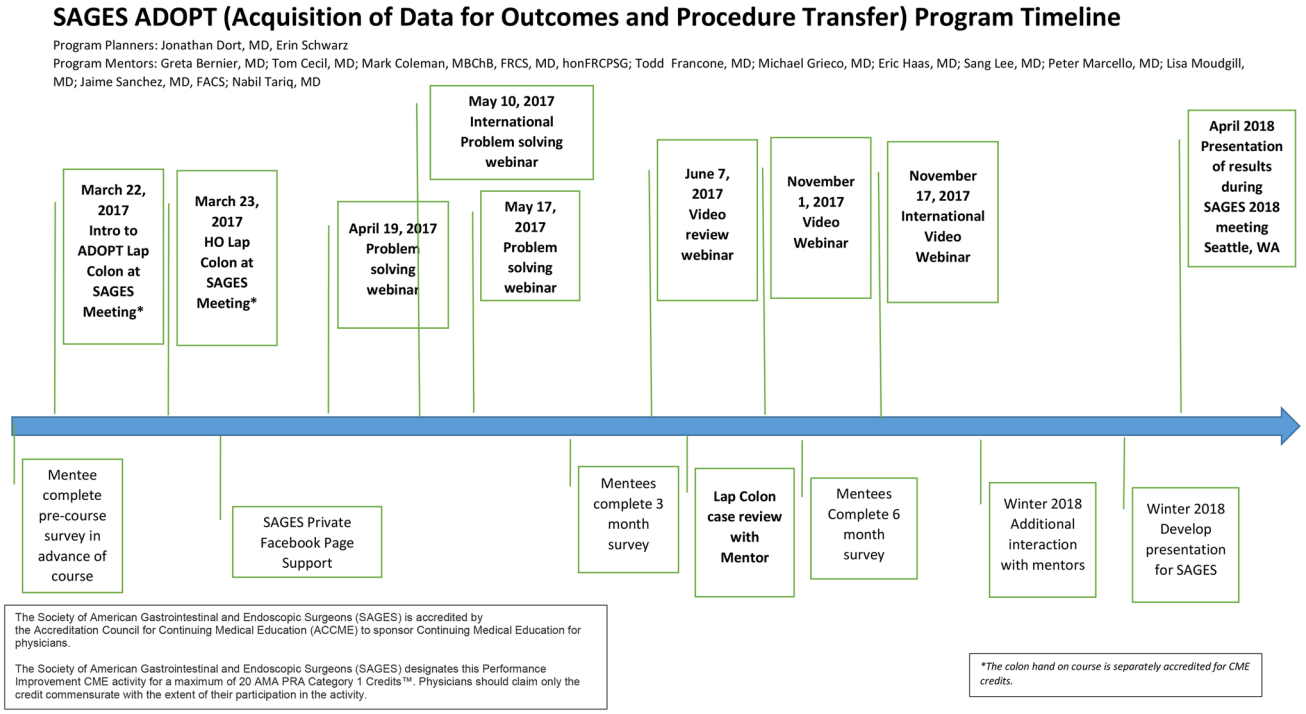

Fig. 1 Course implementation timeline

Table 1 Mixed methods evaluation of ADOPT program effectiveness using Kirkpatrick model

Level	Category	Quantitative measures	Qualitative measures
1	Reaction	Course attendance, survey response, mentorship and webinar participation	Open-ended questions related to course quality
2	Learning	Pre-/post-course self-reported volume and confidence levels in colectomy procedures	What have you gained from this program?
3/4a	Behavior/impact	Case volumes	What are barriers, etc

quantitatively by course attendance, responsiveness to surveys, and involvement in longitudinal mentorship and webinar activities. In addition, qualitative data were collected via open-ended survey questions related to the quality of the program. Learning, Level 2 effectiveness, was evaluated by pre-and post-course surveys given to participants in advance of the ADOPT Colon course and 6 months after the course, respectively. We collected data on demographics, training, experience, self-reported colectomy case volumes, and confidence in colectomy procedures. Confidence levels were collected for specific tasks relevant to techniques taught in the course via a survey using a 5-point scale: 1 = not confident at all to 5 = completely confident. Participants reported confidence in the following skills for laparoscopic right colectomy (LRC) and laparoscopic left colectomy (LLC): (1) formulating an operative plan, (2) identifying proper anatomical planes and isolating anatomic structures, and (3) competently conducting the technical steps of the procedure.

