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Abstract

The Royal College of Surgeons of Edinburgh 'Future Surgeons Key Skills' course aims to provide medical students and foundation (FY) doctors with a solid grounding in frequently practiced surgical skills. To evaluate its effectiveness and whether attendees benefited, an observational qualitative study of attendees' confidence was performed.

Attendees anonymously completed a five point pre- and post-course questionnaire rating their confidence in: gowning and gloving (GG), handling instruments (HI), handling sharps (HS), knot-tying (KT), simple suturing (SS), skin lesion excision (ESL), cyst excision (EC), wound debridement (WD), laparoscopy (LS) and diathermy skills (DS). Mean scores were calculated and a paired Student's t-test used for analysis.

One hundred and forty attendees completed the questionnaire. A significant improvement in confidence was observed in all components before attendees were divided into "early" (years 1-2), "intermediate" (years 3-5) and "advanced" (FY1 and FY2). Early attendees improved most in GG, HS, HI, LS and DS. Intermediate attendees improved most in KT, SS, ESL, EC and WD.

This study shows that attendees benefited overall and in each group. GG, HI and HS can be considered introductory skills, with the remaining skills intermediate based on the groups that most benefited. LS and DS are more difficult to class, probably due to differences in session structure or increased video game experience. A course focusing on GG, HI and HS would benefit early attendees. The 'Future Surgeons: Key Skills' course should focus on teaching intermediate attendees and act as a refresher for advanced attendees.

Key Words

Future Surgeons; Key Skills; Surgical Assessment; Simulation; Students; Foundation Doctors; Surgery; Surgical Training

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Introduction

The Key Skills course has been formed following the success of the well-known 'Basis Surgical Skills' (BSS) course. The BSS was established in 1994 following collaboration of all four royal colleges to introduce surgical trainees to safe and technically sound surgical techniques early on in their career. The Basic Surgical Skills course is specifically aim at FY1, FY2 and core trainee 1 doctors¹.

The consultant led Royal College of Surgeons of Edinburgh, Future Surgeons Key Skills course was introduced to address a basic lack of structured surgical skill teaching to medical students with an interest in surgery. It has been running at the Christie Hospital, Manchester since January 2012. It aims to provide medical students of all years and foundation doctors a solid grounding in the following skills: gowning and gloving (GG), handling

instruments (HI), handling sharps (HS), knot-tying (KT), suturing (S), excising a skin lesion (ESL), excising a cyst (EC), abscess drainage (AD), wound debridement (WD), laparoscopic skills (LS) and diathermy skills (DS). It differs from the BSS in that it targets trainees at a more junior level, specifically medical students and foundation doctors².

Aims & Objectives

To evaluate the effectiveness and ascertain whether the attendees attained benefit and an improvement in their confidence pertinent to the skills learned on completion of the course.

To gain an understanding of why the attendees participated in the course and the perceived level of the suitability of the course for medical students and foundation doctors.

Material and Methods

Attendees anonymously completed a five point Likert scale pre- and post-course questionnaire rating their confidence in each of the aforementioned skills (1 = not at all confident, 2 = not confident, 3 = somewhat confident, 4 = confident, 5 = very confident). A copy of both the pre- and post-course questionnaires are available in appendix 1 and 2. One hundred and forty attendees anonymously completed the questionnaire and their answers matched. Mean scores were calculated for each skill and compared pre- and post-course. They were divided into three groups. Medical students in years 1 and 2 were classed as 'early attendees', medical students in years 3-5 were classed as 'intermediate attendees' and foundation doctors were classed as 'advanced attendees'. The mean confidence ratings in each group were then compared for each skill to assess whether there were any differences between the cohorts. A paired Students t-test was performed to analyse the data. The questionnaire also included questions related to attendees' purpose to attend and perceived suitability of the course with space for elaboration. Attendees who were neither medical students nor foundation doctors were excluded from the study.

Results

A total of 140 attendees participated in this study;

111 of whom were from the United Kingdom, 19 from International countries with 10 not stating their university of study. The questionnaires used in this study were taken from attendees who attended courses between January 2013 and June 2014.

The total number of early and senior attendees were 20 and 81 respectively; whilst there were 32 advanced attendees who attended the course. There were 7 non-medical attendees who were excluded from the study. Graph 1 shows the distribution of medical students and foundation doctors.

Of the remaining 133 questionnaires analysed, 55 were male, 64 were female with 14 attendees did not specify gender.

