

Original Article

Mapping the perceptions of trainees for promoting surgical competence at the Sharjah clinical training centre



Nabil Sulaiman, PhD^{a,*}, Salman Guraya, FRCS^b and Ahmed Hasswan, MBBS^b

^a Family and Community Medicine and Behavioural Sciences Department, College of Medicine, University of Sharjah, Sharjah, United Arab Emirates

^b College of Medicine, University of Sharjah, Sharjah, United Arab Emirates

Received 11 October 2018; revised 17 November 2018; accepted 19 November 2018; Available online 3 January 2019

المخلص

أهداف البحث: على الرغم من الحاجة الملحة لبرنامج تدريبي جراحي معياري في جميع أنحاء العالم، فهناك ندرة في مراكز التدريب الجراحية المعتمدة التي يمكن أن تنسق الخبرات التعليمية. عقب المخاوف حول سلامة المرضى والمنحنى التعليمي الطويل في التدريب الجراحي، يجري التأكيد على دور مراكز التدريب الجراحي المعتمدة. يقدم هذا البحث انطباعات المتدربين الجراحين في مركز تدريبي معتمد في الإمارات العربية المتحدة.

طرق البحث: استخدمنا استبياناً يحتوي على ١٠ عبارات حول البيانات الديموغرافية وجودة محتويات الدورة في مختبرات جافة ورطبة وكذلك في جلسات التدريب النظرية. وتم التحليل الكمي والنوعي باستخدام "البرنامج الإحصائي للعلوم الاجتماعية" كما تم استخدام برنامج "إنفيو" لتحديد الموضوعات المشتركة.

النتائج: من بين ٢١٢٤ مستجيباً حضروا ٩٣٤ دورة، كان هناك ١٨٦٦ (٨٧.٦٪) رجلاً و٢٥٨ (١٢.١٪) امرأة. مثل غالبية المستجيبين (١٨٤٨ أو ٨٧٪) الشرق الأوسط، وكان ١٠٩٣ (٥١.٥٪) من بينهم يعملون في مستشفيات. على الرغم من أن غالبية المشاركين كانوا راضين عن جودة المحتوى والمواد المستخدمة في التدريب الجراحي، إلا أنهم كانوا غير راضين عند الإجابة عن "هل تفضلون الحصول على المزيد من التدريب الجراحي عن طريق المحاضرات أو الجلسات التفاعلية الشفهية أو الفيديو؟". اقترح عدد كبير من المستجيبين الحصول على المزيد من التدريب بالممارسة الجراحية ولم تعجبهم الجلسات النظرية. علاوة على ذلك، كان هناك اختلاف كبير في الاستجابات من حيث الملامح الإقليمية ومكان العمل للمشاركين.

الاستنتاجات: تؤكد هذه الدراسة على الحاجة إلى مزيد من التدريب الجراحي بالممارسة العملية. وتحث هذه النتائج المعلمين على تعديل برامج التدريب الجراحية لتضمين المزيد من التدريب الجراحي العملي والممارسة العملية.

الكلمات المفتاحية: التدريب الجراحي؛ تقييم؛ مركز تدريبي؛ بالمنظار البطني؛ حيوان؛ جثة تشريحية

* Corresponding address: Family and Community Medicine and Behavioural Sciences Department, College of Medicine, University of Sharjah, P O Box 27272, Sharjah, United Arab Emirates.

E-mail: nsulaiman@sharjah.ac.ae (N. Sulaiman)

Peer review under responsibility of Taibah University.



Production and hosting by Elsevier

Abstract

Objectives: Despite the pressing need for a standard, worldwide surgical training program, there is a dearth of accredited surgical training centres that harmonize learning experiences. Following concerns about patient safety and the long learning curve in surgical training, the role of accredited surgical training centres is being emphasized. This research reports on the perceptions of surgical trainees at an accredited training centre in the UAE.

Methods: We used a questionnaire with 10 close-ended statements about demographic data and the quality of course contents in dry and wet labs as well as in theoretical training sessions. Quantitative and qualitative analyses were conducted using SPSS software, and NVIVO was used to identify common themes.

Results: Of 2124 respondents who attended 934 courses, 1866 (87.6%) were men and 258 (12.1%) were women. Most respondents (1848; 87%) represented the Middle East, and 1093 (51.5%) of them worked in hospitals. Although most attendees were satisfied with the quality of the contents and materials used for surgical training, they were dissatisfied for 'Would you prefer to have more surgical training by lectures, oral interactive sessions, or videos'? A significant number of respondents proposed more hands-on surgical training and did not like theoretical sessions ($p < 0.05$). Furthermore, there were great variations in responses in terms of the participants' regional and workplace profiles.

Conclusion: This study underlines the need for more hands-on surgical training. These findings urge educators to modify surgical training programs to embed more practical and hands-on surgical training.

