Transfer of Skills From Simulation Lab to Surgical Services: Impact of a Decade Long Laparoscopic Urology Surgical Course

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OBJECTIVE: To investigate the impact of decade-long dedicated laparoscopic urology surgical skills course on the successful implementation of surgical services by the participants.

METHODS: A prospective database was maintained for all the participants in urological laparoscopic courses run by a single dedicated unit between January 2016 and December 2016. Data on various variables were collected using a follow-up validated questionnaire exploring speciality of clinical practice, challenges and need for additional training to establish clinical services, improvement in quality and frequency of laparoscopic courses. A subset of participants reported data of their outcomes in a national database available publically.

RESULTS: One hundred sixty one delegates were drawn from 18 countries attended laparoscopic skills courses during the study period of 10 years. Data were available for 154 (95.65%) participants. There were only 20 (20/154; 12.9%) responses to online website questionnaires despite 3 reminders. Further, follow-up through websites/telephonic contact/organizational contacts improved the response rate to 93% (143/154). Of the participants, 95% (135/143) felt that these courses should be continued, and they agreed to recommend them to their trainees in the future. More than 50% (81/143; 56.6%) of the participants performed laparoscopic/robotic surgery at various centers. Sixty two (62/143; 43.3%) did not pursue laparoscopic surgery as a career choice. Fifty six (56/81; 69%) participants were established laparoscopic surgeons were from the UK, and of them, 30 (30/56; 53.57%: 30/81; 37.04%) were established surgeons that contributed to publishing their results through professional organizations with the outcomes of all of these within normal ranges of their peers.

CONCLUSIONS: A dedicated laparoscopic urological surgery course run over a decade had a significant impact on the skills of participants, and most participants were able to establish clinical practice catering to a large proportion of the UK population as well as a few centers internationally. (J Surg Ed 76:591−599. © 2018 Published by Elsevier Inc. on behalf of Association of Program Directors in Surgery.)

KEY WORDS: Surgery, simulation, skills, nephrectomy, laparoscopy

COMPETENCIES: Patient Care, Medical Knowledge, Practice-Based Learning and Improvement

INTRODUCTION

Acquiring surgical skills in laparoscopy or minimally access surgery is an integral aspect of surgical training[1] and a number of centers have invested in facilities promoting training through various skills courses.[2] However, acquisition of laparoscopic skills, in particular advanced suturing skills, is hard and difficult[3-6] and the long-term impact of training courses on surgical practice is unknown. Assessing the impact of this on surgical

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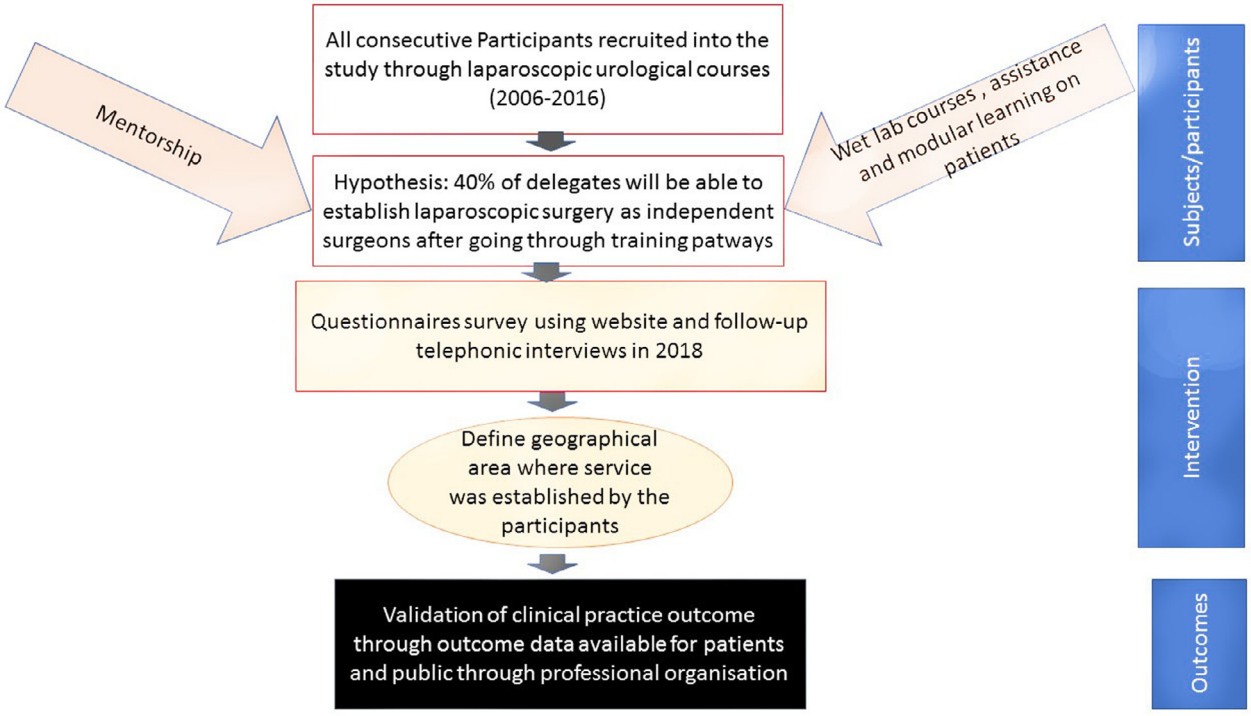