At the 6 month follow-up, overall course experience was evaluated from open-ended responses to the question "What have you gained from this program?" Behavior change, Level 3 effectiveness, and changes in practice, Level 4a effectiveness, were evaluated by participants' reported annual case totals of colectomy procedures prior to the course as well as 6 months following the course completion. Procedure volume totals were summed from the pre-course survey item "Please estimate the total number of procedures you have performed over the last year" for right laparoscopic colectomy, left laparoscopic colectomy without colostomy, and left laparoscopic colectomy with colostomy. For 2 participants who did not provide annual case totals, annualized estimates were derived from case totals reported on a separate item which requested "…the number of cases that you have done for each of the CPT codes given below over the last 6 months at the hospital at which you do the most cases: Lap Right Colectomy: 44205; Lap Left Colectomy without colostomy: 44207; Lap Left Colectomy with colostomy: 44208." The same procedures were queried in the 6-month post-course survey item "Please estimate the total number of procedures you have performed since the SAGES Hands-On Course in Houston, TX March 23, 2017." Case totals from the 6-month survey were annualized for comparison to 1-year pre-course totals. Participants were also queried about barriers to procedure adoption and implementation at their home institutions.

Statistical analysis

For quantitative data, descriptive statistics were summarized with counts, percentages, means, standard deviations, and ranges of values. Procedure totals and confidence ratings of tasks taught during the course were compared pre- and post-course using nonparametric paired Wilcoxon signed-rank tests. Procedure totals and confidence levels were further compared between different types of colectomy procedures using paired Wilcoxon signed-rank tests. Procedure comparisons were stratified by participant tertiles of pre-course annual colectomy experience (≤ 5 cases, 5–19 cases, and ≥ 20 cases, each $n = 6$). Nonparametric Wilcoxon rank sum tests were calculated to compare pre-course case totals in 6-month survey responders vs. non-responders and to compare post-course confidence among pre-course experience tertiles. Statistical significance was assessed at the level of $\alpha = 0.05$. Statistical analyses were conducted using Stata/MP v.14.2 (College Station, TX).

Qualitative analysis of open-ended responses followed established protocols. Responses were first read, then re-read, listed, coded, and analyzed for themes [6]. Trustworthiness was assessed through data triangulation, evaluation of participant quotes, and consideration of discrepant cases.

Results

Participant demographics

A total of 18 surgeons enrolled in the SAGES ADOPT 2017 Colon Program, all of whom completed questionnaires prior to the course (100% response rate). Table 2 lists

Table 2 Demographic characteristics of course participants

Demographic	Values		Mean (range)
	N	%	
Age	18		47.8 (29–69)
Residence			
US	9	50	
International	9	50	
Practice type			
Academic appointment	3	17	
Private practice	11	61	
Government/group/other	4	22	
Practice setting			
Large urban (> 100 k)	9	50	
Small urban (20 k–100 k)	3	17	
Rural (< 20 k)	6	33	
Hospital setting			
Academic	2	11	
Private	3	17	
Community, state or critical access	12	67	
Training (years)			6 (2–8)
Practice (years)			14 (0–37)
Colorectal fellowship trained	14	78	
Colorectal board certified	11	61	
Annual colectomy case volume			14 (0–35)

their characteristics. Briefly, participants were, on average, middle-aged, had undergone over 5 years of training, and had almost 15 years of practice experience. Half hailed from outside the United States, and the majority were in private practice at a community hospital. Over three-quarters had completed a colorectal fellowship, and about three-fifths were Board Certified in Colorectal Surgery. Finally, participants performed a mean of 14 colectomies a year (Table 3), of which few involved creation of a colostomy. There were no significant differences in the number of pre-course cases between responders and non-responders to the 6-month follow-up survey (15.7 vs. 11.9 cases, $p = 0.76$).

Kirkpatrick level 1 effectiveness—participant reaction

All 18 enrollees attended the hands-on course. Webinars participation varied with 61% attending at least one webinar (range 0–4), and an average of 1.1 webinar per participant. Ten participants (56%) completed the follow-up questionnaire 6 months after the course.