Keywords: Animal; Cadaveric; Evaluation; Laparoscopic; Surgical training; Training centre

© 2018 The Authors.

Production and hosting by Elsevier Ltd on behalf of Taibah University. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Introduction

The value and mechanics of training, assessment, and certification for surgical competence have been debated widely, especially in recent years. In the past, surgical trainees have had ample time to learn by watching and listening to their seniors and shadowing them in the wards, operation theatres, and outpatient departments. However, with current time constraints, surgical training needs to utilize more adult learning principles.¹ It should be a learning which is flexible and self-directed, experiential and reflective, built on prior experience, goals-oriented, and self-evaluating.² There are four basic aims that underpin surgical education³: (a) current and updated evidence-based knowledge; (b) excellent communication skills³; (c) competent technical skills; and (d) superb clinical judgement.

In recent decades, technical skills training has undergone several modifications to enrich the mastery of techniques and maintain a high level of patient safety. Studies on surgery simulation have stated that inorganic (synthetic and computer) and organic (animal or cadaver) simulations are effective and promising modes of training.^{4–6} The outright benefits of simulation-based training stem from the fact that it is not associated with any morbidity or mortality and can be done repeatedly, hence reducing harm to real patients. Surgical teachers must ensure that the surgeons of the future are as competent as or better than their teachers; this can be achieved using the same assessment tools during simulation training that are used with real patients.⁷ The success of simulation training will depend on evidence of its advantages as well as its cost-effectiveness⁸ and evidence that simulators provide safe and realistic opportunities for repeated practice, with feedback and objective metrics of performance.⁹

The focus on simulation using animal and cadaveric models and mannequins has reduced the need for training on real patients to develop surgical competence, especially in the early years of surgical training. Such surgical acumen can only be gained by sustained practice over many years, complemented by timely expert feedback. This should be nurtured by a supportive environment with a learner-centred surgical training approach.^{10,11} Unfortunately, there is a worldwide dearth of accredited surgical training centres that can harmonize the learning experience for surgical trainees. Furthermore, there is no mechanism for updating senior surgeons' knowledge and skills in the innovative developments of surgical craftsmanship. A stepping-stone would be to explore the perceptions of surgical trainees attending a surgical training centre regarding their learning preferences and then to customize surgical training courses that can effectively articulate with their needs. In this paper, we present our data on the evaluation of surgical training

courses by analysing the opinions of attending surgical trainees and established surgeons in a study that was conducted at the Sharjah Clinical and Surgical Training Centre (SCSTC) over the last 7 years.

Materials and Methods

Data were collected regarding surgical trainees' perceptions of the surgical training courses at the end of training in a study that was conducted from 2011 through 2017 at the SCSTC.

The SCSTC encompasses the Sharjah Surgical Institute (SSI)—a state-of-the-art training facility for health care professionals in the region that is regarded as one of the best training facilities in the Middle East. The centre is equipped with a top-quality laparoscopic and endoscopic surgery facility using animal, dry lab, and virtual reality platforms. It was established as a partnership venture between the University of Sharjah (UoS), the Ministry of Health United Arab Emirates (UAE), the Royal College of Surgeons (RCS), the American Heart Association (AHA), and major medical equipment companies such as Johnson & Johnson to create and implement strategic training programs. Since its inauguration in May 2010, the centre has conducted 934 surgical and clinical training courses involving more than 14,678 physicians, nurses, and other health professionals from the UAE, GCC, Middle East, India, and Pakistan as well as some African and European countries.

The courses offered follow the standards of the RCS England, American College of Surgeons, European Surgical Institute, AHA, ITLS international, and Advanced Life Support Group. The centre has 12 consultation rooms and simulated clinics with cameras linked to a control room, two simulation wards (8 stations), state-of-the-art simulation operating rooms (OR1) with 5 stations for live animals, and a cadaveric room (OR2) with 6–8 stations where freshly frozen cadaveric specimens are used mainly for bone and joint, ENT, spine, and trauma surgery. A world-renowned international faculty of field experts supervises relevant courses at SCSTC. The courses were developed by senior surgeons from the RCS, such as the Basic Surgical Skills (BSS) course. In addition to senior national and international faculty, depending on the type of the course. The average course structure is almost 40:60 of presentations to hands-on training. Presentations regarding knowledge as well as evidence for the procedure are given by senior faculty. Hands-on training utilizes animal organs, live goats, and cadaveric specimens for surgeries, depending on the type of surgery, the target audience, and the participants' level. Average course length is 2–3 days. Depending on the course, there are various levels of assessment. For example, the BSS course includes a comprehensive assessment of each session and feedback; in other courses, the assessment is less stringent, but in all courses, individual feedback is given for improvement.

