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Motivators and deterrents for early career female doctors applying to surgical training programmes in the United Kingdom National Health Service – a mixed-methods study.

Motivators and deterrents for early career female doctors applying to surgical training programmes in the United Kingdom National Health Service – a mixed-methods study

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Abstract

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Objectives
To perform a mixed-methods study to identify motivators and deterrents to female doctors who are interested in core surgical training (CST). To provide tangible implementations based on the findings.

Design:
This study used quantitative (questionnaires) as well as qualitative (semi-structured interviews (SSIs)) analysis. Participants completed online questionnaires on Qualtrics and SSIs were conducted remotely on Microsoft Teams. Questions were derived from previous studies and a novel term, the Gender Impact Rating (GIR), was coined to assess the impact of gender on opportunities available during CST application.

Setting:
Participants were working in the United Kingdom National Health Service.

Participants:
A total of 100 female surgical trainees in the UK ranging from Foundation Year 2 to Core Training Year 2.

Main Outcome Measures:
Participants ranked factors by their influence on their CST application. Of the 100 trainees, 21 were randomly selected for an SSI, to explore their questionnaire responses. Statistical analyses were performed using Matlab and SPSS, alongside a thematic analysis of the interviews.

Results:
A total of 44 out of 100 questionnaire respondents ranked early exposure to surgery as the most influential motivator, whilst 43 (%) selected work-life balance as the greatest deterrent and 33 (%) suggested mentoring schemes as the most valuable intervention. The median GIR was 3 out of 5, indicating a moderate perceived impact of gender on opportunities available during CST application. Qualitative analysis found four overarching themes: institutional factors (including mentorship schemes), organisational culture (including run-through training), social factors, and personal factors.

Conclusion:
Thematic analysis suggested that positive experiences and a cultural shift would encourage entry of more female surgeons. Therefore, the proposed implementations are increasing the number of run-through posts and destigmatising less than full-time training. Further research into ethnicity and personality on motivations to enter surgery is advised.

Strengths and Limitations

Strengths
- First mixed methods study covering motivators and deterrents in the NHS
- Most recent study looking at entry level surgical trainees
- First study to implement ranking system for factors
- Extensive reach across the UK

Limitations
- Small sample size
- 15 minute interviews may not be enough time to explore entire narrative
- Participants agreeing to be interviewed may have stronger opinions than those who don't, thus skewing results

Background

Currently in the United Kingdom, just over half of all medicine graduates identify as female.[1] However, this is not reflected in senior roles (e.g. consultant or professor), and neither is the disparity explained by the time lag between the increase in female graduates and their progression through surgical training.

Previous studies have examined factors that affect the career choices of women considering surgical training.[2,3] Hirayama and Fernando[2] conducted a systematic literature review using studies from the UK, US, and Canada and identified 7 studies which cited the common organisational barriers as "career structure, male dominance, and lack of equal opportunities" in hindering career progression. They also identified role models and early exposure to surgery as important decision-making factors. Previous surveys of members of the Royal College of Surgeons (RCS) have found that surgery is perceived by a significant proportion of female trainees as an 'old boys' club leading to some respondents feeling out of place.[3]

Whilst previous research has focused on female medical students and surgeons completing their training, there are no studies examining the perceptions and attitudes of female trainees who are at a level of training immediately prior to the surgical application process. This a key cohort as it is the juncture at which the decision to pursue a career in surgery is pivotal, and studies that analyse the perceptions of females who are already in core surgical training (CST) using retrospective recall are subject to recall bias.[4]

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Aims

To understand the motivators and deterrents for women entering surgical specialties, and provide tangible interventions to overcome these, using a combination of quantitative and qualitative analysis.

Methods

Setting, study design and participants

This study was motivated by the application of feminist theory to medicine,[5] which promotes that men and women are equal and so gender issues from a feminist perspective need to be addressed to encourage more women into surgery. The approach to qualitative research was guided by the grounded theory which was used to identify influential factors of applying to surgery and produce tangible implementations.[6] From previous studies and these theories, it was sought to perform a convergent parallel mixed-methods study in the UK, encompassing a national approach.

Social media adverts promoted the online questionnaire and snowball sampling enabled a wide reach across the UK. Participants were encouraged to share the social media adverts with their friends and colleagues.

Questionnaire

Our questionnaire was based on a combination of previous studies, which were further refined following a pilot interview.[2] Questions were tailored to suit females who are applying or just completed application to CST. A self-administered, online programme was developed using Qualtrics.[7] The participants were asked to rank the influence of popular identified motivators and deterrents. A Likert scale assessed the impact of gender on opportunities available during surgical training application. This novel concept was termed the Gender Impact Rating (GIR) on a scale of 0 to 5, whereby 0=no impact and 5=major impact. A copy of the questionnaire can be found in Appendix A.

Semi-structured interviews

The methodology of this study was concurrent with the Consolidated Criteria for Reporting Qualitative Research Checklist.[8] The TACT (Trustworthiness, Auditability, Credibility and Transferability) Framework was used to ensure a rigorous approach.[9]

The interviews were recorded, limited to 15 minutes per participant and were held via Microsoft Teams[10] due to the COVID-19 pandemic restrictions. These questions (Appendix A) allowed participants to elaborate on and contextualise their answers from the questionnaire. Pilot interviews were carried out to test the quality of data extracted.