Qualitative analysis of open-ended questions revealed positive feedback to the course structure and content. Analysis of responses to the open-ended question "What have you gained from this program?" identified four important themes: mentorship (40%), confidence (40%), technique (40%), and experience (30%). Example quotes from each theme are presented in Table 4. Most participants requested additional access to course resources in response to the question "Is there anything else that you would like to receive from this mentorship program?"

Table 3 Self-reported annual procedure volume prior to the course

Procedure	Case volume mean (SD)
Right laparoscopic colectomy	6 (5.1)
Left laparoscopic colectomy without colostomy	6.8 (6.3)
Left laparoscopic colectomy with colostomy	1.2 (1.4)
Total	14 (11.7)

Half of respondents (50%) commented that additional videos would be a helpful resource for continued education. Nearly one-third (30%) of respondents indicated that continued mentorship would be highly valued. Other responses to the question included (1) "potentially the skills to become an instructor…", (2) "a certificate", and (3) "no", indicating no additional resources are needed.

Kirkpatrick level 2 effectiveness—knowledge, skills, and abilities

Participants reported significantly higher confidence in all learning objective skills at the 6-month post-course survey compared to the pre-course survey (all $p \leq 0.015$) (Fig. 2). In general, participants were quite confident in performing procedures taught during the course after 6 months. (Figure 3) The highest mean confidence was reported for "Competently conduct the technical steps of laparoscopic right colectomy" (mean 4.5), and the lowest confidence was reported for "Identify proper anatomical planes and isolate anatomic structures for the performance of laparoscopic left colectomy" (mean 4.0). Confidence ratings were significantly higher for techniques applied in LRC compared to LLC (mean 4.38 vs. 4.1, $p = 0.010$).

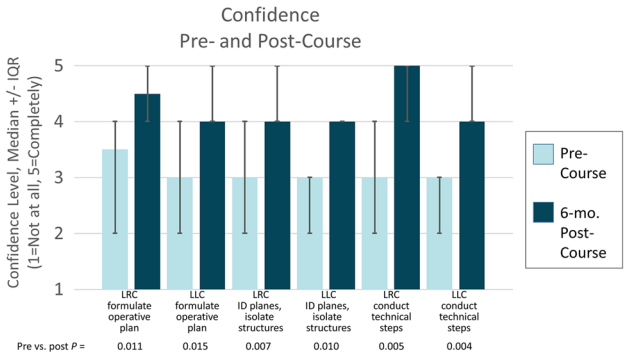

Fig. 2 Confidence levels, pre-course and 6-months post-course

Table 4 6-month survey responses to "What have you gained from this program?"

Response theme	Percentage reported (%)[a]	Example
Mentorship	40	"Technique, personal mentorship, and feedback… it was very well run"
Confidence	40	"This program (and especially conversations with my mentor)… have completely changed my standard approach for laparoscopic colonic resection to a more oncologic appropriate technique (vessel-first, medial-to-lateral). I now undertake this approach confidently…"
Technique	40	"A good insight into methods of mobilizing the splenic flexure for all cases of [left] colectomy"
Experience	30	"I really appreciated the hands on experience"

[a]Response percentages sum to > 100% because multiple themes were reported in some responses