Course evaluation instrument

The instrument used was a standard evaluation form that all participants were invited to complete at the end of each

course. This form had 10 close-ended statements about the quality of course contents, training strategies in dry and wet labs, and theoretical sessions. The statements used on the evaluation form are elaborated in Figure 1. The surgical trainees were instructed to respond with a numerical value on a 5-point-Likert scale: 1 (highly dissatisfied), 2 (dissatisfied), 3 (neutral), 4 (satisfied), and 5 (highly satisfied) for statements 1 to 9 (S1 to S9), while for statement 10, the trainees were asked whether they would recommend the course to their colleagues by selecting a value on a scale from 1 to 10. The questionnaire was validated looking at face validity, contract validity, and content validity, which were favourable.

Statistical analysis

We used SPSS version 20.0 for the quantitative analysis for analysing frequency distributions, descriptive statistics, and non-parametric tests for ordinal data. The Mann–Whitney U and Kruskal–Wallis tests were used for determining the variations in responses between different demographic variables. The Mann–Whitney U test was applied to investigate the variations across two groups, whereas the Kruskal–Wallis test was used to record the variations across more than two groups. Qualitative analysis was performed with NVIVO software to explore the main and sub themes about the surgical training courses. A *p* value of less than 0.05 was considered significant.

Results

Empirical results

As many as 2124 respondents provided feedback regarding their perceptions of the quality of the surgical courses they attended during the study period. Most respondents were men (1866; 87.6%), and only 258 (12.1%)

Table 1: Demographic characteristics of the surgical trainees (n = 2124).

Variable demographic	Values categories	Frequency	Percentage
Gender	Male	1866	87.6%
	Female	258	12.1%
Geographic position	Asia	129	6.1%
	Middle East	1848	87%
	Europe	72	3.4%
	Africa	67	3.2%
	North America	8	0.3%
Workplace	Hospital	1093	51.5%
	University	700	33%
	Private clinic	331	15.5%

women attended the courses (Table 1). Most of the attendees (1848; 87%) were from the Middle East. Regarding professional experience, most respondents (1093; 51.5%) worked in hospitals.

Descriptive analysis

Figure 1 shows the results of the descriptive analysis done by a chi-square test of independence for all statements using a median value across years. For statements 1 to 8, a median value of 4 showed the level of satisfaction. Although the attendees were satisfied with the quality of the contents and the material used for surgical training, they were dissatisfied for *Would you prefer to have more surgical training by lectures, oral interactive sessions, or videos?* as shown by a maiden value of 2 in 2011. Finally, for *Would you recommend this professional educational course to colleagues?* all respondents suggested that they would highly recommend the courses that they have attended.

A snapshot of the aggregate descriptive results for all years that reflects the significant variations in responses

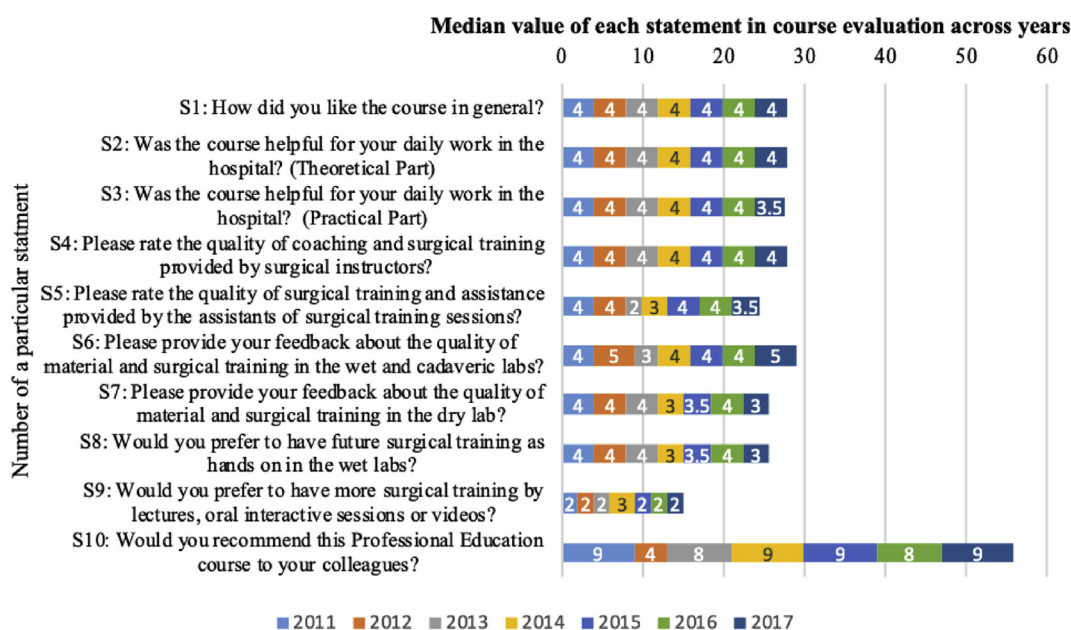


Figure 1: Descriptive analysis of the trainees’ perceptions by chi-square test of independence (n = 2124).

among the participants for all statements ($p = 0.00$) is shown in Table 2.