FIGURE 1. Flow diagram of study concept and basic format.

practice is challenging, as not all participants taking teaching courses manage or opt to engage in laparoscopic surgical services, and training centers receive very little feedback regarding their contributions. In general, the effect of running a laparoscopic training course over a long period and its influence on surgical practice remains skewed, and most places rely on while receiving very little criticism through an immediate feedback forms filled out by participants. This may lead to high satisfaction and continued investment through workforce efforts and infrastructure in their surgical skills teaching.[7,8]

Notwithstanding a number of minimally invasive surgical courses run across the globe, including recent virtual ones,[9,10] there is still poor agreement on which training tool and scheme is best suited for acquiring minimally invasive surgical procedural skills. Human cadaveric use, especially new soft embalmed models,[11,12] appear to be better performing in terms of anatomical reality and learning. However, this approach is associated with ethical concerns, cost, poor availability, and lack of bleeding, leading to poor preparation for real-life situations in operating rooms. At the Cuschieri Skills Centre, University of Dundee, we have been running urological laparoscopic courses for 12 years using different sets of simulation models ranging from animal tissue to Thiel-embalmed cadavers.[13]

The majority of surgical course literature describes training approaches, content, and satisfaction of participants with content delivery. However, there is lack of reports examining the impacts of training or the most useful content and training methods on future contributions of these educational exercises on clinical services developments. The effect on healthcare outcomes, quality of training, and usefulness of resource allocation remains uncertain. Given that there is little in the literature reporting the impact of investment through dedicated laparoscopic skills courses and the future establishment of surgical services, we hypothesize that long-term investment in teaching laparoscopic skills will have a significant effect on laparoscopic surgical services. There is considerable investment in training by professionals and organizations, but rarely is the influences of these assessed. Studies from management research suggest that, on average, 10% to 40% of learning is transferred to jobs.[14-16] Based on this, we hypothesized that 40% of delegates who attended skills courses will be able to establish surgical practice in minimally invasive surgery (Fig. 1).

The aims of this study were to explore whether the participants going through laparoscopic urological courses at a single centre over a period of 12 years have contributed to the development of laparoscopic surgical services. In addition, we wanted to know the reasons for not continuing with laparoscopy by those that went on to other subspecialities. To our knowledge, this is the first study to explore such a question in terms of minimally invasive surgical skills education, in particular delving

into the deeper and long-term consequences of imparting skills to the surgical workforce and their contribution in terms of development of laparoscopic surgical services for populations in the areas of their employment.

