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Research Paper

Impact of an in-person small group surgical skills course for preclinical medical students in an era of increased e-learning

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ABSTRACT

Objective: The COVID-19 pandemic led to a dramatic decrease in face-to-face teaching. This can particularly impact medical students' skills development. This prompted development of an in-person surgical skills course as guided by the General Medical Council "Outcomes for Graduates" facilitated by tutors with surgical experience. This study aimed to primarily assess participant confidence in surgical skills following the course.
Design: This was an interventional study assessing both qualitative and quantitative data collected prior to, during, and post course completion. Data were collected from students via online forms, which included a mixture of "Yes/No" responses, self-assessed confidence levels via Likert scales, and free type questions.
Setting: The study assessed feedback for a 5-session surgical skills course delivered at the authors' institution. This is a newly designed course using low-cost materials which was free for all attendees.
Participants: Participants were all in the first or second year of medical school. There was capacity for 60 students, and all attendees provided informed consent to participate.
Results: A total of 446 students applied for the course with 58 participants in the final study, 31% of whom had prior surgical skills experience. There was a statistically significant increase in student confidence levels following the course for all taught surgical skills ($P = .0001$). Participants were also more confident that they possessed the skills required for clinical placements ($P = .0001$) and to work as a junior doctor ($P = .01$). Thematic qualitative analysis revealed a reliance on third parties for previous surgical experience; this course improved knowledge and skills for future practice. Limitations included session duration and equipment choice.
Conclusion: This study demonstrates high demand and student satisfaction from this course, offering a potential framework to improve undergraduate surgical skills teaching. The results presented here have the potential to inform wider curricula development across medical schools in the future.
Competencies: Medical knowledge; practice-based learning and Improvement.

INTRODUCTION

The General Medical Council (GMC) "Outcomes for Graduates" [1] stipulates that all graduating doctors acquire surgical and procedural skill competence. This has recently been highlighted by the Royal College of Surgeons in their development of a "National Undergraduate Curriculum in Surgery" [2] which seeks to raise standards by defining a minimum level of surgical achievement on completion of medical school. Cited outcomes include an ability to recognize common surgical presentations and competence in practical skills such as the use of local anesthetics, skin suturing, and wound care. A robust surgical education for all undergraduate medical students is essential irrespective of subsequent career path. Not only do surgical conditions represent a significant proportion of elective and emergency referrals within the National Health Service [3,4], but surgical principles and skills are transferrable within all aspects of medicine including interventional specialties, emergency medicine, and general practice [5]. Effective surgical education is therefore imperative for the continued provision of safe care for future patients.

A national United Kingdom review of surgical and procedural skills training at medical schools conducted in 2014 [6] found that skills cross-referenced against GMC documentation were provided by

Abbreviations: A&E, Accident and Emergency; COVID-19, coronavirus disease caused by SARS-CoV-2 virus; e-learning, electronic learning; GEP, graduate entry program; GMC, General Medical Council; GP, general practitioner; MBBS, Bachelor of Medicine, Bachelor of Surgery; NHS, National Health Service; RCS, Royal College of Surgeons; UK, United Kingdom.

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medical schools and supplemented by extracurricular student surgical societies. Basic surgical skills modules incorporated as part of an undergraduate curriculum for first year students have been found to have a positive impact on technical skill development [7]. Furthermore, greater benefit has been demonstrated when surgical skills teaching is provided in a distributive manner with weekly practice when compared with an intense 1-day course [8]. These studies suggest the efficacy of surgical skills introduced and practiced early in medical schools. Established educational theory applied in the context of surgical education [9] include the (1) acquisition and retention of motor skills [10], (2) importance of availability of expert assistance [11], and (3) learning within communities of practice [12].

The educational landscape has rapidly evolved due to the recent COVID-19 pandemic [13]. In an era with reduced opportunity for in-person teaching, there has been an exponential growth of online "e-learning" which offers the additional benefits of flexible scheduling and increased accessibility to educational materials. E-learning has a demonstrable role within surgical education as an educational tool [14]; the use of virtual patients, graphics, and videos can significantly enrich the learning experience of trainees. However, e-learning may offer little in the way of hands-on-skills or individualized instruction and performance feedback [15]. This supports previous literature in favor of "blended" learning strategies integrating both traditional in-person teaching with online learning [13,16,17].