Table 3 compares the trainees' perceptions by gender using the Mann–Whitney U test. The male trainees had the highest mean rank of 668.81 compared with 596.17 by females for statement 2 ($p 0.02$). The female trainees scored the highest mean ranks for statements 5 to 8. There were no significant differences regarding recommending these courses to colleagues. The trainees' perceptions of the surgical training courses' quality were further analysed with respect to their geographic representation using the Kruskal–Wallis test (Table 4). Significant differences were noted for all statements ($p < 0.05$). Trainees from Asia showed the highest significant difference for 3 statements: 2, 6, and 10; in contrast, trainees from Africa had the highest significant difference for statements 3, 4, 5, 7, and 8.

Table 5 shows the results of the Kruskal–Wallis test with respect to the nature of the attendees' job in various surgical courses. The results showed that the trainees from hospitals had the highest mean rank of 1027 for the first statement ($p = 0.00$). Similarly, all responses from various workplaces are shown in Table 5. Significant variations in terms of analysis of attendees' workplaces indicate different opinions and proposed suggestions that would match their desires and institutional facilities.

Table 6 shows the results of statement 10, *Would you recommend this professional education course to your colleagues?* which was measured on a scale of 1–10. The overall results show an average of 8 (median value), which indicates that trainees are highly likely to recommend this training course to their colleagues. Regarding gender, male trainees are more likely to recommend this training course to their colleagues, as shown by a slightly higher median value of 8 compared to female trainees, with a median value of 7. Regarding geographic distribution, trainees from Europe are most likely to recommend this training course to their colleagues with a median value of 10, as compared to trainees from other regions, with the median values of 9, 4, and 2 from the Middle East, Asia, and Africa, respectively. Regarding workplace, trainees from universities are most likely to recommend this training course to their colleagues, showing a median value of 10, as compared to trainees from hospitals and private clinics with the median values of 9 and 5, respectively.

Table 3: Surgical trainees' perceptions by gender in the study cohort (n = 2124).

Statement	Male MR	Female MR	Mann-W U	Z	P-value
S1	996.25	953.08	200531	-1.20	0.23
S2	668.81	596.17	78545	-2.38	0.02**
S3	914.64	814.58	148908	-2.86	0.00***
S4	344.67	333.20	12508	-0.39	0.69
S5	45.37	66.20	119	-1.89	0.06*
S6	422.25	541.79	18158	-3.96	0.00***
S7	290.39	350.86	17352	-3.24	0.00***
S8	290.37	351.00	17340	-3.26	0.00***
S9	341.99	376.55	11638	-1.19	0.23

Note: Mann–Whitney U test is applied here. ***, **, and * represent the 1%, 5%, and 10% levels of significance, respectively.

For the open-ended field, 637 trainees did not provide any comment, while 1487 trainees provided some comments. Four hundred and ninety-six respondents wrote notes of thanks, and 991 shared their views regarding the effectiveness as well as suggestions to improve the quality of training courses (Figure 2). Using NVIVO software, four main themes—well-designed and productive courses, effective learning environment, gained professional experience, and great teamwork—were extracted regarding the effectiveness of the training programs. The five key suggestions generated were clustered as time, facilities and equipment, resource persons, course design, and assessment of needs. These five themes have respective subthemes, which are portrayed in Figure 2.

Discussion

In the present study, the attending surgical trainees were satisfied with the quality of the contents and the materials used in surgical courses at SCSTC. In addition, the participants showed their willingness to recommend the courses that they attended to their colleagues. This may reflect the use of state-of-the-art equipment, cutting-edge technologies, and expert field preceptors invited to our centre. Similar high rates of satisfaction have been reported in other studies.^{3,12,13} However, in our study, the participants showed their

Table 2: An aggregate of descriptive analysis by chi-square test of independence across years 2011–2017 (n = 2124).