All interviews were audio recorded, transcribed, and anonymised. The resulting transcripts were then analysed using the Braun & Clarke method of qualitative analysis. Important features from the dataset of transcripts were identified and coded. Themes were then inductively and semantically determined from the collated codes. These themes were validated against the dataset and the themes that reflected the data were retained, which were further analysed and more fully described. This thematic and analytic narrative was then interwoven with the quantitative data derived from the questionnaire. 20 interviews were sufficient as data saturation was reached and we gained no new information after 15 interviews.

Inclusion and exclusion criteria

The inclusion criteria were as follows: female, doctor employed by the NHS, foundation doctor year 2 (FY2) or core trainee years 1 (CT1) and 2 (CT2). Non-surgical trainees and trainees identifying as male or non-female were excluded.

Data Analysis

Questionnaire data was collated from the online hosting solution and imported into IBM SPSS Version 27.[11] As the data consisted primarily of Likert scales and rankings, non-parametric tests were used in the analysis, which included independent sample median tests. As individuals could select multiple surgical specialities, it was not possible to assess the impact of the subspeciality itself on the dependent factors. Some individuals

chose more than one surgical speciality, and therefore existed within multiple groups simultaneously, making a chi-squared test invalid.

Reflexive Statement

The researchers acknowledge their biases and influence on the outcomes of this study. The research team consisted of 4 female and 2 male medical students, and a male consultant surgeon as the supervisor. The diverse backgrounds and experiences have led to personal aims and impetuses that influence the research process. To minimise this bias, multiple interviewers carried out the interviews so that the perception of the qualitative data was done with many different perspectives to increase the validity.

Results

Quantitative analysis – Overall*

A total of 100 participants were questioned of which 35 (%) were FY2, 36 (%) were CT1, and 29 (%) were CT2. The respondents spanned all 24 of the geographically distributed UK deaneries. The median age was 27 (range: 23-40); 55% identified as Black, Asian, and Minority Ethnic (BAME), 46% White/British/Other; 19% were married and 4% had dependents. The typical respondent was between 26 and 29 years of age, identified as White/British/Other, was unmarried with no dependents and completing CT1 at a deanery outside of London.

Gender Impact Rating (GIR)

Differences in median GIR were noted across training stages and ethnic groups. CT2s had a median GIR of 2, whereas CT1 and FY2s had a higher GIR of 3 (figure 1A). GIR of White/British/Other respondents was skewed towards lower values with the median rating of 2 which was lower than both the BAME and global median of 3 (figure 1B). Both results were not statistically significant (α = 0.05)**.

Motivators, Deterrents, and Interventions

Of the factors that participants regarded as influential to their application to CST programmes, "early exposure to surgical specialties" and "professional support" were the highest median ranked motivators (Mdn=4, figure 2A). "Work-Life Balance" was the deterrent with highest median ranking (Mdn=3, figure 2B) and "mentoring schemes" (Mdn=3, figure 2C) had the highest median ranking as the most valuable intervention to CST application suggested by our applicants.

The highest-ranked motivator in "Married/Civil Partnership" participants was "Professional Support in Specialties", whereas "Early Exposure to Surgical Specialties" was the highest-ranked motivator in "Unmarried/Divorced/Widowed" participants. **

*More information in appendix B.
**More information in appendix C.

Quantitative analysis – By Speciality

Participants were subdivided into the 11 specialities they wished to pursue in the future. 8% of participants were unsure of which surgical specialty to pursue.

Currently, there are only 3 specialties not offering a run-through programme; paediatrics, plastics and academic.[12] Of the respondents, 88% were pursuing at least 1 specialty which offers run-through programmes, with 74% choosing only specialties with run-through programmes.

A more detailed summary of the influential deterrents, motivators and interventions for each specialty choice can be found in the Appendix D.

Some notable findings were:

- The median for most participants and their chosen specialties, ranked income as the least influential motivator.
- Highest median GIR was found in participants considering neurosurgery, GIR=4 (median GIR=2 for non-neurosurgical specialties). However, they ranked male dominance as the second least influential deterrent. Ranking of motivators were consistent among participants. *
- Lowest median GIR was found in participants considering Oral and Maxillofacial surgery (OMFS), GIR=1, close to no impact. Ranking of deterrents and interventions were consistent among participants. *
- All participants considering Academic, Trauma Orthopaedic (T&O), OMFS and paediatrics were "Unmarried/ Divorced/ Widowed".
- BAME participants constituted <50% in the following specialties: OMFS, T&O, Otolaryngology, Vascular Surgery.

    *Refer to appendix D

Qualitative analysis

Meta themes that arose were of deterrents, motivators, and implementations. Each of these sections could be further categorised into the following 4 themes:

1. Institutional factors which included aspects of the RCS.

2. Organisational culture, including the hospital environment.
3. Social factors which included friends/family.
4. Personal factors which were individualistic.

Common themes, and corresponding quotes occurring throughout the interviews can be found in Table 1.