The reduced availability of in-person teaching during the COVID-19 pandemic has prompted our development of an in-person surgical skills course. Herein, we aim to provide early-year medical students with formalized teaching on basic surgical skills as guided by the GMC "Outcomes for Graduates" facilitated by tutors with surgical experience. Primary outcomes include an assessment of participant confidence in surgical skills, early consideration of a career in surgery, and engagement with the course. Secondary outcomes relate to student perceptions of current in-person and online teaching modalities during the pandemic.

MATERIAL AND METHODS

Participants. The surgical skills program was offered to medical students in phase 1 of their study at Queen Mary University of London. Phase 1 refers to first and second year undergraduate program students and first year Graduate Entry Program students. We advertised to all phase 1 students via their cohort mailing list. An online sign-up form using Microsoft Forms was distributed to this cohort of students, and selection was based on a first-come-first-served basis. There was capacity for a total of 60 students to complete the course. Of those that signed up to the course, participation in the study was voluntary. All attendees received a written information sheet regarding the study (see Appendix 1) and provided written informed consent to participate. Ethical approval for the study was obtained from the Queen Mary Ethics of Research Committee and the Institute for Health Sciences Education Peer Review Committee.

Course Design. The course consisted of five 1-hour sessions and was free to attend. Each session was modeled on the Practical Skills and Procedures subsection of the GMC "Outcomes for Graduates" [1], and the structure of each session is outlined in Table 1. These sessions took place on the university campus when students had no other scheduled university teaching. Each session had the capacity for 20 students and was repeated 3 times to accommodate all participants. The course ran from November 2021 to March 2022. Sessions were delivered by 6 current or past clinical teaching fellows at the medical school. All tutors had completed their UK Foundation training and had clinical experience in all procedural skills covered in this course through surgical or emergency department jobs. Sessions were designed such that there were 7–8 students per tutor. Sessions contained practical components where students could attempt all taught skills. Students were assessed in an informal manner with verbal feedback provided by the tutors at the time. This included the use of tasks to review and assess students' competencies such as a quiz in the final session (Table 1).

Equipment and Resources. Consumable equipment was supplied by either local surgical departments or course tutors. All other equipment was available within the department. Artificial wounds were made using the RCS-approved low-cost construct for suturing practice [18] as seen in Fig 1.

Data Collection. Data were collected from the participants via online, anonymized feedback using a Microsoft Form. As part of this, participants used a random number generator to acquire a unique identifier which was used on all feedback forms to allow pairing of these data. These were completed before the course, after each session, and after the course's conclusion, allowing comparison between the various stages of course progression. Feedback was collected using a mixture of dichotomous questions, Likert scales, and open questions (Appendix 1). Using various approaches allowed us to collect data that were easily comparable, such as via Likert scales, but also subjective opinion-based responses that could be analyzed using thematic qualitative analysis. These same data from open-ended questions could also be used to improve the sessions as we went along, thus enhancing the experience of the students. Students were provided with the link to the feedback forms at the end of every session for postsession questionnaires; for the pre- and postcourse questionnaires, the links were provided via email.

Data Analysis. Pre- and postcourse questionnaire responses were analyzed using R (version 3.6.1) [19]. For those who completed both pre- and postcourse questionnaires, nonparametric statistical testing was carried out using a paired Wilcoxon signed-rank test with Holm correction. Comparison of career considerations was carried out using Fisher exact test. Results reported include the test statistic (Z), P value, and corrected P value. For qualitative analysis, we conducted thematic analysis of the 4 free text questions within the postcourse questionnaire using Braun and Clarke's [20] established method. The intention of this process is to seek understanding of the experiences and thoughts of student participants. Responses to each question were analyzed for their semantic meaning and coded accordingly. Themes were then constructed from these codes through an iterative process. The approach to the thematic analysis was inductive, though we note that the relatively short answers provided by respondents' limit the scope of analysis.

RESULTS

Demographics. A total of 446 individuals applied to attend the course, for which there was available space for 60 participants. The final cohort of course participants consisted of 55.2% Year 1 students, 39.7% Year 2 students, and 5.2% Graduate Entry Programme Year 1 students, which was roughly equal to the proportion of students in these years currently enrolled at the university. Of those who attended the course, 96.7% ($n = 58$) completed the precourse questionnaire, 51.7% ($n = 30$) of whom we were able to pair with a corresponding postcourse questionnaire.

Prior to the course, participants reported having considered a range of career paths as shown in Table 2.