Statements	Median	Chi-square	P-value
S1: How did you like the course in general?	4.00	1795 ^a	0.00***
S2: Was the course helpful for your daily work in the hospital? (Theoretical Part)	4.00	1043 ^b	0.00***
S3: Was the course helpful for your daily work in the hospital? (Practical Part)	4.00	1718 ^c	0.00***
S4: Please rate the quality of coaching and surgical training provided by surgical instructors.	4.00	149 ^d	0.00***
S5: Please rate the quality of surgical training and assistance provided by the assistants of surgical training sessions.	4.00	21 ^e	0.00***
S6: Please provide your feedback about the quality of material and surgical training in the wet and cadaveric labs.	4.00	375 ^f	0.00***
S7: Please provide your feedback about the quality of material and surgical training in the dry lab.	4.00	278 ^g	0.00***
S8: Would you prefer to have future surgical training as hands-on in the wet labs?	4.00	292 ^h	0.00***
S9: Would you prefer to have more surgical training by lectures, oral interactive sessions, or videos?	2.00	149 ⁱ	0.00***

Notes: The minimum expected cell frequency: a = 396.2; b = 264; c = 361; d = 229; e = 30.7; f = 215.3; g = 149.3; h = 129.6; and i = 229. Total respondents are 2124.

Table 4: Surgical trainees' perceptions across regions in the study cohort (n = 2124).

Statement	Mean rank					Chi-square	P-value
	Asia	Middle East	Europe	Africa	North America		
S1	991	980	1186	1055	895	12.02	0.02**
S2	785	640	822	754	583	27.18	0.00***
S3	1003	887	992	1032	627	14.10	0.01**
S4	346	340	328	398	79	9.57	0.05*
S5	51	43	53	69		9.91	0.02**
S6	517	423	429	448	437	9.70	0.05*
S7	283	296	289	385	112	11.06	0.03**
S8	281	296	282	382	103	10.72	0.03**
S9	373	336	259	422	458	16.18	0.00***

Note: Chi² value of Kruskal–Wallis test. ***, **, and * represent the 1%, 5%, and 10% levels of significance, respectively.

dissatisfaction with the statement *Would you prefer to have more surgical training by lectures, oral interactive sessions, or videos?* as shown by the median value of 2 in 2011. In a study conducted on the surgical trainees at the Academy for Int'l Minimally Invasive Surgery (AIMS) in Italy by Antonello et al., the participants preferred hands-on training in operating rooms, tutoring by skilled colleagues, and short fellowships as a means of strengthening their surgical skills.¹² Such findings from AIMS resonate with SCSTC as the participants preferred hands-on surgical training more than theoretical knowledge. Matter et al. (2013) surveyed the readiness of general surgery trainees who were looking forward to entering surgical subspecialty fellowships. The researchers reported that, out of 91 respondents, 21% were not prepared for independence in operating rooms, 38% indicated insufficient patient ownership, 30% could not handle tissues atraumatically, and 26% were not able to identify tissue planes during dissection.¹⁴ Such dissatisfaction of surgical trainees has been reported by other studies as well.^{15,16} An overarching factor responsible for inadequate surgical training in designated health care facilities is patient safety, as patients are exposed to a greater risk, and the time to complete surgical procedures is longer.¹⁷ Furthermore, surgical preceptors fail to provide enough cases for trainees during the stipulated surgical training period. Accredited surgical training courses have the potential to bridge this gap in surgical training by providing

virtual reality simulation avenues that can certainly overcome the risk of threatening patient safety.¹⁸ Mechanical simulators are a cheaper version in which objects or organs are placed in boxes, and then trainees perform various exercises using surgical instruments.¹⁹ Labs using live animal surgery are considered the best training tools, with a high fidelity unmatched by other kinds of simulation armamentarium.²⁰ Telementoring is another powerful surgical training tool that carries the potential for coaching and mentoring surgical trainees from remote areas by using cutting-edge innovative digital and surgical technologies.²¹ The accredited surgical training centres use a range of surgical education and training models that are invariably influenced by available resources and by legal regulations for the use of animals and cadavers.

In the study population, the number of female participants was significantly small (12.1%); this is attributed to Middle East society norms and fewer females selecting surgery as their career option. However, there are certain areas where the females outnumber males, like gynaecological surgery, cosmetic gynaecology surgery, laser surgery, and dental surgery. We also found that the number of female participants is increasing in the ENT workshop.

In this study, in response to the questions regarding whether the theoretical and practical parts were helpful in their daily work at the hospital, males scored significantly higher mean ranks than their female counterparts, whereas female participants scored higher mean ranks in feedback about the quality of material in dry and wet labs (Table 3).

Table 5: Comparison of the surgical trainees in terms of their workplaces in the study cohort (n = 2124).

Statement	Mean rank			Chi-square	P-value
	Hospital	University	Private clinic		
S1	1027	978	904	14.21	0.00***
S2	692	610	656	13.98	0.00***
S3	949	858	857	16.55	0.00***
S4	362	337	303	9.74	0.01**
S5	39	59	36	17.80	0.00***
S6	439	417	442	2.12	0.35
S7	295	307	296	0.63	0.73
S8	292	317	290	3.18	0.20
S9	354	355	285	14.49	0.00***

Note: Chi² value of Kruskal–Wallis test. ***, **, and * represent the 1%, 5%, and 10% levels of significance, respectively.

