


Hands-on 2.0: improving transfer of training via the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) Acquisition of Data for Outcomes and Procedure Transfer (ADOPT) program

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Received: 10 October 2016 / Accepted: 16 November 2016 / Published online: 30 December 2016
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Abstract

Background Practicing surgeons commonly learn new procedures and techniques by attending a “hands-on” course, though trainings are often ineffective at promoting subsequent procedure adoption in practice. We describe implementation of a new program with the SAGES All Things Hernia Hands-On Course, Acquisition of Data for Outcomes and Procedure Transfer (ADOPT), which employs standardized, proven teaching techniques, and 1-year mentorship. Attendee confidence and procedure adoption are compared between standard and ADOPT programs.

Methods For the pilot ADOPT course implementation, a hands-on course focusing on abdominal wall hernia repair was chosen. ADOPT participants were recruited among enrollees for the standard Hands-On Hernia Course. Enrollment in ADOPT was capped at 10 participants and limited to a 2:1 student-to-faculty ratio, compared to the standard course 22 participants with a 4:1 student-to-faculty ratio. ADOPT mentors interacted with participants through webinars, phone conferences, and continuous email availability throughout the year. All participants were asked to provide pre- and post-course surveys inquiring about the number of targeted hernia procedures performed and related confidence level.

Results Four of 10 ADOPT participants (40%) and six of 22 standard training participants (27%) returned questionnaires. Over the 3 months following the course, ADOPT participants performed more ventral hernia mesh insertion procedures than standard training participants (median 13 vs. 0.5, $p = 0.010$) and considerably more total combined procedures (median 26 vs. 7, $p = 0.054$). Compared to standard training, learners who participated in ADOPT reported greater confidence improvements in employing a components separation via an open approach ($p = 0.051$), and performing an open transversus abdominis release, though the difference did not achieve statistical significance ($p = 0.14$).

Discussion These results suggest that the ADOPT program, with standardized and structured teaching, telementoring, and a longitudinal educational approach, is effective and leads to better transfer of learned skills and procedures to clinical practice.

Keywords ADOPT · Mentorship · Skills training · Hernia repair

The practice of surgery has been transformed multiple times over the past century and a half by the adoption of seminal innovations. In the late 19th century, these changes included the routine use of anesthesia, which dramatically improved the experience of patients undergoing surgical procedures [1], and the adoption of antiseptic techniques, which improved the safety of procedures [2]. By the late 20th century, another change was ushered in by the advent of the minimally invasive surgery (MIS) revolution [3, 4]. Unlike prior transformations, however, the MIS revolution required surgeons to learn a completely novel skill set in a very abbreviated period of time. Over the last 25 years,

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virtually every common surgical procedure can now be offered with a markedly different approach than in the previous decades and centuries [5, 6]. This transformation necessitated a re-engineering of the manner in which surgeons were trained in new technical skills, since it required, and continues to require, a massive educational undertaking to train almost all surgeons in practice in the procedures adapted to the MIS approach.

Currently, the most common manner in which practicing surgeons learn new procedures and techniques is by attending a “hands-on” course in which they have an opportunity to practice on some form of simulated model, often cadaveric or porcine. These courses are typically offered either as a half or day long experience at large regional or national meetings, or as a weekend event at a smaller local hospital setting. Such one off, mass training events are ineffective at promoting subsequent adoption of the targeted procedure or technique in actual practice, data evaluating the subsequent utilization of learned procedures by the attendees suggest [7, 8]. In addition, attendance at a national/regional meeting or designating a weekend to a local course presents a significant commitment in time and/or money to the surgeon wishing to learn the new technique, leading to a poor return on investment if it is not meaningfully adopted. Given the rapid evolution in technology and scientific advancement in medicine in general and the field of surgery in particular, a new paradigm in assisting practicing surgeons in adopting new procedures and techniques beneficial to the public is needed in order to maximize their transfer to practice. Such a paradigm should attempt to incorporate sound educational principles to enhance learning during the course as well as long-term interaction to promote transfer of training and overcome potential barriers to implementation.

The Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) has been actively engaged in the training of surgeons in all minimally invasive surgical techniques since the beginning of the MIS revolution [9]. To date, it has used the above mentioned hands-on course model as part of its Annual Meeting, incorporating both didactic and “laboratory” (i.e., cadaveric, porcine, or part-task trainer models) components. Recent analysis of SAGES Annual Meeting data has indicated that such a model often leads to perceived inadequate procedure adoption rates by the course attendees [7, 8]. Given this fact, SAGES commissioned a special task force consisting of members from its Continuing Education Committee and Quality, Outcomes, and Safety Committee in order to develop a new hands-on course structure, Hands-On 2.0, to help increase transfer of training to clinical practice. The resultant program, Acquisition of Data for Outcomes and Procedure Transfer (ADOPT), was developed to employ standardized, proven teaching techniques at the Annual Meeting course and to include a year-long mentorship

program lasting from the SAGES 2015 Annual Meeting to the SAGES 2016 Annual Meeting. It was implemented as part of the SAGES All Things Hernia Hands-On Course, in which participants learned both minimally invasive and open techniques related to hernia repair, including component separation.

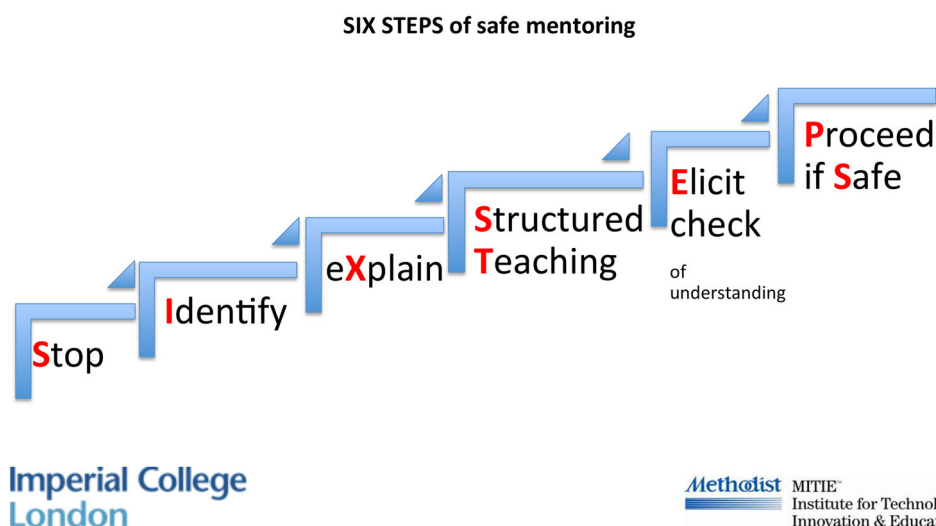
We hypothesized that the standardized teaching techniques employed at the Hands-On course combined with the availability of in-depth mentoring over a longitudinal post-course period would result in improved confidence among attendees in performing the targeted procedures with resultant higher procedure adoption rates. This article describes the findings from a prospective examination of attendees who participated in this ADOPT program and compares it to results from participants of the same course using the standard Hands-On Course model. We hypothesized that such a model of training incorporating individual support would result in increased procedure adoption by the participants in their practices.

Methods

Program design

The ADOPT program differed from the standard Hands-On Course in two important ways. First, for the onsite component of the program involving training using cadaveric models, a standardized teaching technique was employed by all instructors at each table. This instruction was structured on the Laparoscopic Colectomy (Lapco) Train the Trainer (TT) teaching model [10], developed in the UK in order to enhance the effectiveness of teaching laparoscopic colectomy during the implementation of the National Institute for Health and Care Excellence (NICE) mandate. This mandate was to train as many coloproctologists in laparoscopic colectomy in the UK as possible in order that the public could have these procedures as an option to open colectomy for therapy for colon cancer. Developed in 2007 in England, this model emphasized a set-dialogue-closure framework. The set, consisting of a pre-brief before undergoing the procedure/training, focuses on aligning agendas between the instructor and learner (i.e., setting agreed upon learning objectives and goals) as well as removing potential distractions. The dialogue, used during the actual training event, consists of a structured verbal interaction between the instructor and learner known by the acronym SIX STEPS (Fig. 1). First, the instructor halts all activity by saying “Stop.” Next, he/she inquires about what the learner was thinking or trying to do. This inquiry and the learner’s response are followed by the instructor explaining what he/she sees as the issue. Next, the instructor engages in structured teaching designed to