Eighteen students (31.0%) had previous experience in surgical skills, 88.9% of which was mostly or entirely delivered in an in-person setting. Free text responses from all students who had experience in surgical skills reported that this experience had taken place outside the MBBS curriculum. Of those that had prior surgical skills experience, 11.1% had experience in scrubbing and infection control, 5.6% had experience with basic surgical equipment, 55.6% had experience suturing, 22.2%

Table 1
Session designs including timing and learning objectives

	Session 1 *Hand washing, scrubbing up, infection control*	*Session 2* *Intro to surgical instruments, blades/safe disposal of sharps, sutures*	*Session 3* *Local anesthetics—tutorial and practical procedure*	*Session 4* *Basic suturing (interrupted, mattress), knot tying*	*Session 5* *Wound care + removal of sutures and staples*
Timing & content	Introduction: 10 min	Introduction: 5 min	Introduction: 10 min	Introduction: 5 min	Introduction: 10 min
	Group stations: 45 min (15 min per station, 3 stations)	Group activity: 30 min	Group activity: 30 min	Group activity: 30 min	Group activity: 30 min
		Timed challenge: 15 min	Introduction to knot tying: 10 min	Local anesthetic: 20 min	Wound after care + quiz 15 min
Learning objectives	To be able to demonstrate how to effectively hand wash/scrub for theater using soap/water (± alcohol-based solution)	To be familiar with the commonly used surgical equipment	To be able to perform a simple interrupted suture	Perform a single-handed surgeon's knot	Discuss indications and benefits of basic wound management
	To be able to demonstrate how to appropriately gown and glove for surgery	To be able to recognize the terms for different devices	To be able to demonstrate an instrument tie	Discuss indications for local anesthetic	Understand the basic principles of wound management
	To be able to describe when standard hand washing versus aseptic nontouch technique versus sterile conditions are appropriate	To be able to demonstrate how to blade a scalpel and dispose of blades safely	To understand the main steps in performing a 2-handed surgeon's knot	Understand the principles of drawing up local anesthetic and calculating doses	Perform wound irrigation and apply surgical dressings
	To be able to demonstrate how to maintain a sterile field and handle equipment accordingly to maintain this	To be able to handle and pass sharps safely and securely	To be able to handle and pass sharps safely and securely	Perform local anesthetic infiltration	Understand principles of wound after-care
		To be able to describe and demonstrate the proper handling of sutures	To be able to describe and demonstrate the proper handling of sutures		Perform suture removal

had experience knot tying, 5.6% had experience with local anesthetics, and 11.1% had experience with wound management and dressing.

Teaching Modality. The precourse questionnaire, distributed in October 2021 when teaching remained multimodal due to the COVID-19 pandemic and associated restrictions, showed that most students prefer multimodal (55.2%) or in-person (41.4%) teaching delivery methods. The perceived proportion of teaching delivered in-person at the time is shown in Fig 2.

Surgical Skills Course Impact. The increase in student confidence levels postcourse, as compared to precourse, was statistically significant for all surgical skills outcomes, as outlined in the GMC "Outcomes for Graduates" (Fig 3). They were also more confident that they had the skills required for clinical placements and to later work as a junior doctor.

Although they overall felt that the course increased their exposure to surgery and surgical teaching, it had no apparent impact on whether they had considered a career in surgery (Table 3).

Following each session, feedback was obtained from participants on the session itself including session content, design, and delivery, the median scores of which are shown in Table 4.

Overall, following the course, 63.3% of participants felt that the surgical skills course had a very or extremely large impact on their overall confidence levels carrying out basic surgical skills.

Qualitative Thematic Analysis

Reliance on Third Parties for Surgical Experience

All respondents identified that existing surgical teaching within the phase 1 curriculum was lacking, although it should be noted that there is variability in the experience of respondents because this course was

Fig 1. RCS low-cost construct for suturing practice.

Table 2
Career paths considered by participants

Career path	Precourse		Postcourse		Fisher exact P value
	Number (n = 58)	Percentage (%)	Number (n = 30)	Percentage (%)	
Surgery	48	82.8	23	76.7	.5722
Medicine	19	32.8	13	43.3	.3512
General practice	11	19.0	5	16.7	1.0000
Anesthetics/critical care	19	32.8	10	33.3	1.0000
A&E	16	27.6	5	16.7	.3014
Obstetrics and gynecology	12	20.7	2	6.6	.1259
Pediatrics	11	19.0	7	23.3	.7811
Psychiatry	7	12.1	0	0	.0902
Other	3	5.2	1	3.3	1.0000

offered to students from years 1 to 2. Demand for surgical education is high, with a significant number of respondents seeking out surgical education opportunities from third parties such as societies, work experience, and student-selected components to meet this gap.