Table 6: Would you recommend this professional education course to your colleagues? (n = 2124).

Variable demographic	Values categories	Median
Gender	Male	8
	Female	7
Geographic position	Asia	4
	Middle East	9
	Europe	10
	Africa	2
	North America	9
Workplace	Hospital	9
	University	10
	Private clinic	5
Overall		8

Published literature regarding gender differences among trainees in terms of attrition and barriers to women in surgical training has shown higher attrition rates among female residents than among male residents.^{22,23} The demanding nature of surgical training with more focus on longer duty hours certainly affects the preferences of surgical trainees among genders.²⁴ The results of the Kruskal–Wallis test showed significant differences for all statements ($p < 0.05$) among trainees from Asia, Europe, and Africa (Table 3). Interestingly, the European trainees liked the courses more than other surgical trainees did, while the Asian attendees were more satisfied with the theoretical parts of the courses that they attended. Again, varying scales of surgical services and training programs in different hospitals might play key roles in such dissimilarities in opinion. As we analysed the results, we found that Asians liked the theoretical parts of the course predominantly because the majority of Asian health care facilities have an enormous number of patients available for surgical training, but there is a scarcity in coaching about the theoretical component.

This study showed significant variations in attendees' preferences regarding the desired training tools at their

workplaces, which signals that multi-modal training programs across hospitals lack uniformity and standardization ($p = 0.00$). Participants in this study showed multi-modal learning styles and preferences, a finding endorsed by several other studies.^{25,26} However, most respondents preferred the more hands-on surgical training in animal labs. The diversity of learning styles with uneven distribution stresses that the surgical educators should customize training programs in line with the trainees' preferences. The Accreditation Council for Graduate Medical Education has imposed an 80-h workweek for all residency programs since 2003,²⁷ and this regulation has witnessed a shift within the majority of surgical trainees towards a preference for team-based learning in patient care.²⁸ Thus, the surgical training programs should be delivered in an environment congruent with an individual's learning style.²⁹ On the same note, based on the lessons learnt from surveys, surgical training centres can modify the contents and delivery of their training courses to maximize surgical training effectiveness.

The qualitative analysis using NVIVO software, in this study, clinched five major suggestions regarding time, facilities and equipment, resource persons, course design, and