The main deterrents mentioned in the interviews were career progression, discouragement and discrimination by other staff, difficulties with family planning and finance.

Positive motivational factors included exposure to surgery throughout medical school, conferences, mentors, positive changes to attitudes towards female surgeons and the varied, technical aspect of surgery.

The implementations participants viewed as most valuable were increasing exposure to surgical specialties. Furthermore, improving the work environment by raising awareness of existing stigmas, social and professional support from mentors and allocating time for self-improvement.

Deterrents		
Institutional Factors		Quote
Career Pathway	Taking years out of training	"Experience out of surgical training seen as negative in surgery, like if you've had to take more than a year's experience outside the foundation programme. Whereas, for example, in anaesthetics, that's favoured so you get points for that"
	Pay Gap	"Surgical specialties have the biggest pay gap"
	Expenses	"Expenses caused an issue as it is "certainly very expensive doing surgical training and paying for the courses"
Work-Life Balance	Flexible working hours	"Financial support and flexible working hours is not a thing" "I think it's the way our training works, and you know it's not all that flexible and I find out a bit frustrating"
	Balancing responsibilities with dependents	"Enough time, effort and family support to look after [children] or arrange childcare"
Application Process	Too many requirements	"I didn't have a full quality improvement project but had 5 published papers. But when I applied, that actually disadvantaged me, because I haven't jumped through some of the heaps that I needed to"

	Lack of support from the deanery	"Deanery didn't do anything to support my application process"
Organisational Culture		Quote
Discouragement	Discouragement from non-surgical specialties	"A lot of the discouragement comes from people who don't do surgery"
	Discouragement from family	"My whole family basically said don't do medicine and then they said don't do surgery"
	Stigma surrounding family life and women	"You're doing surgery that's the end of you having any children"
Discrimination	Male validation	"They validate them more than you even though they're more junior than you"
	Proving yourself	"You've got to spend a lot more time proving yourself and the bar will be set different"
	Sexism	"Male colleagues making sort of sexist remarks"
	Prejudice	"I do think slightly that women when they are at early stages of their surgical career, people still don't fully assume you that you want to become a surgeon"
Surgical Type	Stereotypes of female surgeons	"Someone who's very… I would say… maybe male, maybe white middle class, maybe you know when you think about a surgeon… someone quite cold"
	Stereotype of surgeons	"Everyone thinks surgeons are going to be quite mean"
Work Environment	Lack of equal opportunities	"People who are the loudest and the mouthiest will only get the opportunity and no one else" "Subtle undertone sometimes of men being given opportunities"
	Male dominance	"there will not only be more of them, but they will also have those positions of essentially running the other parts of the Department and having a greater say"
	Resentment over less than full-time workers	As soon as someone on the rota goes part-time, it makes life harder for everyone else… [so] I think instead of resenting the system... you end up resenting the person who's part time"
	Sexual harassment by consultants	"And the consultant who had scrubbed in turned round to me and said 'well, only if you give me a kiss' and stuck his cheek out. So I think that's probably the worst example I've had. Stuff like that is really common that women have experienced particularly in surgery"
Social Factors		Quote
Dependents	Having children means that training takes longer	"I do know people who do have children and they've done less than full time training, but it does take a really long time"
	Wanting to have children is a deterrent	"If I did have children, I'd- I wouldn't go down the surgical route"

	Geographical limitations due to dependants	"If I had dependents that were committed to a specific geographical location, for whatever reason, because that's where our support network is and so on that is then another"
Family Life	Impact of training on future relationships	"This path would have some kind of impact on... future personal relationships, marriage relationships, and relationships that weren't even formed"
	Wanting a family life is a deterrent	"I'm not married and I'm single, but it's something that is constantly there at the back of my mind"
	Compromise is necessary	"Quite a lot of sacrifices to keep their family together"
Personal Factors		Quote
Exposure	Negative experiences in foundation training can be a deterrent	"What you were exposed to as an F1 and F2 probably does really influence your decision-making process or bias"
	Lack of early exposure to surgery	"Surgery gets shoved under in the curriculum and you don't get much exposure to it as a student"
Finance	Financial burden of extra courses needed for applications	"To pay for all of the exams and courses that you're expected to go on...if you want to have a kind of competitive CV for getting into higher specialty training"
	Financial problems	"I think if I had all of those at the back of my mind, then I may consider taking a year or something"
Resilience	Necessity to handle negative comments	"Develop a thick skin after a while"
	Wanting to pursue extra hobbies but afraid of stigma	"Don't want to be seen as being lazy or not interested… [but I] want to do a lot of singing and basically piano…and all of those things have largely slipped away"
	Personality affects the number of perceived barriers	"Probably difference between like perceived barriers there and actual barriers"
Motivators		
Institutional Factors		Quote
Informative Events	Going to conferences and courses for advice and application process	"I just got lots of verbal advice from lots of registrars. Went to conferences, went to preparation courses and that sort of got me into it"
	Going to conferences and courses for increased motivation	"Just being in those conferences, which is very inspirational talks, so I think that was one of my motivation factors as well"
Career Progression		"One of the better fields to work in with regards to career progression"
		"But like practically I thought "okay some specialties are better suited to private work"
Work-Life	The variety of work in surgery	"Nice balance between, yes you've got lots of surgery but you do also still use some medical skills"
	No difference in	"The same whether you do medicine or surgery"