> Aside from this course there is not much exposure to surgical teaching in pre-clinical years. I have had to sign up to extra curricular events in order to experience surgical skills so would be good to incorporate into the curriculum even in pre clinical years.

Knowledge and Skills for Future Practice

All respondents clearly identified that they had learned new surgical skills and knowledge from the course. Students reported that the new knowledge and skills acquired gave them greater confidence going into clinical placements and empowered them to make the most of learning opportunities.

> I feel like I've gained more confidence in surgical skills, so I'll be more prepared when it comes to surgical placements later on in medical school. Because I have more knowledge than before in surgical skills, I feel as though I'll be able to engage more in the surgical placements and get more out of it.

> The familiarity with scrubbing in and aseptic equipment handling has been hugely beneficial. I recently undertook a two week placement with a surgical team and was given the opportunity to scrub in and assist. Being able to have done this before was great and really allowed me to have confidence going in to this experience.

Moreover, several students reported that being taught by junior doctors gave them a better insight into the realities of life as a junior doctor and how their new skills might be employed.

> A more realistic idea of what small procedures and jobs doctors do in their day and that early exposure will help me improve these skills for real patients.

A significant number of students expressed that they had enjoyed the course, felt it was well run, and would recommend it to others. Several highlighted that they felt the course content would be relevant to all students and not just to those with a desire to pursue a surgical career.

> Really enjoyed the course. As GEPs we don't get much opportunity for the applicable part of medicine in our first year, and I think it's to the detriment of the university course. A course like this would be really appreciated for the whole year I think, even those not necessarily interested in surgery.

> Well designed and helpful course, I highly recommend to all, even those with no interest in surgery because of the practical skills and knowledge taken away from it.

Limitations. There were, however, limitations to the benefit of the course. The most common area that students highlighted was the need for more time to practice the new and complex skills they were learning. In addition, several highlighted that they would prefer more realistic prosthetic materials for practicing suturing and anesthetic infiltration

> Time and equipment were limited. Maybe working with more skin like models could have been useful. But I understand timings and budget may be issues! So not much of a complaint. Learning-wise, it was super useful. More suturing practice could have been fun. That felt a little rushed.

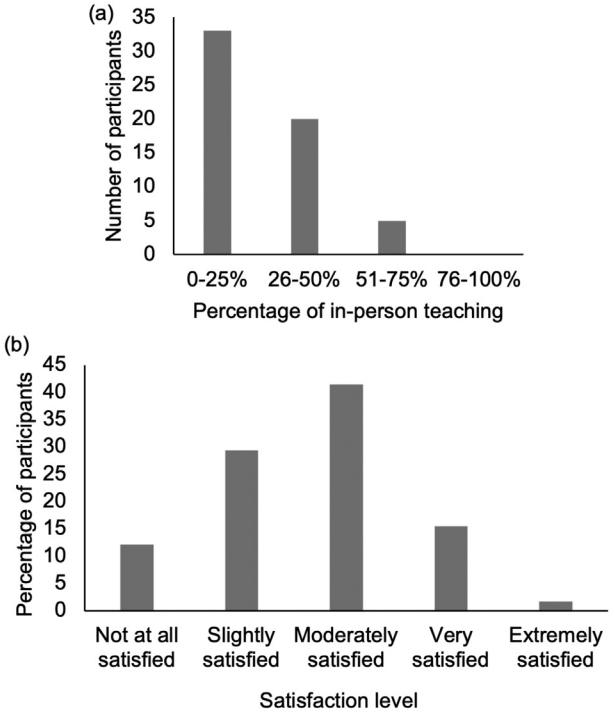

Fig. 2. A, Perceived current proportion of teaching delivered in-person. B, Satisfaction with current ratio of in-person to online teaching.

DISCUSSION

This study has shown that there is an unmet desire for preclinical surgical skills education and high demand for this course. Both quantitative and qualitative data show increased confidence levels postcourse among participants in all core GMC "Outcomes for Graduates" [1] covered by the course, which was statistically significant for all skills taught. Participants also felt more prepared for future practice in medical student clinical placements as well as beyond. Moreover, through familiarization with some of these surgical skills, students felt more comfortable seeking opportunities on placements. Additionally, the results show that students prefer at least a proportion of their teaching to be in-person, which appeared to correlate with the positive feedback received for the sessions of this in-person surgical skills course.

