New technologies in minimally invasive surgery training: what do surgeons demand?

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Abstract

Background: Minimally invasive surgery may greatly benefit from the information and communications technologies. The objective of this work is to determine the best approach to include those technologies, in particular an e-Learning platform, into an in-person training course.

Methods: An online survey was sent to all participants in any of the laparoscopic training courses at Jesús Usón Minimally Invasive Surgery Centre. This survey included questions regarding new technologies used for training. Once all data were gathered, a descriptive analysis was performed.

Results: There were 382 questionnaires sent of which 102 were correctly returned. This indicates a response rate equal to 30%. Current theoretical training means are watching surgical videos (85 – 83.3%) and assisting at in-person training courses (77 – 75.5%). Participants rated as useful the use of new technologies for training (4.1 ± 0.9) and would mainly use it both before and after assisting at an in-person training course (80 – 78.4%).

Conclusions: A methodology is proposed that provides participants with didactic resources based on surgical videos, both before and after assisting at an in-person training course. Through the application of this methodology, an improvement and reduction of the time that surgeons expend in training is the goal.

Key words: Surgical procedures, minimally invasive, laparoscopy education, education, distance, multimedia.

Introduction

Because of the large adoption of minimally invasive surgery as a routine surgical practice, training of surgeons in this area has currently become a need.1,2 This is evident by the recently approved changes included in the Specialty Training Programme in General Surgery and Gastroenterology3 and analyzed by the Postgraduate Training Section of the Spanish Association of Surgeons.4 In addition to residents training, it is necessary to consider the lifelong learning of professionals.5 Because minimally invasive surgery has witnessed rapid developments, it is essential for surgeons to maintain updated knowledge. So far there is no standardized training model for minimally invasive surgery because of complications that the surgeon must face compared with the widely accepted Halsted model2,6 and the fact that European regulations require personnel to work 48 h a week and society has increased awareness about patient security. Apparently, there is not a unique training model, but it is possible to have models that include a combination of training surgeries, specialization courses, tutoring and application of new technologies.7 In any case, all training should aim to train more surgeons in less time, to carry out interventions in the best possible way, providing the best outcome for patients.6 E-learning is one of the new technologies available that uses the Internet to distribute educational materials from a central location to users who are in different locations. This minimizes time-related barriers because users are not limited by schedule or specific location (access to content is ubiquitous) or costs (absence of travel expenses to training centers).8 Therefore, the inclusion of an e-Learning platform on a traditional training program, which requires in-person attendan-
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Materials and Methods

An on-line survey was provided to trainees attending the laparoscopic surgery course at JUMISC via the web platform SurveyMonkey (www.surveymonkey.com). The link to the survey was sent by e-mail explaining the study objectives and instructions in regard to completing the survey. The e-mail addresses were obtained from the JUMISC database, which adheres to the General Registry of the Spanish Data Protection Agency. All legal requirements were met.

The survey contained two sets of questions: one related to demographics and the other related to new technologies used for training in addition to other blocks without interest for the present study. Surveyed trainees were prompted about current tools they use and were required to assess an e-Learning process and its usefulness. The questionnaire included direct response, multiple-choice questions and Likert 5-point scale (1 being the lowest score and 5 the highest). The survey ended with an open comment section.

To validate the survey, check the comprehensibility, detect ambiguities and ensure adequate semantics, a pilot test was carried out beforehand with ten users. Results from the initial sampling were not included in this study. An invitation was sent initially to all participants who had provided an e-mail address during registration for classroom courses at JUMISC. A week later, a reminder was sent to all addresses that had not responded to the questionnaire. The responses were tabulated as quantitative and qualitative variables and were analyzed using the Survey Monkey platform. Due to sample size, design and purpose of the study, no variables relationship analysis was carried out.

Results

The study considered 427 participants from any laparoscopic surgery courses at JUMISC. Of these participants, 270 (63.2%) were male and 157 (36.8%) were female; 414 provided an e-mail address in the registration form and 32 were involved in more than one training activity. Therefore, the population for the actual study was reduced to 382 students. Of 382 surveys sent, 42 (11.0%) were returned by e-mail servers and 104 were completed. Of surveys, 102 (26.7%) were regarded as valid, with a response rate of 30% defined as the number of valid responses received from the total questionnaires sent successfully. Demographic results are shown in Table 1. Surgical experience for participants was 11.71 ± 8.7 years (range 0.5-35 years) of previous experience as a surgeon in their specialty. The use of video as a training tool in minimally invasive surgery (Figure 1) was rated positively by 100% of students. The majority described them as either essential (42-41.2%) or recommended (48-47.1%). Students were asked about the tools they use to acquire theoretical knowledge; favored options were watching surgical videos and attending courses or seminars (Figure 2). As this was a multiple-choice question, users were able to select as many responses as they considered necessary, so percentages exceed 100%.

The survey covered the assessment of four aspects related to the inclusion of new technologies such as the Internet or e-Learning, applied to theoretical training in minimally invasive surgery. The following results were obtained on a 5-point Likert scale (Figure 3): usefulness was rated with 4.14 ± 0.9 points; acceptance by the surgeon scored 3.89 ± 0.9 points, ease of access to content was scored with 4.18 ± 0.8 points and, finally, 3.9 ± 0.9 points for credibility. As for the utility and use of a custom web platform, results are shown in Figure 4, including the relationship between the assessment made by participants and the time they would use the platform using larger or smaller spheres depending on frequency. Overall results of each option were either to the right of the graph for assessing utility or at the top of the graph for platform usage time. We can observe the highest frequencies match when both maximum scores are combined (4-5) and the use before and after attending a training course.