METHODS

Participant Cohort

The Surgical Skills Centre in Dundee conducted basic, intermediate, and advanced laparoscopic urological courses between 2006 and 2016 (https://cuschieri.dundee.ac.uk/courses/urology/baus-sections-endourology-and-oncology-laparoscopic-training-course/mon-03122018). A database of all the participants was maintained, including their immediate feedback. All the participants consented to providing feedback and follow-up tracking at the time of seeking placements during the courses. A questionnaire was designed to explore the long-term impact of laparoscopic skills education through these courses, including the contribution of participants to the delivery of laparoscopic urological services (Appendix 1).

Development of Questionnaires and Validation

Questionnaires for the survey were based on a 7-step survey scale design process for medical education research.[17] This included a thorough literature review, meetings with focus groups, and review of questionnaires with feedback from trainees and consultants. Moreover, the questionnaires were designed after a Delphi consultation between 5 experienced laparoscopic surgeons (at least 5 years of teaching and training in surgical laparoscopy). Questionnaires were then validated using face validity and emailed to all the participants based on their email addresses. There were 2 sections in a short questionnaire, and each was meant for consultants and trainees. A specific attempt was made when designing these questionnaires to keep them short and ensure their content was to the point.

The survey questions were formulated to reflect the objectives of assessing the impact of skills courses on transferring skills to clinical practice. Data were collected from participants in 4 main areas as follows: (i) main area of clinical practice; (ii) how training through courses at our center helped achieving skills required in their current clinical practice?; (iii) any additional training needed to acquire their skills required for the job; and (iv) key challenges faced in establishing laparoscopic/robotics surgical services in areas of interest. Other questions were related to: hospital/deanery affiliation; grade (Consultant/Trainee/Fellow/Nontraining grade); starting date of current post; usage of laparoscopic surgery (robotic) surgery or another model; reason/s for choosing an alternate subspeciality; Year of training (for those in training); career plans surrounding laparoscopy/robotics in urology; Achievement of goals; Sufficient support in training; Course continuation; Course frequency; and any additional comments and suggestions.

All these aforementioned questions were converted into an online survey format, which was designed by the Bristol Online Survey and provided by the University of Dundee Library & Learning Centre Survey Service. The survey link was emailed to each participant and 3 rounds of reminders were sent out to increase the response rate.

Telephonic Contacts and Website Search

Failure to respond to at least 3 reminders through website questionnaires was followed-up by telephonic contacts. Delegates were tracked through websites, based on access to their professional organization and contacts were made via telephones wherever possible. In many cases, it was not possible to evaluate clinical practice as data were not available publicly (18/161; 11%), however the British Association of Urological Surgeons (BAUS) website provided an overview of clinical practice in laparoscopic urological surgery for independent practitioners (consultant levels and those participating in the BAUS audit process).

Statistical Analysis

Descriptive analysis was carried out using the Statistical Package for the Social Sciences (SPSS; IBM, Chicago) software programme to calculate group differences using nonparametric Mann-Whitney U testing. Comparisons were made between immediate feedback and follow-up outcomes. Additionally, analysis was carried out for additional training delegates required for their independent practice and reasons for not pursuing laparoscopic surgery.

RESULTS

One hundred and sixty one delegates were drawn from 18 countries attending urological laparoscopic skills courses during the study period of 10 years. Data were available for 154 (95.65%) participants. Seven participants could not be contacted despite extensive searches via emails, websites, and institutional addresses. There were only 20 (20/154; 12.9%) responses to online website questionnaires despite 3 reminders. Further, follow-up through websites/telephonic contact/organizational contacts improved the response rate to 93% (143/154). Table 1 includes the baseline for all delegates. Table 2 lists the challenges encountered by participants during establishment of laparoscopic surgery and their area of their practice. All responders felt that training through laparoscopic skills courses provided them skills they

TABLE 1. Basic Details of the Cohort

Varibales	Total Number of Delegates (N = 161)
Numbers responded to questionnaires	20
Telephonic follow-up questionnaires completed	154
Participants could not be contacted	7
Numbers practising laparoscopic surgery	81
National: International	116: 38
Area of subspecialisation within laparoscopy	
• Upper tract	15
• Lower tract	25
• Robotic	16
• Others (Mixed)	25
Additional training needed prior to independent practice	81
Population of area (Mean) by surgeon trained through course	300,000