Most students that undertook the course had no prior surgical experience. This reflects a general trend in the limited availability of undergraduate surgical education in the UK resulting in graduates feeling ill-prepared for surgical Foundation jobs [21]. The study shows that

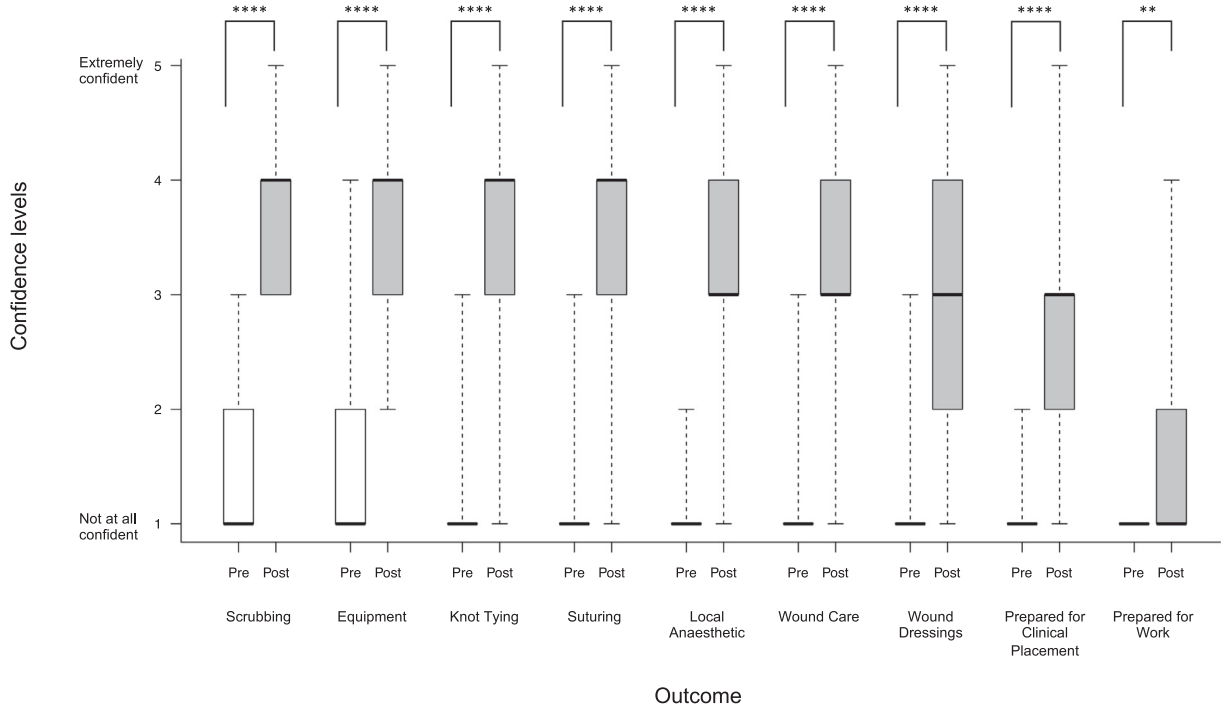

Fig 3. Impact of course on students' confidence levels related to surgical skills and impression of preparedness for future practice (* $P = .05$, ** $P = .01$, *** $P = .001$, **** $P = .0001$).

participants who did have prior surgical experience had accessed it through noncore opportunities such as student-selected components, societies, and taster sessions. Several studies have found similar results, with aspiring surgeons relying on student societies to gain sufficient experience in skills which the GMC mandates as essential [1,6,22]. Unsurprisingly, students who had attended previous surgical skills courses had higher self-confidence ratings regarding technical skills.

This course was the first introduction to surgical skills for many participants and specifically targeted preclinical medical students. Although it is evidently not representative of a career in surgery, students reported that their informal interactions with course tutors gave them an insight into the realities of life as a junior doctor. A primary aim of this phase 1 course was to facilitate greater student participation during surgical attachments due to increased confidence in basic skills, a process which can increase self-efficacy and student learning [23]. These results support existing literature demonstrating that early exposure to surgical specialties increases student engagement during medical school [24]. Specifically, students reported that undertaking a surgical skills course prior to surgical attachments would maximize the educational benefit [25]. Helping students to develop basic surgical skills prior to their clinical placements increases self-efficacy and confidence, permitting them to make use of real-life learning opportunities [25]. This is especially pertinent in an era when the time medical students spend in the clinical environment is declining, along with opportunities to practice surgical skills.