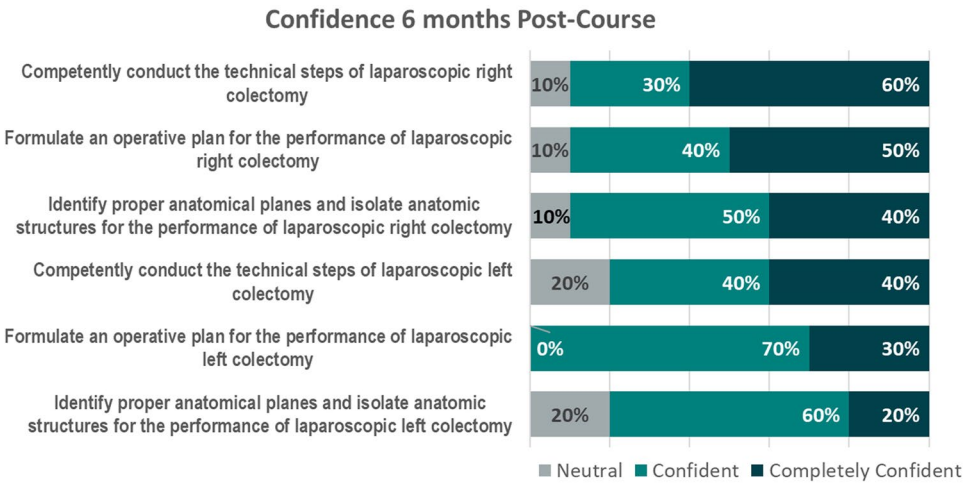

Fig. 3 Self-reported participant confidence in performing specific tasks related to colectomy at 6 months following the SAGES hands-on colectomy course

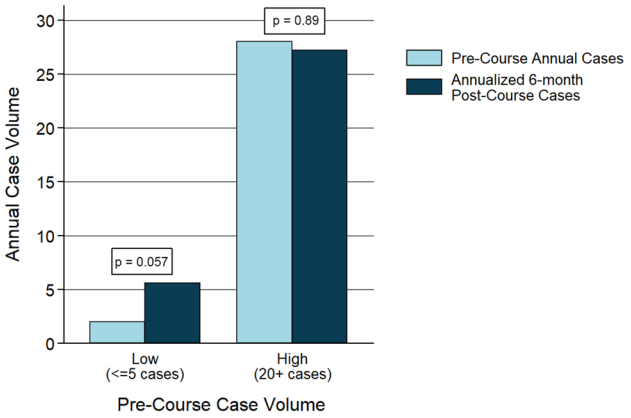

Fig. 4 Pre- and post-course annualized case totals by pre-course volume

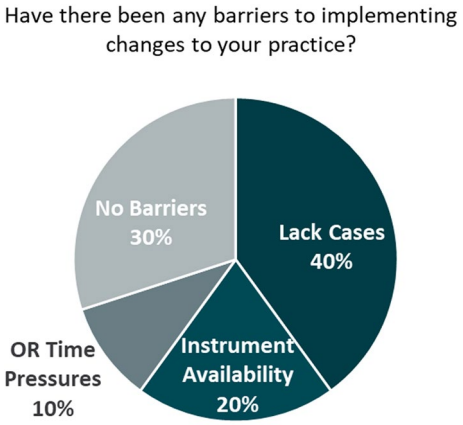

Fig. 5 Barriers to implementation of practice changes learned in the course

Kirkpatrick level 3 and 4a effectiveness—behavior change and practice change

At the 6-month post-course survey, most participants (60%) reported an increase in the number of procedures performed (Fig. 4). When analyzed by tertiles of pre-course annual colectomy case volume, the lowest pre-course case volume group (≤ 5 cases, $n=6$, 5 responders to the 6-month survey) demonstrated a trend for increased procedure volume post-course (2 vs. 5.6, $p=0.057$). The highest case volume group (≥ 20 cases, n = 5 responders) had a slight non-significant reduction in the number of annual procedures (28 vs. 27.2, $p=0.89$). Course participants in the middle tertile group (5–19 pre-course colectomy cases, $n=6$) did not respond to the 6-month post-course survey.

Qualitative analysis of responses to the question "Have there been any barriers to implementing changes to your practice?" revealed a variety of themes (Fig. 5). They included a lack of case volume (40%), lack of instrument availability (20%), and lack of time in the operating room (10%). Interestingly, almost a third of the respondents reported no notable barriers to implementation.

Discussion

Consistent with our previous findings, the participants of our laparoscopic colectomy course utilizing the ADOPT method found the program to be a useful and advantageous method of becoming competent and confident in performing these procedures. Nearly all of the survey respondents said that they felt either confident or extremely confident to perform the procedures learned. Even the lowest score category, techniques of left colectomy, had a high number of participants rating their confidence level positively. In addition to being a statement attesting to the high quality teaching of the faculty, it serves to validate the ADOPT method of standardized instruction and longitudinal mentorship. The robust response rate to the survey, as well as the above findings of confidence improvement, confirm the success of Kirkpatrick level 1 and

level 2 effectiveness, respectively. Subjective responses were all positive, with a significant number of respondents stating that they wished the mentorship would continue beyond the 1 year time period, another indication of Kirkpatrick level 1 effectiveness of the ADOPT program.