Fig. 1 Structured verbal interaction between the instructor and learner known by the acronym SIX STEPS [10]



help the learner. He/she then elicits a check of understanding by having the learner repeat back the teaching point. Finally, the instructor has the learner proceed on if safe to do so. The closure is a post-procedure/training debriefing in which the instructor encourages the learner to reflect on what went well, what could be improved, and guides him/her to an overall “take home” to work on related to the training. By using this framework, instruction for the training exercise is consistent, predictable, and standardized.

The second difference between the ADOPT program and a standard hands-on course was the post-course mentoring and follow-up that participants undertook over a 12-month period. All ADOPT participants were paired with a faculty member with whom they were encouraged to communicate regarding questions or issues they may encounter when trying to incorporate the techniques/procedures they had learned at the Hands-On Course. In addition, they were encouraged to participate in several phone conferences which were held the first few months after the course to discuss issues and review techniques. Participants had the opportunity to submit videos and participate in a web-based coaching session as well. Finally, they were invited to present their experiences to participants of the Hands-On Course in hernia (another ADOPT course) at the SAGES Meeting the following year. Thus, participants had the opportunity to continue to interact with faculty and learn over the course of the year.

Implementation and recruitment

For the pilot implementation of the ADOPT course, a hands-on course focusing on abdominal wall hernia repair was chosen. This technique was chosen for multiple reasons. First, the hernia is consistently chosen as a top four learning theme by attendees to the SAGES Annual

Meeting, [7, 8] providing a large pool of potential learners who could sign up. Second, SAGES has a large number of experts in hernia repair, increasing the availability of potential faculty to teach and mentor. Third, abdominal wall hernia repair lends itself to being able to teach multiple new different techniques (e.g., laparoscopic hernia repair, endoscopic or open component separation). Finally, hernia was identified as a desirable topic for a course by previous attendees to the meeting.

Faculty were recruited to participate as instructors/mentors in the ADOPT program based on several criteria: their known expertise in the field, effectiveness at prior educational events, their willingness to participate in the Lapco TT mentor training course, and their demonstrated enthusiasm and commitment to the ADOPT program. Participants were recruited among the overall enrollee pool of learners signing up for the Hands-On Hernia Course. All enrollees were offered the opportunity to do the ADOPT program for a small supplemental fee. Enrollment in ADOPT was capped at 10 participants and was limited to a 2:1 student-to-faculty ratio compared to 22 participants and a 4:1 student-to-faculty ratio for participants who chose to take the standard hands-on course. In addition, ADOPT mentors interacted with participants through a series of webinars, phone conferences, and continuous email availability throughout the year (Fig. 2). Finally, the participants were required to provide a reflection on their experience at the conclusion of the project in the form of a short presentation to incoming participants of the 2016–2017 ADOPT program.

Faculty training

All participating faculty in the ADOPT program underwent a full day and a half Lapco TT course in order to standardize teaching during its cadaveric component [10]. The