TABLE 2. Data on Challenges in Dissemination of Laparoscopic Surgery Following Skill Training Courses

Questionnaires	Responses
Main reasons for not pursuing laparoscopic surgery	Interest in other subspeciality during training Facilities not available Cancer work centralised Job prospects in the region
Challenges in establishing service following training in laparoscopic surgery	Equipment and infrastructure issues Number of cases needed to overcome learning curve Peer encouragement and training Mentorship availability Centralization of services Helpful management
Importance of local/distant mentor (1-5)	4.5
How important is laparoscopic skills for every trainee? (1-5)	4
Should laparoscopic surgery skills be offered at undergraduate level?	5
Importance of surgical skill courses (1-5)	5

needed to pursue a career in minimally invasive surgery in the field of urology.

Participants were working in a number of centers in the United Kingdom, representing approximately 30% of the total population of the country. The courses contributed to training of surgeons working in these centers and patients benefited from the practice of laparoscopic surgery as seen from the data for a number of the participants. Thirty eight participants (38/154; 24.67%) were international delegates representing 15 countries (Table 3 and Fig. 2). It was difficult to draw a conclusion on the geographical area or population being served by delegates trained through these courses in international countries, but more than 90% of them were practicing in high-volume centers as per the website addresses (LinkedIn/Facebook/Google) and telephonic contacts.

Of the participants, 95% (135/143) felt that these courses should be continued, and they agreed to recommend them to their trainees in the future. Most of the responding delegates recommended animal laboratories for further training; however, those that took the latest courses using models of Thiel cadavers did appreciate the additional value of human cadaver models.

Many factors were identified as challenges to pursuing the practice of laparoscopic surgery, including availability of the kit, infrastructure, hospital catchment area, number of cases, cost pressures within organizations, and priority of care for healthcare providers. Access to mentorship was also identified as a challenge to establishing laparoscopic surgery services.

For trainees, 50% responded with suggestions to improve facilities to encourage uptake of laparoscopic surgery and felt that there were not enough opportunities during their training years. An equivalent of 70% (100/143) of participants believed that increasing the number of courses and their frequency would be beneficial.

More than 50% (81/143; 56.6%) of the participants performed laparoscopic/robotic surgery at various centers. Sixty two (62/143; 43.3%) did not pursue laparoscopic surgery as a career choice. It was interesting to observe that 50% of the participants who had been through courses still maintained that skills they acquired from laparoscopic surgery, were useful in their area of practice (nonlaparoscopic urology).

Of all participants, 2.79% (4/143) did not pursue urology as career and went on to engage in transplants, paediatric surgery, radiology, or medical research as their speciality of choice.

We found interesting reasons for poor responses during the follow-up telephonic contact, such as failure to check emails, not having seen the questionnaire coming through, or accidental deletion of emails. Workload and not having enough time to respond to so many requests through questionnaires, though potentially being irrelevant, were other reasons for poor responses to initial requests.

Fifty six (56/81; 69%) participants were established laparoscopic surgeons, were from the UK, and of them, 30 (30/56; 53.57%: 30/81; 37.04%) were established surgeons that contributed to publishing their

TABLE 3. Show Distribution of Participants From Different Countries Including Their Speciality of Clinical