Data from the study do not support previous findings that undergraduate surgical skills courses can increase desire to pursue surgical careers [26–28]. This may be partially explained by the relatively small sample size. Furthermore, the precourse proportion of students interested in a surgical career was already high. That said, the benefit of a preclinical surgical skills course extends beyond those who wish to pursue surgical careers, however. The techniques taught in this course are applicable to other specialties including aspiring GPs who wish to undertake minor procedures, dermatologists, and emergency department clinicians [29].

This course was led by early-career doctors who had recently completed the Foundation program. Our results contribute to the growing body of evidence demonstrating positive outcomes from surgical skills courses run by junior doctors and senior medical students [27,30]. Near-peer-led courses offer a relaxed learning environment for participants with evidence of increased educational attainment [31]. They confer the additional benefit of reducing the burden on senior surgeons of teaching relatively simple surgical concepts while offering valuable teaching opportunities to junior doctors [30]. These factors provide a strong pedagogical and practical rationale for implementing a junior-led course.

The study took place at a time when the increased use of online learning strategies has become the norm. Participants in this study favored multimodal teaching above online-only tuition, in line with findings that medical students desire increased face-to-face teaching postpandemic [32]. The COVID-19 pandemic accelerated research in e-learning, and the switch to online learning is likely to persist in many aspects of medical education thanks to positive findings for knowledge-based learning [33,34]. However, data to support the use of e-learning in surgical skills tuition have been equivocal, with only 1 study in a systematic review reporting noninferior objective outcomes

Table 3
Impact of course on students' views of surgery and surgical teaching

Category	*Sample size* (n)	*Test statistic* (Z)	P *value*	*Adjusted* P *value*	*Significance (adjusted* P *value)*
Have had sufficient exposure to surgical teaching so far	30	229	0.005	0.014	*
Have had the opportunity to meet current surgeons	30	22	0.005	0.014	*
Have considered a surgical career	30	0	0.346	0.346	NS

Table 4
Session design and delivery feedback: median score shown; Likert scale from 1, strongly disagree, to 5, strongly agree

	Session				
	1	*2*	*3*	*4*	*5*
Content was at an appropriate level	5	5	5	5	5
Content was relevant	5	5	5	5	5
Clear introduction	5	5	5	4	5
Aims and objectives outlined	5	5	5	5	5
Well-organized session	5	5	5	5	5
Clear summary	5	5	5	5	5
Interactivity	5	5	5	5	5
Effective use of resources	4	4	5	4.5	5
Session pacing	5	5	5	5	5
Session duration	5	5	5	5	5

compared to an in-person course [35]. The success of e-learning courses is highly contingent on robust technological resources, equipment dissemination, and complicated logistics such as to review the quality of student suturing [35]. These challenges are compounded by the more general problems associated with distance learning, including distractions at home and internet issues, both of which will impact students from lower socioeconomic groups to a greater extent [36,37]. On balance, the favorable results from this study align with the literature in support of in-person provision of surgical skills teaching, although it is likely that the quality of e-learning will continue to evolve.

A key strength of this study design lies in the alignment of the course with GMC outlined skills and the fact that it was specifically targeted to achieve core skills required of medical graduates. Crucially, course sign-up was advertised to all year 1 and year 2 medical students at the authors' institution and was free to attend, providing an accessible means of obtaining surgical skills teaching. Here we have successfully modeled a low-resource intensive course featuring reusable and more sustainable practices as compared with tissue-based courses, which may be feasibly implemented within different institutions. Furthermore, as this course is based on surgical skills required of all medical graduates, a benefit of this course is that it could be taught by a doctor of any level and would be compatible with near-peer teaching. However, as in this course, tutors with prior surgical experience could be used to provide a higher level of expertise. It is recognized that this course was run using a high staff-to-student ratio which was felt to be beneficial to the educational experience. However, this may represent a challenge if upscaled should the course be implemented within the formal curriculum. Additionally, although this course has been designed as low-cost, there were some overheads due to consumable equipment. These would also become more significant and would need to be factored into an institution's budget.

Another strength of the study is that it involved the collection of paired data. Through allocation of each participant with a randomized identification number, students were followed up with responses before and after the surgical skills course directly compared. This serves to strengthen subsequent statistical analysis. Additionally, inclusion of both quantitative and qualitative data allowed for a more complete understanding of participant responses to the course.