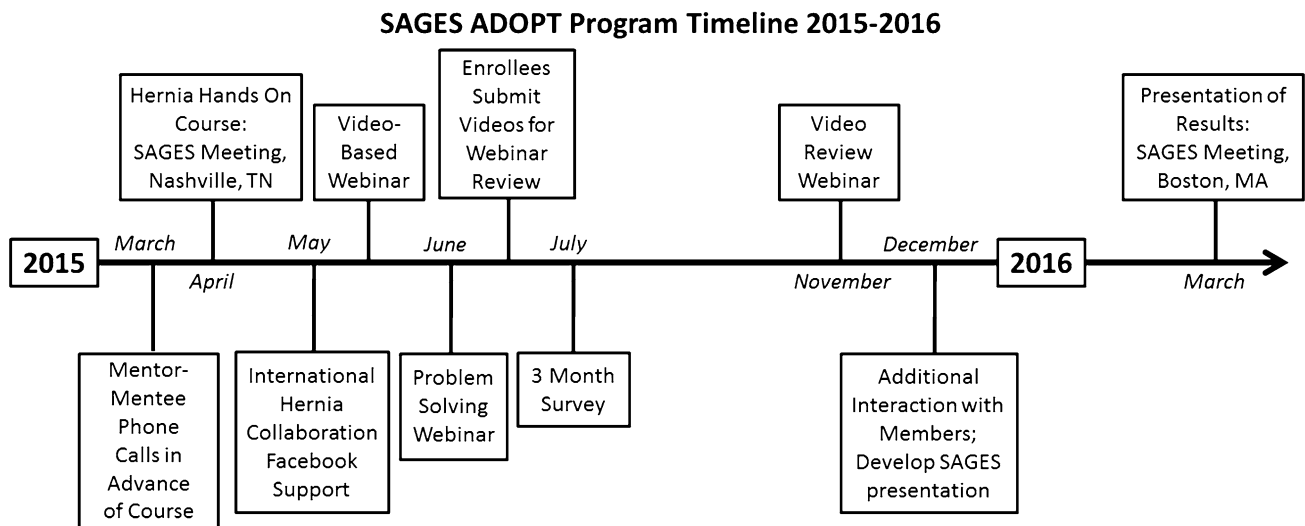


Fig. 2 SAGES ADOPT program timeline 2015–2016

Lapco TT course was made available thanks to the leadership of the program director, Professor and consultant colorectal surgeon Mark Coleman, who has worked recently to extend its reach to an international audience, including the USA. All faculty for the ADOPT course completed a full Lapco TT course refresher the day prior to the Hands-On Course at the Annual SAGES Meeting. As described earlier, the emphasis of the Lapco TT course is to convey learner-focused educational strategies and techniques for procedure skill transfer. By training our faculty/mentors in these strategies, we ensured a uniform mentorship experience for all learners during the hands-on course laboratory.

Evaluation

The Institutional Review Board at Inova Fairfax Medical Campus determined that this evaluation of educational practices met criteria for exemption from review. A quasi-experimental design was adopted. All participants in the Hands-On Hernia course (i.e., both ADOPT and standard training groups) were asked to complete pre- and post-

intervention surveys inquiring about the number of targeted hernia procedures they performed and their confidence level related to performing them. The targeted procedures are listed in Table 1. Participants reported the level of confidence improvement on a 5-point scale, from “not at all more confident” to “significantly more confident” in their ability to perform specific tasks (Table 2). The pre-intervention survey was sent to participants upon registration. The post-intervention survey was sent 3 months after the completion of the cadaveric Hands-On Course. In addition, for the 3 month follow-up survey, participants had the opportunity to provide open-ended feedback regarding their practice changes since the course, barriers to adoption of learned techniques, and suggestions for improvement of future courses. Finally, ADOPT participants were queried regarding the number of times they were in contact with their mentor since the completion of the cadaveric course and participation in post-meeting webinars.

Qualitative and statistical analysis

Open-ended responses were summarized by themes and characterized descriptively. The number of reported procedures and degree of confidence improvements were compared between the ADOPT and standard training groups. Descriptive statistics include medians and interquartile ranges (IQR). Nonparametric Wilcoxon rank-sum tests were calculated to compare outcomes between training groups. All tests were two-sided, and statistical significance was assessed at the level of $\alpha = 0.05$. Analyses were performed using Stata v.12 (College Station, TX).

Table 1 Targeted hernia procedures

1. Open primary ventral hernia repair
2. Laparoscopic primary ventral hernia repair
3. Open components separation technique
4. Mesh insertion for ventral hernia repair
5. Endoscopic components separation technique

Table 2 Confidence assessment tasks

1. Employ a components separation via an open approach
2. Employ a components separation via a minimally invasive approach
3. Identify and avoid situations where there is risk to nerve and vascular structures
4. Describe advantages, disadvantages, and barriers to various mesh choices in repair of hernias
5. Perform an open, perforator sparing, anterior external oblique release
6. Perform an open, transversus abdominis release
7. Identify barriers to implementation of new techniques learned during course at the home institution

Results

Overall

Four out of 10 ADOPT participants and six out of 22 standard training participants returned questionnaires for response rates of 40 and 27%, respectively. Of the ADOPT respondents, 50% reported some changes in their practice since the course. Among standard training participants, 50% reported changes in their practice as well. On qualitative analysis, the ADOPT participants indicated increased utilization of learned techniques, for example “more complex hernias and... sublay mesh placement,” and “using the transversus abdominis release more.” Standard training participants, on the other hand, reported less specific changes such as making “more time for practice” and having “increased awareness of incisional hernia repair options.” Two ADOPT participants and one standard training participant reported experiencing barriers to application of learned techniques, including case mix, difficulty obtaining help for larger hernias in a small hospital, and concerns of practice partners. The other respondents reported no specific adoption barriers.