No	Country	Total	Lap/Robo	Stone	FNU/Rec	Andro	Gen/Core	Misc	NA
1	England	86	39	21	9	5	6	-	6
2	Scotland	25	15	2	4	1	2	-	1
3	Ireland	12	8	-	2	-	-	-	2
4	Wales	5	2	1	1	-	1	-	-
5	Greece	5	4	-	-	1	-	-	-
6	Hungry	1	-	-	-	-	1	-	-
7	Dubai	2	2	-	-	-	-	-	-
8	Australia	1	1						
9	Iraq	2	2	-	-	-	-	-	-
10	USA	3	1	-	-	-	-	2*	-
11	India	3	1	-	-	-	-	1†	1
12	Cyprus	1	1	-	-	-	-	-	-
13	Pakistan	1	1	-	-	-	-	-	-
14	Spain	1	-	-	-	-	-	-	1
15	Thiland	1	1	-	-	-	-	-	-
17	Damascus	1	-	-	1	-	-	-	-
16	Canada	1	-	-	-	-	-	1‡	-
17	Poland	1	1	-	-	-	-	-	-
18	KSA	1	1	-	-	-	-	-	-
19	New Zeland	1	1						
	TOTAL	154	81	24	17	7	10	4	11

*1 × Research and 1 × Paediatrics.
†Transplant.
‡Radiologist.

FIGURE 2. World map showing number of delegates from different countries over 10 years period.

results through professional organizations (www.baus.org.uk) with the outcomes of all of these within normal ranges of their peers. Data for some surgeons were not available because of either not upgrading BAUS data or data from early consultation years. There were no statistically significant correlations between immediate feedback and follow-up outcomes of participants where data for both points were available.

DISCUSSION

There has been an increasing focus on enhancing minimally invasive surgical skills pursued objectives related to

achieving better quality, greater access, and better value for money. In recent years, many training centers with various curriculums have arisen to train the future medical workforce for sustained quality of clinical services, especially in surgery. With the rapid expansion of minimally invasive surgery with or without assistance of robots, training through courses has become nearly mandatory for surgeons. The present study assessed the long-term impact of dedicated laparoscopic surgical courses conducted from a single center over a period of 10 years. A number of key findings were: a significant number of delegates through the courses were able to establish successful laparoscopic/robotic minimally invasive surgical services; courses were rated highly; and several challenges continued to exist pertaining to acquiring skills and development of clinical services. These findings justify allocation of resources and inform policymakers in surgical education, where consumption of scarce resources takes place to show the impact on improvement in healthcare.

There are few reports on transferring of surgical skills from skills laboratories to operating rooms. Sturm et al.[18], in a systematic review, identified areas of further research focusing on evidence needed to show reliable transfer of skills learned in laboratories to clinical practice. Most procedures described were from general surgery and none from urology. Metrics for simulation-based training differed from one study to another. What contributes to the transfer effect of skills learning into clinical practice remains unknown. Certainly, there is multilevel continuous lifelong learning requiring different sets of resources at each level. There are no studies that have explored the influence of combining technical, nontechnical, and team-based skills simulations on successful clinical practice. Simulation in technical skills alone may not be sufficient to achieve transfer of advantages from simulation into patient care. Continuous mentorship from skills laboratories to successful independent practice may be an important area and was identified through questionnaires in the present study. It would be desirable, although difficult, to study the effect of simulation training versus conventional training on real-life outcomes in surgery and justify resources.

While much research on surgical skills has concentrated on curriculum design, simulation devices, and promoting uptake of opportunities, there is a need to focus on the workplace environment and managerial support for surgeons. It is essential to understand that the best-skilled trained surgeons will not succeed without peer encouragement, adequate resources, and team support.[19-21] Important research has been performed on the management of people has shown that focusing on barriers in the work environment in terms of skill application and transfer of learning benefits. National workforce planning and anticipation of opportunities should guide investment in skills training in surgery. Continuous encouragement within workplaces should include methods to enhance self-efficacy and peer networking for trained surgeons to establish new services.[22,23] This was clearly demonstrated in the present study as participants identified a few of these areas as barriers to application of their skills.

In the present study, we have accessed surgeon-reported publicly available data for the outcomes of laparoscopic surgery carried out by surgeons trained through skills courses from a single laparoscopic surgery training center. It would be a forgone conclusion to accept that a skills course of 1 to 2 days is adequate for providing the necessary skills to make an impact on healthcare services that would be realized. However, skills gained through participation in such courses contribute to multilevel learning to achieve the competency expected of a laparoscopic (robotics) urological surgeon. In anticipation of refinements to further research in this area, our report may serve as the first in this field.