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	workload when compared to medicine	
	Less than full time training is available in surgery	"You know less than full-time work is there and is available and you see lots of people make it work"
Organisational Culture		Quote
Cultural Shift	Reduce stigma about less than full-time training	"Reduction in stigma about less than full-time training"
	Encourage diversity, both ethnic and females	"I think just generally within surgery there has been a move to encourage diversity, and I kind of saw that more when I started working within surgical specialties"
Female Presence	Increased female presence	"There were actually a lot of female registrars where I was and that really motivated me to apply"
	Inspirational female team members	"She knows her stuff, she's confident, she's funny, she's sociable, she's nice, she's the kind of person that you'd happily, sort of, sit down and have a chat with and just completely respect clinically and I think it was that kind of eye-opening moment; oh actually, you know, you don't have to be a certain way to be a woman surgery you just have to be a woman who wants to do surgery"
Active Engagement	Having consultants who motivate and engage trainees	"I had great, great consultants who were really motivating and really enthusiastic about their field, so absolutely"
	Having a good team that actively got participants involved	"Encouraging CTs and they yeah they were very encouraging and I was in a small District Hospital so they were constantly teaching us and they allowed us to do things to help operate so I think that's what inspired me to do it"
Social Factors		Quote
Mentor	Mentors had an influence	"They have definitely had a massive impact in my choices"
	Impact of female presence throughout the training process, especially at senior levels	"I think it is incredibly, incredibly just reaffirming and heart-warming to see other women at a consultancy level, registrar level or even just a year or two ahead of me"
Social Support	Having a good team environment	"I really like when you're in a good team and with really supportive, you know, seniors like it's kind of an amazing experience"
	Support from family	"my family and husband always said just that go for it whatever you want to do, do that, you may as well"
Personal Factors		Quote
Exposure	Positive early exposure in foundation years	"I did not have the early exposure that I had during a really good surgical rotation I don't think I'd be even remotely interested as much as I am now"

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	Being actively involved by a team in medical school	"Being taken on by that team quite early on and having that early operative exposure is quite important"
	Positive exposure in foundation training	"To balance that out, like I was, I enjoyed the specialty, and I was really interested in in the specialty then I decided to choose it"
Intrinsic Motivation	Early goal and motivation to do surgery	"I wanted to do surgery before I went to medical school so that was always the plan"
	Proving stereotypes wrong about women in surgery	"Proving yourself and the bar will be set different. But sometimes I actually use that as more of a motivation than deterrent"
Nature of Surgery	Personal interest in physiology	"I understand the range of pathology easily, mechanisms of disease comes naturally to me, I enjoy this abdominal anatomy"
	Technical aspects and variety offered by surgery	"Think just the surgical specialties themselves being quite straightforward. And I think there's the technical aspects I think which is another motivator. You really get to use your hands and you don't get very often in medical specialties"
Implementations		
Institutional Factors		**Quote**
Early Exposure	Increased hands-on exposure in undergraduate level	"Increased exposure to surgical specialities, I think it's got to be fairly hands-on exposure"
	Increased hands-on exposure in foundation level	"Think that's probably why there's a reasonable number of people who pull out of training during- because you just don't really ever get a true idea of what life as a surgical trainee is going to be like. But then I would think that increased exposure, because that's what I would enjoy"
Representation	Increased female representation	"There needs to be more gender representation. There needs to be more diversity"
	Having more females in positions of leadership	"I think more female leadership, more so. ****, she's the head of the GMC at the moment. She is a female surgeon which is great and I think that's important as well"
Support	Offering maternal support to women	"Identifying the need for it and then addressing the actual day to day practical factors, like less than full-time work and work challenges you might have. Like mothers for financial support, support with coming back to work and flexible training and working hours"
	Having a standardised checklist of application requirements in one accessible place	"Because it changes every year, it's changed for us this year compared to last year and there's a lot of new things but just having that and then the option to sit down with someone to go through your portfolio if you can, that's probably the main thing"
	Application support from senior medical professionals (professional support)	"Consultants taking an interest in you, and saying that they'll look through your portfolio and give you interview practise"

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Training process	Availability of run through programmes	"Run through training programmes are great for that. So, my friend is married and has two kids and she's run through training ENT"
	Alternative pathways to training	"It would be much easier to sort of carve your own training without going through a training programme and I think for me that would be- yeah that's a useful change"
	Workshops to educate applicants	"I think it would be useful to have some like workshops and understand the patient process and what's required of you and what they are looking for and expecting"