Discussion

First we should acknowledge a 30% response rate compared with similar study responses9,10 in spite of attempts to increase this response rate.11 This participation level may be motivated by the survey itself (writing complex, unattractive or excessively long surveys) or selected channel, which could lead to a selection bias because participants who are more interested or familiar with the use of new technologies may show further interest in responding to the survey.12 However, percentages of males and females attending courses and responses were very similar; therefore, we can draw trends of current perceptions of minimally invasive surgery trainees even though carrying out a statistical analysis is not feasible.
Undoubtedly, information technology and communications provide added value to training processes in many different fields. There are emerging initiatives in medical training based on the former including e-Learning platforms and surgical videos. Because e-Learning has great potential for surgical training, it is interesting to determine how these new tools can be reconciled with short in-person training courses, which are currently the most common way of training in minimally invasive surgery resulting in improvements in clinical practice, in order to optimize the time surgeons devote to training.

Therefore, our approach (Figure 5) is to combine e-MIS (e-Learning and multimedia content for minimally invasive surgery) with in-person training courses such as those included in the training methodology at JUMISC. Before participating in a training course, the trainee could use an e-Learning platform (adapted to surgical specialty and experience, previous training, etc.) where he/she could gather information on theoretical concepts related to the upcoming course: anatomy, surgical instruments involved, ergonomic recommendations, techniques description, intervention steps and others by watching multimedia content and surgical videos. A hands-on practice will be carried out during in-person courses and, afterwards, the trainee will be able to review learned concepts using an e-Learning platform, ask questions directed at the experts, foresee complications or query about news in the field. Thus, participants could perform the theoretical training remotely while they optimize the time outside their workplace for hands-on activities.

The media currently used for theoretical training are mainly attending courses and visualization of surgical videos, followed by the literature search and CDs/DVDs. The established methodology will bring these together in a single training environment under the “umbrella” of recognized training institutions and integrating well-established training courses.

In view of the assessment attendees make about surgical videos as a training tool, it appears they need to be included in any training tool, considering that these resources are easily created with the currently available computer programs. In our view, these surgical videos can be edited and supplemented with additional material to ge-
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Figure 2. Current methods for theoretical training in minimally invasive surgery.

Figure 3. Rating of different aspects associated with the inclusion of new technologies in theoretical training for minimally invasive surgery using a 5-point Likert scale (1 min, 5 max).

Despite all the advantages provided by an e-Learning training program, we need to keep in mind that it also requires an ongoing effort to maintain quality content that is updated and that encourages user participation. A critical component in any training process is feedback and these should be included in the platform because it is regarded as an appropriate method to encourage user participation.27

Also keep in mind that the acceptance and credibility of new technologies used for theoretical training in minimally invasive surgery is currently low. However, we believe future generations, including Gen Y,28 are increasingly used to new technologies in every aspect of their life as they have used mobile phones, computers and technology with immediate access to information 24/7 during their lifetime along with Web 2.0 technologies (such as instant messaging, videoconferencing, social networking, blogs etc.). Therefore, it seems likely that soon there will be new technologies such as e-Learning, which will be integrated into any training program, especially in surgery. In addition, it will be necessary to establish new channels such as social networks that enable communication in line with technological advances as reported by other authors29 without neglecting professionalism.30 Another new development that may have a major impact on training, especially for medical residents, are the so-called serious games, which include different aspects of computer-based training with a very creative component.31 Although some studies have been carried out in this regard, we believe that it is interesting to advance research in this field and to de-
Figure 4. Bubble graph between the assessment of a custom web platform (vertical axis) and when it would be used (horizontal axis).

Figure 5. Methodology for the inclusion of an e-Learning platform.
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terminate the effectiveness of these new training systems. From the proposed training scheme, future work will focus on the development of appropriate teaching materials for a particular course and then conduct a pilot study that reveals possible improvements. Because there is a history of the benefits of combining multimedia content with basic skills training and the use of e-Learning, we are confident that these results can be reproduced in advanced training of minimally invasive surgery. To carry out this pilot study, TELMA environment will be used, which provides an online training environment based on the edition of laparoscopy videos, knowledge management and collaborative work with e-MIS contents, considering design and validation from e-Learning platforms.

Finally, we review the major training centers. In Spain, the Iavante Foundation has courses among its surgical programs that include an e-Learning module before and after the course; however, none of these considers future editions. The Virtual Hospital Valdecilla does not mention e-Learning tools included in the programs of their courses. In Europe, the European School of Laparoscopic Surgery provides multimedia contents but not remote learning. IRCAD, in any of its centers, offers courses and WebSurg, which are not integrated in the same training process. The Skills Cushieri Centre offers the option of on-line classes, questions with multiple choices or DVDs for some courses.

In conclusion, there is a need to determine and validate a structured training program for minimally invasive surgery that reconciles in-person courses and e-Learning so that through its implementation and optimization it improves training in these techniques for resident surgeons and experts in lifelong learning programs.

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