Unlike the Hernia Hands-On experience, a significant increase in the overall number of procedures was not demonstrated within the hands-on colectomy cohort. Subgroup analysis of the participants based on pre-course case volume suggests a possible explanation. In those participants who had the least pre-course experience (i.e., the tertile with five or fewer cases), a trend toward increased case volume was present. This increase was almost three fold in this group. Among those participants who had the most pre-course experience (i.e., the tertile with 20 or more cases), the case volume barely changed. Thus, this particular ADOPT course seemed to have two audiences, a novice group looking to learn the procedure and add it to their surgical practice, and a more experienced group already doing the procedures in their practice but looking to gain confidence and technical tips. This more experienced group appears to have achieved this goal, since confidence scores were universally higher at 6 months after the course. Gaining so-called "tips and tricks" to improve practice is an important component of CPD, and the success of ADOPT in attracting experienced surgeons to hone their skill set is noteworthy. Alternately, the failure to reach statistical significant may be related to the small number of respondents in each tertile. In fact, this division resulted in one tertile having zero respondents.

Among barriers to adoption of techniques and procedures taught at the hands-on colectomy course, two-fifths of respondents cited a lack of case volume. This fact emphasizes the reality that, no matter how effective a training program may be, participants must have the patient volume requiring the procedure or technique taught in order to adopt it in clinical practice. Thus, participants must ensure that they dialogue with both their hospitals and the communities they serve to attract the appropriate patients. The need for such participant dialogue with their facilities is highlighted even further by the fact that lack of instrument availability was a cited barrier by one-fifth of respondents. Having the appropriate resources is key to success in adopting a new procedure. Such dialogue could also contribute to reducing the time pressure in the operating room that one tenth of the respondents reported as a barrier. More important than the barriers themselves is overcoming them successfully. The longitudinal mentorship of the ADOPT program assists with this process by providing participants opportunities throughout the year to discuss problems and issues with their mentors and colleagues to help with problem solving. The fact that a third of the respondents did not experience any barriers emphasizes the usefulness of this community of learners/mentors in helping overcome obstacles. It also demonstrates that, with the correct support from facilities and referring physicians, a pathway to local procedure adoption is possible.

Important limitations to this study do exist. First, the data arise from a single course involving a small sample size. This sample size is a deliberate design of the program in order to allow the individualized mentorship required for its success. Nonetheless, it can result in very small numbers when response rates below 100% occur and when subgroup analysis is undertaken. Second, our volume and confidence levels are self-reported data, and, consequently, they are subject to the biases and potential inaccuracies inherent with them. For busy practicing surgeons, we felt that self-reported data would give the best response rate, given it did not entail extra work that might discourage completing the surveys. Third, we did not compare our findings with participants who did not undergo the ADOPT program. The decision to do this was based on our earlier findings that the ADOPT group in our Hernia Hands-On pilot course had such significant volume and confidence improvements over the non-ADOPT group that it seemed unfair to not offer the advantages to the entire colectomy learner group.

In conclusion, the application of the ADOPT program to the laparoscopic colectomy course was successful in increasing surgeon confidence and demonstrated a trend in improving surgeon procedure counts in the low volume participant group. In comparing these findings with prior results from previous ADOPT programs, it is clear that longitudinal mentorship and standardized instruction are critical to aiding in a surgeon's continued professional development. Future projects include expansion of the ADOPT program to include more SAGES hands-on courses.

Acknowledgement This course was an accredited Performance Improvement activity which was supported by Applied Medical. Additionally, we would like to thank our outstanding course faculty: Greta Bernier, MD; Tom Cecil, MD; Mark Coleman, MD, MBChB; Todd Francone, MD; Michael Grieco, MD; Eric Haas, MD; Sang W. Lee, MD; Peter Marcello, MD; Lisa Moudgill, MD; Jaime Sanchez, MD.

Compliance with ethical standards

Disclosures Drs. Dort, Trickey, Paige, and Ms. Schwarz have no conflicts of interest or financial ties to disclose.

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