Organisational Culture		Quote
Cultural Shift	Help with conversations about comments in the workplace	"Frank conversation with them when I said as much as I appreciate where you're trying to see my best interest. I personally don't have those challenges, and if it comes to that point where, um, you know, say I do have children and I do. I need time off, the Deanery does support that and there are some kickass women with three children working less than full time and doing their thing and they've managed it"
	Surgical teams need to accommodate females	"Just making the culture more accepting of having more female trainees"
	Reduce prejudices against women	"Is possible and people just being generally supportive of 'oh you want to be surgeon, great' rather than 'oh you want to be a surgeon but you're a woman'"
Destigmatisation	Active engagement in undergraduate level	"I think just the engagement is really important, just show that you actually care and you know that this student exists somewhere in the theatres. You know like, just go "can you help me hold it" - like get them involved"
	Breaking stigma of the surgical type of woman	"Maybe reducing I would say but it's kind of again the notion, thing that women in surgery are real hard and cold and you know not very nice which is completely untrue"
	Normalising less than full-time training in the workplace	"I still I find that quite daunting concept and I I know that's quite far away for me at the moment, but trying to get that understanding in the Department without being feeling like you are doing less because you are not there as much as some others, and to normalize that behaviour"
	Destigmatising less than full-time training and its impact on life out of medicine	"And just this kind of it will take away so much of the pressure to be a perfect surgical trainee or a perfect partner or a perfect parent. I think it will actually mean that you have a longer term."

Social Factors		Quote
Mentorship Schemes	Mentoring schemes should start in medical school	"There's tonnes of buddy schemes out there at the moment, but I think maybe starting this from undergraduate level would be nice"
	Female role models established early	"Setting role models early and making female medical students think that they can do it, and know that it's a possibility at that stage"
	A mentor should be close in training position to help with	"So you might want to know like someone directly above you, like a year or two, that can get you through the applications. I think that will really make a difference"

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	applications	
Networking Opportunities	Spaces to get involved with research projects	"Setting up networking meetings at hospitals and stuff where people could give projects, show what projects have got on offer and if they need any help and things"
	Joint groups with peers to practice interviews	"I think having a local group will be useful, where you can do face-to-face practise. I think that that's a huge goal within the interview checklist itself"
Personal Factors		Quote
Self-Development	Time should be scheduled in the rota to be able to increase theatre time and grow professionally	"My job as an F1/F2 has been purely service provision and I really do feel, apart from if I came in on day-offs, I had no opportunity to go to theatre or go to clinic or do anything that like a specialty trainee might do. I do think that into the rota, it should have been scheduled for you to sometimes go to the theatre"
	Time for self-development and career development	"F1 is really critical, because by the time you get to F2 and your first placement like literally the end of your first placement. I think having some of those afternoons, or even like a couple of hours, where you can just go and assist in a case or you can go to clinics, is so important for people's choices. And those career conversations that go on very early on are really important, so I think if you were going to target anything to make a successful intervention, I'd really try and push up the F1 stage"

Table 1: A table summarising the qualitative findings

Discussion

Our mixed-methods study utilised a questionnaire and semi-structured interviews (SSIs) to determine deterrents and motivators considered by female trainees early in their career when applying for a surgical training programme. This study confirmed that the most influential motivator was "early exposure to surgical specialties", whilst the greatest deterrent was "work-life balance". Income was ranked as the least influential motivator. The establishment of mentoring schemes was suggested as the most valuable implementation to the application process. Furthermore, median GIR of the cohort was 3 (some impact) out of 5 (major impact), confirming that there continue to be significant barriers that discourage females from applying for a career in surgery.

Motivators, Deterrents, and Interventions

The findings of this study concur with those of Singh et al.[13] which showed early exposure to surgical specialties and professional support were the most influential motivators. However, Walker et al.[14] contradicts these results having found, in a cohort of male and female surgeons, that role models and well-structured career progression were more important driving factors than early exposure. Walker et al.[14] further contradicts our study finding that 90% of their participants believed there was sufficient time for training during working hours. The women interviewed in our study believed that more time is needed to be allocated for self-development and training activities. Further analysis of our qualitative data suggests that this difference may be due the perceived greater involvement of male doctors in surgery by consultants leading to less training opportunities being available to females.

The results showed that work-life balance was ranked the most influential deterrent which corroborates with a questionnaire conducted by the RCS.[3] Qualitative analyses suggest that this is due to the lack of flexible working hours as well as stigma around less than full-time training (LTFT).

The most valuable intervention found in the quantitative analysis was the establishment and availability of mentoring schemes. In 2017, Faucett et al.[15] emphasised that same-sex role models were essential to promote the entry of women into surgical specialties, as well as motivating them to take higher academic roles in the field. This study also highlighted a statistically significant difference in exposure to role models between the genders, which further emphasises the importance of providing these, particularly from an undergraduate level.[15]

Income as a motivator was ranked lowest in most specialties, which is supported by existing literature.[14,16] Financial support was also often a low priority implementation in our cohort. However, participants who ranked it higher, often mentioned that training courses and entry examinations were "very expensive". Financial support could potentially be a more important factor for women than expected, due to the gender pay gap as mentioned in interviews. Stephens et al.[17] suggested that women in surgical subspecialties have the largest difference in mean income compared to their male counterparts than other specialties, which alongside the increased cost of surgical career pathways, makes entrance and progression through CST more difficult.