A limitation of the study does include the relatively small sample size. One factor reducing the sample size was that of participant drop-off. This included students that failed to attend all sessions and those that stopped providing feedback. In addition to reducing the data collected, the authors acknowledge that this also runs the risk of introducing bias as students who continued to attend or complete feedback were likely more engaged in the course. To avoid this issue in the future, data collection could be partially anonymized with trackable feedback completion. Another factor that could have influenced the drop-off rates was the timing of each session. Wednesday afternoons were chosen to avoid clashes with the formal timetable; however, this also made it challenging for some students to attend due to university society commitments. This may be mitigated if a surgical skills course was incorporated within the formal curriculum for all students to attend.

Another limitation was the terminology used in the questionnaire Likert scales. In hindsight, the 5-point scale used may have introduced bias as it was not balanced and ranged from "not at all confident" to "extremely confident." Less biased terminology could have been "very unconfident," unconfident," neutral," "confident," and "very confident." A viable alternative to the classical model is the Visual Analog Scale as suggested by Bishop et al [38]. This system requires participants to grade themselves on a scale between 2 set points, allowing the representation of smaller changes. However, this scale is more subjective, and what counts as confident for one student may be at a different point in the scale for another.

Finally, as participants were phase 1 students, they were likely to have low confidence levels initially due to a shown lack of surgical exposure. Therefore, any surgical teaching has a high chance of improving this. This could have been addressed by assessing confidence levels among more senior medical students who had experienced clinical placements in surgery, in addition to the participant cohort. Alternatively, confidence levels of the participant cohort could be reassessed following commencement of clinical placements and compared to colleagues who had not completed the course.

In conclusion, this study has shown that there is benefit in incorporating a surgical skills course to improve student exposure and confidence in basic surgical skills prior to starting surgical placements. Additionally, we have shown that there is benefit to this being delivered in an in-person setting in the context of the COVID-19 pandemic. Future work could assess similar outcomes across all enrolled year 1 and 2 medical students following a trial of this course incorporated within a phase 1 curriculum. Furthermore, in addition to assessing confidence levels, ability to perform surgical skills could be assessed prior to and following the course. If a positive impact continues to be shown from this proposed future work, in the long-term, we envision a course such as this being incorporated within all medical school curriculums.

Author Contribution

Louise Kuo: Conceptualization, Methodology, Formal analysis, Writing – original draft. Nadia Liber Salloum: Conceptualization, Methodology, Writing – original draft. Benjamin Kennard: Conceptualization, Methodology, Writing – original draft. James Robb: Methodology, Writing – original draft. Paula Vickerton: Writing – reviewing & editing.

Funding Source

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Ethics Approval

Approval for this study has been provided by the Queen Mary Ethics Committee

Conflict of Interest

None.

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Appendix 1. Questionnaire

Surgical Skills Course Questionnaire

PRECOURSE QUESTIONNAIRE

Random number generator

Please go to RANDOM.ORG - True Random Number Service and set the number generator range from 1 to 10,000. Generate random number.

- Enter randomly generated number here:

(Please note this is your assigned ID number for the remainder of this course—it is important you keep this safe as you will need it for future feedback forms)

1. Which year of medical school are you in? *(Year 1, Year 2, GEP)*
2. What proportion of your current medical school teaching is in person? *(0%–25%, 26%–50%, 51%–75%, 76%–100%)*
3. Which mode of teaching do you feel is more beneficial for your learning? *(e-learning, in-person, multimodal, indifferent)*
4. How satisfied are you with the present ratio between in person and online teaching? *(not at all, slightly, moderate, very, extremely)*
5. Which of the following medical career pathways are you currently considering? (ie, Medicine, Surgery, A&E, Critical care, Anesthetics, General practice, Psychiatry, Obstetrics and Gynecology, etc) Please list all that apply. *(free text)*
6. Have you considered a career in surgery? *(yes/no)*
7. Have you had any previous experience in surgical skills? *(yes/no)*
8. If so, which of the following? (tick all that apply)
   a. Surgical scrubbing and infection control
   b. Managing surgical equipment (sutures, forceps, scalpels, etc)
   c. Local anesthetics
   d. Basic suturing
   e. Basic surgical knot tying
   f. Basic wound management and dressings
9. What proportion, if any, took place in person? *(0%–25%, 26%–50%, 51%–75%, 76%–100%)*
10. How confident do you feel with surgical scrubbing techniques and considering infection control measures? *(not at all, slightly, moderate, very, extremely)*
11. How confident do you feel with managing surgical equipment such as sutures, forceps, scalpels etc? *(not at all, slightly, moderate, very, extremely)*
12. How confident do you feel with deciding on and administering local anesthetic? *(not at all, slightly, moderate, very, extremely)*
13. How confident do you feel with carrying out basic sutures (interrupted and mattress)? *(not at all, slightly, moderate, very, extremely)*
14. How confident do you feel with basic surgical knot tying? *(not at all, slightly, moderate, very, extremely)*
15. How confident do you feel managing surgical wounds? *(not at all, slightly, moderate, very, extremely)*
16. How confident do you feel about different wound dressings? *(not at all, slightly, moderate, very, extremely)*
17. Do you feel you have had sufficient exposure to surgical teaching so far? *(not at all, slightly, moderate, very, extremely)*
18. Please provide reasons for your answer to the above question. *(free text)*
19. How confident are you that you have the surgical skills required for starting your clinical placements? *(not at all, slightly, moderate, very, extremely)*
20. How confident are you that you have the surgical skills required for starting as a junior doctor? *(not at all, slightly, moderate, very, extremely)*
21. Do you feel you have had the opportunity to meet/talk to current surgeons as part of your training? *(not at all, slightly, moderate, very, extremely)*