The average increase in mean confidence and p-value which was calculated using a paired Student's t-test showed the following results for each of the eleven skills (*Table 1*): GG (1.00, $p < 0.0001$), HI (1.50, $p < 0.001$), HS (1.04, $p < 0.0001$), KT (1.72, $p < 0.0001$), S (1.46, $p < 0.0001$), ESL (2.25, $p < 0.0001$), EC (2.20, $p < 0.0001$), AD (2.31, $p < 0.0001$), WD (2.10, $p < 0.0001$), LS (1.63, $p < 0.0001$) and DS (1.74, $p < 0.0001$). These results show that there is a significant improvement in each of the eleven skills taught at the course (*Table 1*).

Skill	Pre-course (mean)	Post-course (mean)	Difference (mean)	P-value
Gowning and gloving (GG)	3.45	4.45	1.00	$P < 0.0001$
Handling instruments (HI)	2.89	4.39	1.50	$P < 0.0001$
Handling sharps (HS)	3.50	4.54	1.04	$P < 0.0001$
Knot-tying (KT)	2.44	4.16	1.72	$P < 0.0001$
Simple suturing (S)	2.70	4.16	1.46	$P < 0.0001$
Excising a skin lesion(ESL)	1.77	3.98	2.25	$P < 0.0001$
Excising a cyst (EC)	1.69	3.86	2.20	$P < 0.0001$
Abscess drainage (AD)	1.69	3.96	2.31	$P < 0.0001$
Wound debridement (WD)	1.75	3.80	2.10	$P < 0.0001$
Laparoscopy skills (LS)	2.22	3.85	1.63	$P < 0.0001$
Diathermy skills (DS)	2.15	3.88	1.74	$P < 0.0001$

Table 1: The Pre- and Post-course Feedback Mean and Difference of the Eleven Skills Taught on the Course

Skill	Attendee Group	Pre-course (mean)	Post-course (mean)	Difference (mean)	P Value
Gowning & gloving	Early	3	4.3	1.3	<0.0001
	Senior	3.4	4.4	1.0	<0.0001
	Advanced	3.8	4.7	0.9	<0.0001
Handling instruments	Early	2.8	4.5	1.7	<0.0001
	Senior	2.8	4.3	1.5	<0.0001
	Advanced	3.1	4.5	1.4	<0.0001
Handling sharps	Early	3.3	4.6	1.3	<0.0001
	Senior	3.4	4.5	1.1	<0.0001
	Advanced	3.8	4.6	0.8	<0.0001
Knot-tying	Early	2.6	4.1	1.5	0.0002
	Senior	2.4	4.2	1.8	<0.0001
	Advanced	2.7	4.3	1.6	<0.0001
Simple suturing	Early	2.7	4.0	1.3	0.0005
	Senior	2.6	4.2	1.6	<0.0001
	Advanced	3.0	4.3	1.3	<0.0001
Excising skin lesion	Early	1.8	4.0	2.2	<0.0001
	Senior	1.6	3.9	2.3	<0.0001
	Advanced	2.4	4.1	1.7	<0.0001
Excising Cyst	Early	1.8	3.9	2.1	<0.0001
	Senior	1.5	3.8	2.3	<0.0001
	Advanced	2.1	4.0	1.9	<0.0001
Abscess Drainage	Early	1.5	3.9	2.4	<0.0001
	Senior	1.5	4.0	2.5	<0.0001
	Advanced	2.3	4.1	1.8	<0.0001
Wound debridement	Early	1.7	3.7	2.0	<0.0001
	Senior	1.6	3.8	2.2	<0.0001
	Advanced	2.1	3.8	1.7	<0.0001
Laparoscopy	Early	2.0	3.9	1.9	<0.0001
	Senior	2.2	3.9	1.7	<0.0001
	Advanced	2.5	3.8	1.3	<0.0001
Diathermy	Early	1.5	3.7	2.2	<0.0001
	Senior	2.1	3.9	1.8	<0.0001
	Advanced	2.6	3.9	1.3	<0.0001

Table 2: Confidence Ratings of Early Attendees (n=20), Senior Attendees (n=71) and Advanced Attendees (n=32).

From Table 3, 121 of the attendees stated pre-course that they attended the course to learn new skills, 84 to develop skills in preparation for a career in surgery and 93 to enhance new skills. In addition, 105 of the attendees stated pre-course that they attended to improve their confidence and 96

attended to improve their portfolio or to obtain a certificate. No attendees did not know their reason for attending the course but 3 stated other reasons including 'preparation for elective' and 'refresher for surgery'.