Among ADOPT respondents, 75% had participated in one or more post-meeting webinars in the 3 months following the course and indicated that the webinars were highly effective (≥ 4 on a 5-point scale). All ADOPT participants had between 1 and 5 contacts with their mentors.

Procedures performed post-course

In the 3 months following the course, ADOPT participants reported performing more learned procedures (Fig. 3) compared to participants in the standard course. Mesh insertion for ventral hernia repair accounted for the most procedures in the ADOPT group. ADOPT participants performed significantly more ventral hernia mesh insertion procedures than the standard training group (median 13, IQR 10.5–17.5 vs. 0.5, 0–3; $p = 0.010$). Similar patterns of ADOPT participants performing more procedures in other evaluated procedures were noted, but the group differences did not reach statistical significance. ADOPT participants

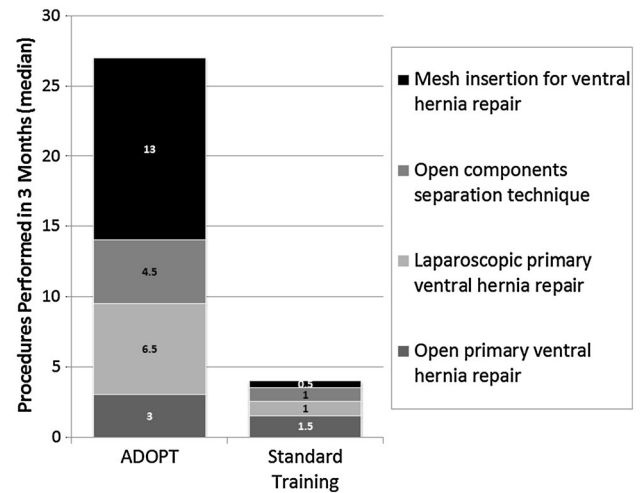


Fig. 3 Median number of procedures performed over 3 months following training for ADOPT and standard training learners

reported considerably higher total combined procedures than standard training participants (median 26, IQR 22–36 vs. 7, IQR 0–14, $p = 0.054$).

Confidence improvement in performing selected procedures

Compared to standard training, learners who participated in ADOPT reported greater confidence improvements in employing a components separation via an open approach (median 5 vs. 4, $p = 0.051$). ADOPT participants also reported more substantial confidence improvement in performing an open transversus abdominis release, though the difference did not achieve statistical significance (median 5 vs. 3, $p = 0.14$). Confidence in other tasks were similar between ADOPT and standard training groups.

Discussion

Optimal surgical outcomes are tied to the ability of a surgeon to provide the most up-to-date, evidence-based procedures, in a safe and reliable fashion. This ability to

provide the most recent quality care hinges on the existence of a procedural skills acquisition mechanism that gives the surgeon the best chance at learning, maintaining, and delivering those skills to their patients. In order to provide such a mechanism, the ADOPT program was developed. Our results suggest that the ADOPT program, that is, the use of a standardized teaching technique combined with post-course mentoring and follow-up, resulted in a significant early increase in both the volume of procedures performed by learners upon return to their practices, as well as their comfort level in delivering them. Learners in the ADOPT group reported volumes three times higher in the first 3-months post-course than their counterparts in the standard course. The lowest number of cases reported in the study group was higher than the highest reported case volumes within the standard group. The length of the on-site procedural course was the same for both groups. The differences in the ADOPT group included: (1) a standardized teaching regimen of mentors (standard course instructors are given no specific teaching strategies), (2) lower ratio of teachers to learners at the tables, (3) scheduled post-conference webinars and phone conferences, and (4) availability of the mentors to the learners for the post-conference period.