POSTSESSION QUESTIONNAIRE

1. Name of session
2. Personal course ID number
3. Please answer all the statements according to the following scale *(strongly disagree, disagree, neutral, agree, strongly agree)*
   a. The content was at an appropriate level
   b. The content was relevant to my training
   c. There was a clear introduction to the subject
   d. The aims and objectives were clearly stated
   e. The material was well organized
   f. There was a clear summary and conclusion
   g. The presenter appeared well informed about the subject
   h. The presenter appeared enthusiastic about the subject
   i. Audience participation and interaction were encouraged
   j. There was effective use of audiovisual aids/handouts
   k. The presentation was given at the right pace
   l. The presentation was of a reasonable length
   m. Overall, this teaching session was of a high quality
4. Relevant question(s) to the specific session from:

- How confident do you feel with surgical scrubbing techniques and considering infection control measures?
- How confident do you feel with managing surgical equipment such as sutures, forceps, scalpels, etc.?
- How confident do you feel with deciding on and administering local anesthetic?
- How confident do you feel with carrying out basic sutures (interrupted and mattress)?
- How confident do you feel with basic surgical knot tying?
- How confident do you feel managing surgical wounds?
- How confident do you feel about different wound dressings?

5. I liked the following things about the session: *(free text)*
6. The session might be improved by: *(free text)*
7. Other comments? *(free text)*

POSTCOURSE QUESTIONNAIRE

1. Personal course ID number
2. How confident do you feel with surgical scrubbing techniques and considering infection control measures? *(not at all, slightly, moderate, very, extremely)*
3. How confident do you feel with managing surgical equipment such as sutures, forceps, scalpels, etc? *(not at all, slightly, moderate, very, extremely)*
4. How confident do you feel with deciding on and administering local anesthetic? *(not at all, slightly, moderate, very, extremely)*
5. How confident do you feel with carrying out basic sutures (interrupted and mattress)? *(not at all, slightly, moderate, very, extremely)*
6. How confident do you feel with basic surgical knot tying? *(not at all, slightly, moderate, very, extremely)*
7. How confident do you feel managing surgical wounds? *(not at all, slightly, moderate, very, extremely)*
8. How confident do you feel about different wound dressings? *(not at all, slightly, moderate, very, extremely)*
9. Which of the following medical career pathways are you currently considering? (ie, Medicine, Surgery, A&E, Critical care, Anesthetics, General practice, Psychiatry, Obstetrics and Gynecology, etc) Please list all that apply. *(free text)*

10. Have you considered a career in surgery? *(yes/no)*

22. Do you feel you have had sufficient exposure to surgical teaching so far? *(not at all, slightly, moderate, very, extremely)*
23. Please provide reasons for your answer to the above question. *(free text)*
24. How confident are you that you have the surgical skills required for starting your clinical placements? *(not at all, slightly, moderate, very, extremely)*
25. How confident are you that you have the surgical skills required for starting as a junior doctor? *(not at all, slightly, moderate, very, extremely)*
26. Do you feel you have had the opportunity to meet/talk to current surgeons as part of your training? *(not at all, slightly, moderate, very, extremely)*

11. Overall, how much of an impact do you feel this course had on your confidence carrying out basic surgical skills? *(not at all, slightly, moderate, very, extremely)*
12. What do you feel you have gained most from this course? *(free text)*
13. What do you feel has been least useful for your learning from this course? *(free text)*
14. Other comments. *(free text)*

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