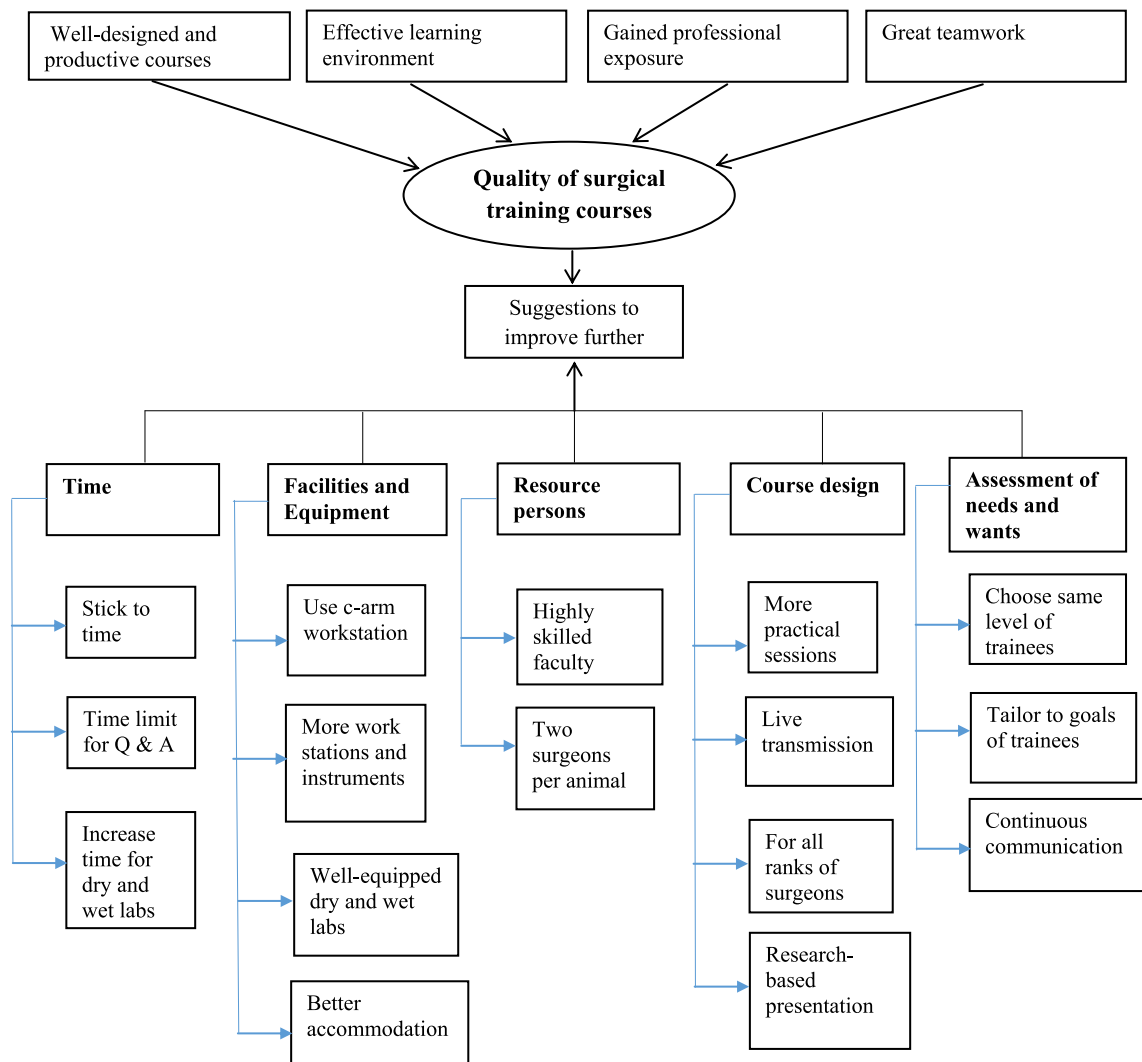


Figure 2: Qualitative analysis of surgical trainees' opinions regarding improving the quality of surgical courses (n = 2124).

assessment of needs. *Per se* organization and disciplined delivery of the course, availability of cutting-edge surgical technologies, and content experts are the major determinants of the success of any surgical training event. The assessment of a needs analysis would certainly enrich the learning climate, as the course design will directly target the participants' training needs. The disparities in the needs analysis in our study reflect the different scales of resources and expertise available at participants' workplaces. Nevertheless, accredited surgical training centres can reinforce surgical residency programs by providing sufficient training on preferred training models.

Study limitations

Our research does not validate the effectiveness of surgical training courses in improving the competence of surgical trainees in their subsequent live surgeries. Further research into the effectiveness of similar surgical training courses in live surgery is required. The centre's plan is to follow all trainees to gather information about the various outcome indications of their operations, including length of stay and complications such as wound infection and bleeding. When possible, patients' satisfaction will also be investigated.

Conclusion

This study showed significant variations in preferences for enhancing participants' surgical skills. Most participants preferred hands-on surgical training and practical demonstration. There were also significant variations in responses among gender and among Asian, European, and African participants. Due to concerns about patients' safety and potential risks, accredited surgical training centres carry a great potential to strengthen and enhance basic and advanced surgical skills. However, more evidence-based studies are needed to validate these findings.

Conflict of interest

The authors have no conflict of interest to declare.

Ethical approval

This study was approved by the Ethics and Research Committee of the University of Sharjah (ERC[25]12/15/51).

Authors' contributions

All persons designated as authors qualify for authorship and have checked the article for plagiarism. If plagiarism is detected, all authors will be held equally responsible and will bear the resulting penalty. NS was involved in the study concept, design, and interpretation of data. SYG was involved in the study design and interpretation of data as well as writing the initial and final drafts of the paper. AH was involved in editing, revising, and submitting the manuscript. All authors have critically reviewed and approved the

final draft and are responsible for the content and similarity index of the manuscript.

Acknowledgment

We are grateful to the STC team who work hard to provide the best training to participants and support them during the courses. To Anil Kumar, Abderrahman Saidi, Lou Ann Tesado, Najna Shehubanath Shabbir, and Batool Alarjani for their assistance in collecting data and to Mr Abdel Kareem for entering the data, we express our thanks.