GIR

The median GIR of participants varied by specialty, similar to Dixon et al. who identified variation in the disadvantages faced by women in the entry to different specialties.[18] In our study, Neurosurgery had the highest GIR, drawing parallels to a previous study that found >70% of female medical students expected inequality in a male-dominated profession like neurosurgery.[18,19] However, female neurosurgeons in our study ranked male dominance the second least influential deterring factor to application. Qualitative analysis suggests women are already aware of the male dominance hence it does not deter them from entering the speciality.

Our quantitative data highlighted differences in the application experience of CT2s compared with CT1s and FY2s, having completed their application only 2 years earlier. The median GIR for CT2s ($Mdn_{CT2}=2$) was lower than that of both FY2s ($Mdn_{FY2}=3$) and CT1s ($Mdn_{CT1}=3$). This reduction in GIR among CT2s may be because of their place in the team hierarchies. The qualitative analysis showed that treatment was dependent on one's position in the workplace hierarchy as well as seniors noticing a reduction in the need to "prove themselves". A possible explanation for why they believe their gender has less of an impact, is the recall bias CT2s experience when recollecting the application process given their current seniority, a phenomenon that is well explored in literature.[4,20]

The median GIR for BAME individuals ($Mdn_{BAME}=3$) was higher than that of individuals who identified as White/British/other ($Mdn_{White/British/other}=2$). Notably, the GIR of the white identifying group was negatively skewed towards lower values. The difference in GIR between these groups could be explained by the intersection of one's gender and ethnicity. BAME participants in the

interviews described cultural norms and expectations they had to overcome to pursue surgery. Cultural norms and attitudes to females in surgical specialities vary between ethnocultural groups and geographical regions.[21] A scoping review on the topic identified that countries with extended family support systems allowed female surgeons to have children during training.[21] These cultural norms allowed better support for female surgeons.[21] Whereas studies in Pakistan and Zimbabwe have shown that cultural norms and expectations may also act as deterrents for female surgeons, such as the belief that surgery is not compatible with the expected role of women as the primary caregiver of children.[22,23]

Marital Status and Dependents

Majority of the cohort was unmarried and expressed concern over the compatibility of surgery with a fulfilling family life. Quantitative analysis showed a significant number of married participants ranking "Professional support within the specialties" as their most influential motivator. Difficulties in parental leave and LTFT were quoted by participants, which could explain this trend. Previous studies showed that females of child-bearing age stated organisational/financial worries when planning, and upon return from maternity leave.[16] Therefore, doctors considering having children may value professional support to overcome this barrier.

In contrast, the deterrents emphasised by interviewees were around sustaining long-term relationships and choosing an appropriate child-bearing time. The current selection process of CST does not consider the location and marital status of applicants resulting in many relocating multiple times during their career.[24] This creates uncertainty towards settling down and building a family home, which could explain the popularity and preference in the interviewees towards run-through CST programmes.

Flexible Working Hours

Flexible working was ranked highest amongst CT2s and FY2s. However, destigmatising LTFT was ranked equally for all levels of training. This suggests that flexible working hours are needed to meet the requirements for progression onto surgical training programmes. This was reflected

in the qualitative study where participants described the need to find time to complete "check box" tasks (e.g., basic surgical skills courses, trauma courses) to be eligible to apply for surgical training, especially during FY1. A 2019 study by Walker et al.[14] also supports our study's finding as pre-CST individuals are more likely to suggest flexible working/LTFT as an intervention than those currently in a CST programme.

Discrimination

Interviewees reported experiencing discrimination at work, especially from other healthcare professionals. Participants also mentioned unwanted comments, showing sexual harassment is still an issue. A questionnaire by Freedman-Weiss et al.[25] found only 7% of incidents being reported by surgical trainees, especially if perpetrated by a senior clinician who may impact an individual's progression. Literature also showed that women were held to higher standards when applying to surgical specialities.[26] Moreover, our participants described a stereotypical view of senior female consultants; cold, detached and unapproachable by other staff. Previous literature established this phenomenon as a female "surgical type", without providing a successful intervention.[27] Our participants said this motivated them to pursue surgery to dispel these perceptions and encourage other women to pursue the field.

Implementations

The implementations suggested by the questionnaires were varied, yet they are not specific enough to address the issues discussed by the interviewees. Hence, specific implementations and the rationale behind them as suggested by participants can be found in Table 2. Many women expressed issues during the application process, especially about time management and lack of information about the requirements to apply. Therefore, the introduction of a new centralised portfolio checklist and allocated time for trainees to improve their portfolio is suggested.