In evaluating the impact of our skills courses, we had poor responses to web-based questionnaires despite 3 reminders. This is similar to observations made in previous reports in other areas.[24,25] Research into the challenges of improving responses showed that intensive follow-up telephonic questionnaires and reminders may be helpful.[26] Underlying reasons for poor response are often lack of motivation or time constraints that may differ depending on the study population selected and questionnaires used. In the present work, we tracked each participant individually and followed-up through telephonic contacts resulting in a very high response rate (>95%). Strategies to encourage responses may be required and differ in various situations. Articulation of the potential benefits of responding to questionnaires may have further benefits, especially with regards to designing future training resources and investments in simulation training. Salim et al.[27] carried out a similar study to the current one with findings that demonstrated an improved response rate employing intensive follow-up telephonic reminders. The refusal rate using telephonic follow-up in our study was very low. This was possible owing to the researcher (MHK) being able to introduce the subject and contact colleagues directly, building rapport and answering all queries. In case participants were busy, appointments for further conversations were arranged at a mutually convenient time, including evening and weekends. There is evidence that questionnaire emails after a telephonic conversation elicited a better response in comparison to vice versa.[28] With significant improvements in telephonic technology, this method should be utilised in conjunction with websites/emails or other electronic resources to elevate the response rate. Accurate details of telephonic contacts are crucial and in the present study, we kept a

record of them. There were missing telephonic contact information that required searching the web or approaching organizations to follow up with participants. Further, we employed multiple sources to achieve a high response to reduce selection bias in the cohort.

The present study definitely had limitations that may have implications for further research into this area. For one, the study was not designed to assess whether no training on courses or training through different pathways would have had similar or better outcomes. Moreover, there were no control groups to test this hypothesis. In a pathway where multilevel learning is essential before achieving competency in a procedure, it may not be possible to quantify exactly how much a course for 1 to 2 days played a part in the learning of skills. Yet, most surgeons' reported data suggested that the "finished product" of training through various pathways had robust patient outcomes, again, how much training at each level through simulation had an impact was not known. Independent surgeon-reported data was available only for 19.4% (30/154) of participants and showed there to be a successful establishment of surgical services. In an educational course with international participants, it is difficult to keep longitudinal track of all outcome data.

CONCLUSIONS

A dedicated laparoscopic urological surgery course run over a decade had a significant impact on the skills of participants and most participants were able to establish clinical practice catering to a large proportion of the UK population as well as a few centers internationally. Telephonic follow-up contacts and questionnaires improved the response rate, especially for those with poor initial reply and website return.

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SUPPLEMENTARY INFORMATION

Supplementary material associated with this article can be found in the online version at doi:10.1016/j.jsurg.2018.08.026.

APPENDIX 1. QUESTIONS WERE DESIGNED TO REFLECT THE OBJECTIVES OF ASSESSING IMPACT OF SKILLS COURSES ON TRANSFERRING SKILLS TO CLINICAL PRACTICE

Areas of survey	Questions	Answers
(i) What are the main area of your clinical practice?	Hospital/deanery affiliation grade (Consultant/Trainee/Fellow/Nontraining grade), Starting date of current post year of training (for those in training)	
(ii) What is the impact of our skills course on your current clinical practice?	Do you plan to pursue a career in laparoscopy/robotics in urology? Would you be kind enough to place your reason/s of choosing an alternate subspeciality?	
	Have you used laparoscopic surgery (robotic) surgery or another model?	Yes or No
	How much did our laparoscopic course help you in achieving your goals?	1, 2, 3, 4, 5 (low to high)
(iii) Is there additional training needed to achieve your skills for the job?	Do you feel that there is sufficient support in training structure to achieve your goals?	Yes or No
	Do you feel that course such as ours should be continued?	Yes or No
	Do you feel a need for these courses being offered more frequently?	Yes or No
(iv) Key challenges fraced in establishing laparoscopic/robotic surgical service in area of interest?		
(v) Any further comments and suggestions?		