Reason to attend	Number of attendees	Percentage (%) (n=133)
Learn new surgical skills	121	90.98
Enhance existing surgical skills	84	63.16
Improve confidence whilst attending theatre	93	69.92
Develop skills to prepare for a career in surgery	105	78.95
Improve your portfolio/ obtain a certificate	96	72.18
Don't know	0	0.00
Other	3	2.26

Table 2: Attendee Reasons for Attending the Course with Percentage of Total Attendees

The results from Table 4 show that 48 of the attendees had no experience of the skills taught prior to the course, only 7 had attended a formal course, 29 had attended surgical workshops whereas 19 had other experience. Of those that

listed 'other', comments included 'medical curriculum/university', 'theatre/hospital experience' and 'other courses'. 22 attendees had previous exposure through more than one of the experiences listed in the question.

Experience	Total number of attendees	Percentage (%)
Prior Experience	Yes 77 No 48 Didn't specify 8	Y 57.9 N 36.1
Formal Course	Yes 7	5.3
Surgical Workshop	Yes 29	21.8
Other	Yes 19	14.3
More than one of above	Yes 22	16.5

Table 2: Attendee Surgical Experience Prior to Attending the Course

Graph 2 shows attendees perceived that medical students in years 4 and 5 would benefit most from this course as well as foundation year 1 doctors. There was also a significant minority who perceived that the course would be suitable for a third year students and foundation year 2 doctors

Discussion

When observing the attendees as a whole, the largest improvement was observed ESL, EC, and AD with all these parameters increasing by at least 2.10. This suggests that these skills are not widely taught (resulting in a low pre-course confidence) but relatively easy to learn (resulting in a high post-course confidence).

Less improvement (though still significant) was seen in the remaining skills which may indicate that the attendees found these difficult to learn despite previous experience or that the attendees were confident pre-course in these skills and this was enhanced by the course. GG, HI, HS, KT and SS all had a pre-course confidence mean of 2.44 or above and post-course mean of 4.16 or above suggesting that the former is true for these skills. LS and DS had an initial pre-course confidence mean of 2.22 and 2.15 with a post-course confidence of 3.85 and 3.88 respectively indicating that the latter applies to these skills.

When the mean confidence ratings were divided based on group (early, senior and advanced attendees), it was found that early attendees benefited most from GG, HI and HS. Senior attendees improved most in KT, SS, ESL, EC, AD and WD. Interestingly, early attendee confidence was most improved in LS and DS.

On this basis, it could be said that GG, HI and HS are basic skills. The results indicate that the least experienced cohort (years one and two) had a relatively low pre-course confidence but went on to improve the most when assessed post-course. The other groups had a better initial pre-course confidence level suggesting prior experience or that the skills are relatively basic for their level of knowledge.

KT, SS, ESL, EC and WD were found to benefit senior attendees the most. This may suggest that this group of skills are most appropriate for attendees with some basic surgical skills experience (as most third, fourth and fifth year students would expect to have gained) and that these skills are relatively easy to learn.

Although popular opinion may expect otherwise, the fact that early attendee year attendees

improved most in LS and DS implies that these skills are relatively easy to learn and gain confidence in. Another more likely theory could be based around the way the skills were taught. Both of these skills were more theory based with basic skill tasks given. The other skills involved demonstration and specific skill sets. This might explain why the least experienced students gained the most confidence and this is corroborated by the fact all three groups had a very similar post-course confidence. A further explanation may lie with the fact these skills rely on the use of technology. One cross-sectional analysis concluded that increased video game experience in surgeons resulted in faster completion of laparoscopic tasks with fewer mistakes when compared to those with less gaming experience³. This has also been found in studies with veterinary students and was recently supported by a large literature review^{4,5}. Another study also suggested that younger groups spend more time playing video games⁶ thus providing anecdotal evidence to explain why the early attendees benefited most in LS and DS. However, the study did not collect data on the age of each cohort or the amount of time spent playing video games. It is therefore difficult to conclude whether these skills are best suited to a particular group.

Given the groups that benefited most from each skill, there is scope for an 'introductory surgical skills' course aimed at early attendees, teaching them GG, HI and HS. The key skills course may be best served by teaching senior and advanced attendees, providing a group with a similar initial skill set and therefore enabling more focused teaching. There is suggestive evidence that if this course is introduced for early attendees, they would go on to benefit more in the Key Skills and Basic Surgical Skills courses in the future. This is based on a study that showed that people attending the Key Skills course performed better in the Basic Surgical Skills course than those who did not.