Implementation	Rationale
A centralised, easily accessible portfolio checklist to guide trainees in their application process	Qualitative results highlighted interviewee's frustration in the application process due to difficulties in finding easily accessible information
Bulletins for up-to-date information when applying	Especially given the current uncertainty after the COVID-19 pandemic, interviewees stated the

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	importance of wanting up to date information
Networking events led by female consultant surgeons, inspiring young applicants	Literature states the importance of role models, which echoed the sentiments of the interviewees. These events would also serve as networking opportunities to enable trainees to build contacts and get involved in projects
Workshops to encourage open dialogue about destigmatising less than full-time training and how to handle negative comments in the workplace	Participants expressed that there is a stigma surrounding less than full time training and a culture of discrimination of women in surgery
Undergraduate same-sex mentorship schemes with mentors gaining points to enhance CV	The benefits of mentoring schemes for the mentees are discussed extensively. This combined with a point system to incentivise mentors would lead to a mutually beneficial scheme
Groups to practice surgical application interviews, led by a senior surgical trainee	Interviewees mentioned having informal practice groups which they found helpful during applying
Allocated time during working hours for professional development including being on a rota for theatre	Existing literature and our study found that trainees need extra time to develop skills and gain experience to build their portfolios which is not currently adequate

Table 2: Recommendations and rationale for implementations

Strength and Limitations

This is one of the most recent studies discussing the deterrents and motivators for women entering surgery, making the implementations relevant to current CST applicants. Other strengths include the extensive reach of the questionnaire and interviews across the UK. Furthermore, the use of mixed methods of both quantitative and qualitative data aided in verifying themes observed in the interviews. Additionally, a ranking system for factors was used, which has not been done in previous literature. In line with the TACT Framework, the study shows transferability as the demographics of participants were recorded. Consequently, the findings from this study can be generalised to the wider population dependent on certain demographics.

However, this study also faces some limitations. The small sample size meant some results were inconclusive, and the use of snowball sampling can cause selection bias. Additionally, 15-minute interviews were performed, which may not allow sufficient time for participants to explore the whole narrative. Another limitation of this study is that it only explored the perspective of women pursuing surgery, hence those who decided against applying due to their gender were unaccounted for. Furthermore, the questionnaire format of ranking existing factors may cloud and bias their judgment when asked to explore other factors and themes. This may have caused difficulty to bring out any new themes from the women. Similar to any study involving interviews, participants who agree to be interviewed often have stronger opinions than those who refuse,[28] which may explain the lack of significance in quantitative results despite recurrent themes in the qualitative interviews.

Future Scope

Further studies should explore motivators and deterrents that arise in various surgical specialties as studies show disparities across the CST programmes. A larger cohort for the study would also allow the exploration of the impact of ethnicity and gender together, as well as the importance of ethnic representation and its contribution to GIR. It would also be helpful to recruit international cohorts to investigate the continuing paucity in female surgical trainees seen globally,[21] and compare geographical differences, as well as those between different healthcare systems (e.g., state-funded versus private).[26] Additionally, future research should explore personality traits commonly shared by female surgeons, which drive their intrinsic motivation against deterrents during their career as exhibited by the interviewees.

Conclusion

This mixed-methods study aimed to identify the deterrents and motivators to women entering surgery, followed by suggesting implementations for healthcare organisations. In concordance with existing literature, this study found work-life balance and early exposure to surgical specialties the most influential factors and suggested mentoring schemes and normalising LTFT as the most suitable interventions for women in surgery. Although there is much change afoot to encourage female surgeons in the NHS, acceptance of diversity and flexibility would be a key factor in this.

Author Contributions
KR, RB, RT, SC, AR and RM are co-first authors and have contributed substantially to the conduct of this study and the writing of the manuscript.
All researchers were responsible for data collection.
KR, RB and AR were responsible for transcribing, coding, data analysis and interpretation.
RT, SC and RM contributed to the statistical analysis and interpretation.
CG was responsible for overseeing the study design, process and writing of the manuscript.

Authors Information
KR, RB, SC and RT are female 5th year medical students, RM and AR are male 5th year medical students.

CG (PhD, FRCS(Tr&Orth), MA, BMBCh (Oxon)) is a male consultant Trauma & Orthopaedics surgeon at Imperial College NHS Trust.

Figure Legends

Figure 1. Boxplot showing the range of participant Gender Impact Rating (GIR) at Foundation Year 2 (FY2), Core Trainee 1 (CT1) and Core Trainee 2 (CT2) of training (**1A**), and GIR in White/British/Other and Black, Asian and Minority Ethnic (BAME) (**1B**).