The importance and positive impact of mentoring is well established in the literature [11, 12]. Mentoring in medical education has only recently been rigorously studied; reports on its use in surgical education have been limited but show promising results [13–16]. To our knowledge, this manuscript reports the first formally structured, large scale, longitudinal mentoring program described for a national meeting hands-on course. The reasons for the increase in reported volumes are most likely multifactorial, but they can certainly be ascribed to the same advantages of access to mentors in both structured and unstructured settings that have previously been reported [13, 15, 16]. Both elements are important to this success. The structured sessions prompt the learner to bring challenging cases or questions given the guaranteed exposure to mentors who will be asking questions in return. The unstructured availability acts as a safety net to the learner, becoming a constant resource for concerns or questions, and giving them the added confidence we see reported in the study surveys. In this manner, through webinars and contact with mentors, a community of practice is formed which provides a vital support network for learners trying to incorporate new procedures in their practice.

The reported time frame of procedure adoption is over the first few months after the course. This time interval was chosen given that early adoption is often required for full incorporation of a new technique into a practice and that nonadoption in the first few months could be interpreted as an abandonment of an attempt to adopt a new procedure.

The question of participating surgeons' learned procedure sustainability beyond the study period was considered and led to the decision to carry the mentoring program to a full year post-course. As part of the course participation and further incentive and motivation to maintain engagement, mentored surgeons were given the opportunity to present their experience and any cases they chose at the SAGES ADOPT course given the following year. Future areas of analysis will include longer-term procedure adoption data as well as the application to procedure skills in other specialty areas.

Limitations to this study do exist. The surgeons in the course were part of an initial pilot group, and therefore, the numbers in the study group are small. The follow-up period is also brief, and the sustainability of the early effect cannot be determined within the study period for either training group. Both of these elements affected the statistical significance of the reported results, but we believe the trends of the case volumes are indicative of a trend toward more transfer of training to clinical practice by ADOPT participants. As these groups were not randomized, the potential of a self-selection bias is present, where the more motivated surgeons who were more likely to incorporate these procedures in their practice would have more likely chosen the ADOPT training. This bias may truly exist, but our results do confirm the effectiveness of the program in providing the resources and necessary support to allow those surgeons to succeed in achieving the increased post-course procedure volumes. Finally, the response rates were not 100%, potentially leading to skewed results.

In conclusion, these results suggest that the ADOPT program, focusing on standardized and structured teaching, multiple telementoring opportunities, and a longitudinal educational approach, may be a more effective way of teaching new skills and procedures to learners in order to ensure better transfer to clinical practice. ADOPT participants demonstrated increased implementation of learned procedures compared to standard hands-on course participants. While this pilot work included open and MIS techniques, the demonstrated outcome shows promise of an improved ability to meet the challenge of enhancing MIS adoption to all surgeons' practices. This transfer to clinical practice, in turn, will ultimately improve the quality of care for all surgical patients.

Acknowledgements The authors would like to acknowledge the leaders of the Lapco TT program, colorectal surgical consultants Mark Coleman and Tom Cecil, and research fellow Susannah Wyles, for bringing this revolutionary mentor training program to the USA, training the authors as instructors (JD, JP, BD), and their time, energy, support, and expertise in participating in the training of the course mentors. The authors also wish to thank our world-class surgeon mentors for their enthusiasm, expertise, and time commitment: Drs. William Cobb, William Hope, Mike Liang, Archana Ramaswamy, Shawn Tsuda, and Khashayar Vaziri.

Compliance with ethical standards

Disclosures Dr. Dort is the Co-Chairman of the Quality, Outcomes, and Safety Committee of SAGES. Dr. Paige receives grant support from HRSA, LSU Board of Regents, Acell, Inc., and Intuitive, Inc., and receives royalties from Oxford University Press. He is also the Chairman of the Continuing Medical Education Committee of SAGES. Ms. Schwarz provides consulting services on behalf of the association management firm, BSC Management, for SAGES. Dr. Dunkin is the Past President of SAGES. Jonathan Dort, Amber Trickey, John Paige, Erin Schwarz and Brian Dunkin have no conflicts of interest or financial ties relevant to the study.

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