The attendees participating in the Future Surgeons Key Skills course have clearly defined reasons to attend. However, there were 121 attendees who sought to learn new skills and 84 who sought to build on existing skills. This implies that there was some overlap in the skills already possessed by the students and supports the idea that some of the skills would be considered basic to the attendees whereas others may be viewed as intermediate or more advanced. The course is also relevant to both the surgical setting and career development as a large majority also sought to improve theatre skill (93), gain skills to prepare for a career in surgery (105) or gain a certificate/develop their portfolio (96).

The majority of the attendees had had some exposure to surgical skills either through attending a formal course or via a surgical skills workshop pre-course. However, the proportion of attendees who did not have prior experience was also relatively high indicating that the course serves to teach new skills and consolidate existing skills. Of those that selected 'other' for prior experience, only 9 attendees cited experience through their university/medical curriculum. This represents just 6.77% of the cohort and suggests that more should be done to introduce to surgical skills into the UK medical curriculum. This evidence is supported by another study performed at King's College using a similar style of assessment. It found that students at their university have very little experience in knot-tying and suturing and 96% would advocate the introduction of surgical skills into their curriculum prior to starting surgical placements⁷. Our study assesses a greater number of components and the cohort comes from a broader population which may indicate that surgical skills would benefit the medical curricula nationally. Perhaps an option to select 'university/medical curriculum' in future questionnaires would enable more accurate assessment of exactly how much experience attendees have from university.

Who the attendees thought the course would be most suited for loosely follows the same patterns as those who actually attended. The majority of attendees thought that medical students in years 4 and 5 as well as FY1 doctors would benefit the most. The fact that this correlates well with the cohort who improved the most across the greatest number of skills suggests that the course teaches a lot of new skills to early attendees and served as a refresher for senior attendees. Some also selected year 1, year 2 and FY 2 doctors which would indicate that these groups still perceive benefit from the course although this may be more dependent on the experience of the attendee as an individual. For example, a third year student with no experience could potentially be overwhelmed by surgical skills that they are completely unaware of or have had no experience in.

The confidence of the students for the post-course questionnaires was taken immediately on completion of the course. It has not been observed whether the improvement in confidence is short-term or whether they benefit over a longer period of time. Further study after a sustained period of time on the same cohort would determine whether attendees benefit is longstanding. Other limitations of this study are those that apply to all observational studies; bias, confounding, chance and cause⁸. Given the statistical significance of the data and the fact that the only outcome measure relate directly to

the course, there seems little evidence for any of the aforementioned limitations.

Conclusion

There was a significant improvement in confidence in each of the skills taught on the course. Hence, this course is effective in achieving its aim to deliver basic surgical skills to all the attendees. The difference in mean improvement of some tasks suggests that some of the skills are more advanced than others and that some are easier to learn than others for attendees. Based on the results, GG, HI and HS could be considered 'introductory' skills. KT, SS, ESL, EC, AD and WD can be viewed as 'intermediate' skills whereas laparoscopy and diathermy are more difficult to class due to either session structure or gaming experience. More research is required to determine why early attendees benefited the most from LS and DS. It follows that the introductory skills would be most appropriate for early attendee medical students as an introduction to these skills or as a refresher for senior and advanced attendees. The Key Skills course should continue but would be better suited to senior and advanced attendees. Anecdotal evidence suggests that attendees of a new introductory surgical skills course would subsequently benefit even more in the Key Skills and Basic Surgical Skills course.

The attendees themselves have a clear aim for attending the course, primarily to learn new skills, gain more experience as well as developing their portfolio and preparing for careers in surgery. The course also serves to teach new skills and consolidate existing skills. Furthermore, this course establishes that whilst many attendees had had prior experience, a very small proportion had gained this from experiences in university. This study advocates that formal surgical skills teaching should be introduced into the medical curricula in the UK.

It would be worthwhile to perform another questionnaire after a significant period of time (for example 3-6 months) to determine if these levels of confidence are maintained. This may be logistically difficult as attendees come from all over the UK and from abroad in some cases so postal/email questionnaires may have a low response rate.

Disclosure

The authors do not have any conflicts of interest or financial ties to disclose.

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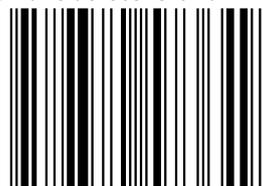


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