References

1. Thomas W. Teaching and assessing surgical competence. *Ann R Coll Surg Engl* 2006; 88(5): 429–432.
2. Moorthy K, Munz Y, Sarker SK, Darzi A. Objective assessment of technical skills in surgery. *Br Med J* 2003; 327(7422): 1032.
3. Anvari M, McKinley C, Stein H. Establishment of the world's first telerobotic remote surgical service: for provision of advanced laparoscopic surgery in a rural community. *Ann Surg* 2005; 241(3): 460.
4. Sarker S, Patel B. Simulation and surgical training. *Int J Clin Pract* 2007; 61(12): 2120–2125.
5. Torkington J, Smith S, Rees B, Darzi A. The role of simulation in surgical training. *Ann R Coll Surg Engl* 2000; 82(2): 88.
6. Windsor JA. Role of simulation in surgical education and training. *ANZ J Surg* 2009; 79(3): 127–132.
7. Tan SSY, Sarker SK. Simulation in surgery: a review. *Scot Med J* 2011; 56(2): 104–109.
8. Kneebone R, Aggarwal R. *Surgical training using simulation*. British Medical Journal Publishing Group; 2009.
9. Kneebone R. Simulation in surgical training: educational issues and practical implications. *Med Educ* 2003; 37(3): 267–277.
10. Szasz P, Louridas M, Harris KA, Aggarwal R, Grantcharov TP. Assessing technical competence in surgical trainees: a systematic review. *Ann Surg* 2015; 261(6): 1046–1055.
11. Hatala R, Cook DA, Brydges R, Hawkins R. Constructing a validity argument for the Objective Structured Assessment of Technical Skills (OSATS): a systematic review of validity evidence. *Adv Health Sci Educ* 2015; 20(5): 1149–1175.
12. Guraya SY, Forgione A, Sampogna G, Pugliese R. The mapping of preferred resources for surgical education: perceptions of surgical trainees at the Advanced International Minimally Invasive Surgery Academy (AIMS), Milan, Italy. *J Taibah Univ Med Sci* 2015; 10(4): 396–404.
13. Cuschieri A. Reflections on surgical training. *Surg Endosc* 1993; 7(2): 73–74.
14. Mattar SG, Alseidi AA, Jones DB, Jeyarajah DR, Swanstrom LL, Aye RW, et al. General surgery residency inadequately prepares trainees for fellowship: results of a survey of fellowship program directors. *Ann Surg* 2013; 258(3): 440–449.
15. Coleman JJ, Esposito TJ, Rozycki GS, Feliciano DV. Early subspecialization and perceived competence in surgical training: are residents ready? *J Am Coll Surg* 2013; 216(4): 764–771.
16. Lewis FR, Klingensmith ME. Issues in general surgery residency training—2012. *Ann Surg* 2012; 256(4): 553–559.
17. Pellegrini CA. *Surgical education in the United States 2010: developing intellectual, technical and human values*. Springer; 2012.
18. Gallagher AG, Seymour NE, Jordan-Black J-A, Bunting BP, McGlade K, Satava RM. Prospective, randomized assessment of transfer of training (ToT) and transfer effectiveness ratio (TER) of virtual reality simulation training for laparoscopic skill acquisition. *Ann Surg* 2013; 257(6): 1025–1031.

19. Taylor RH, Menciassi A, Fichtinger G, Fiorini P, Dario P. *Medical robotics and computer-integrated surgery*. Springer handbook of robotics. Springer; 2016. pp. 1657–1684.
20. Forgione A, Guraya SY. The cutting-edge training modalities and educational platforms for accredited surgical training: a systematic review. **J Res Med Sci** 2017; 22.
21. Forgione A, Kislov V, Guraya SY, Kasakevich E, Pugliese R. Safe introduction of laparoscopic colorectal surgery even in remote areas of the world: the value of a comprehensive tele-mentoring training program. **J Laparoendosc Adv Surg Tech** 2015; 25(1): 37–42.
22. Dodson TF, Webb AL. Why do residents leave general surgery? The hidden problem in today's programs. **Curr Surg** 2005; 62(1): 128–131.
23. Everett CB, Helmer SD, Osland JS, Smith RS. General surgery resident attrition and the 80-hour workweek. **Am J Surg** 2007; 194(6): 751–757.
24. Ban KA, Chung JW, Matulewicz RS, Kelz RR, Shea JA, Dahlke AR, et al. Gender-based differences in surgical residents' perceptions of patient safety, continuity of care, and well-being: an analysis from the Flexibility in Duty Hour Requirements for Surgical Trainees (FIRST) trial. **J Am Coll Surg** 2017; 224(2): 126–136.e2.
25. Guraya SS, Guraya SY, Habib FA, Khoshhal KI. Learning styles of medical students at Taibah University: trends and implications. **J Res Med Sci** 2014; 19(12): 1155.
26. Yang T-C, Hwang G-J, Yang SJ-H. Development of an adaptive learning system with multiple perspectives based on students' learning styles and cognitive styles. **J Educ Technol Soc** 2013; 16(4): 185.
27. Quillin RC, Cortez AR, Pritts TA, Hanseman DJ, Edwards MJ, Davis BR. Surgical resident learning styles have changed with work hours. **J Surg Res** 2016; 200(1): 39–45.
28. Education ACfGM. *The ACGME's approach to limit resident duty hours 12 months after implementation: a summary of achievements*; 2006.
29. Engels PT, de Gara C. Learning styles of medical students, general surgery residents, and general surgeons: implications for surgical education. **BMC Med Educ** 2010; 10(1): 51.

How to cite this article: Sulaiman N, Guraya S, Hasswan A. Mapping the perceptions of trainees for promoting surgical competence at the Sharjah clinical training centre. *J Taibah Univ Med Sc* 2019;14(1):31–38.