Figure 2. Radar graphs showing the median ranking of motivators (**A**), deterrents (**B**), and suggested implementations (**C**) for core surgical training programme applications. Points further away from the centre (0) indicate a greater influence of the factor, whilst those closer to the centre indicate a lower influence.
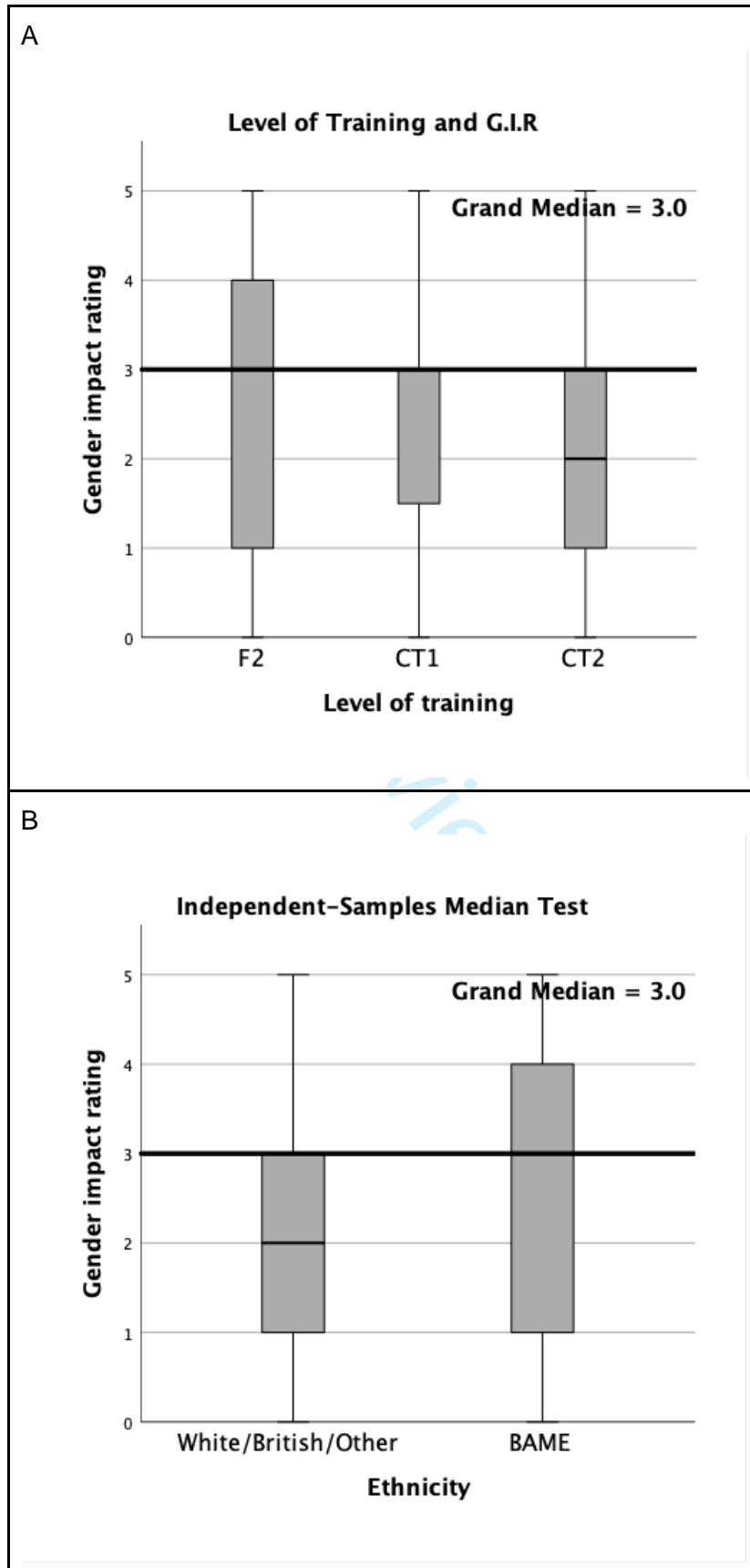
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Figure 1

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For peer review only

Figure 2

A

Median Ranking of Motivators for Surgical Training Application

B

Median Ranking of Deterrents for Surgical Training Application

C

Median Ranking of Potentially Valuable Intervention for Surgical Training Application

Qualtrics Questionnaire

By clicking I agree you confirm that you have read and understood the participant information sheet (linked below). You also agree to the use of your questionnaire response in our study as outlined in the participant information sheet. If you have any further questions about how we will use your data please contact the study organisers before agreeing and completing this questionnaire. By clicking agree you also confirm that you understand your participation is voluntary and that you are able to withdraw at any point without needing to give a reason. You also understand that your response will be anonymous and no identifiable information will be submitted unless you consent later in the questionnaire. You are also consenting to your data being used to support future research which may be outside the EEA.

To view the full participant information sheet click here

If you understand these terms and wish to participate in the study please select I agree.

○ I agree (1)

End of Block: Consent

Start of Block: Demographics

Q1 What is your gender?

○ Male (1)

○ Female (2)

Q2 How old are you?

_____

Q3 What level of training are you currently at?

○ F2 (1)

○ CT1 (2)

○ CT2 (3)

Q4 Did you take any years out of your medical training, and if so, how many?

○ Yes (1) _____

○ No (2)

Q5 Which surgical specialties did you cover in your foundation year training?

☐   Cardiothoracic (4)

☐   General (5)

☐ Neurosurgery (6)

☐ Oral and Maxillofacial (7)

☐ Otolaryngology (ENT) (8)

☐ Paediatric (9)

☐ Plastic (10)

☐ Trauma and Orthopaedic (11)

☐ Urology (12)

☐ Vascular (13)

☐ Academic (14)

☐ None (15)

Q6 Which surgical speciality would you like to specialise in, if any?

☐ Cardiothoracic (4)

☐ General (5)

☐ Neurosurgery (6)

☐ Oral and Maxillofacial (7)

☐ Otolaryngology (ENT) (8)

☐ Paediatric (9)

☐ Plastic (10)

☐ Trauma and Orthopaedic (11)

☐ Urology (12)

☐ Vascular (13)

☐ Academic (14)

☐ None (15)

End of Block: Demographics

Start of Block: Deanery/Foundation School

Display This Question:

    If What level of training are you currently at? = CT1

    Or What level of training are you currently at? = CT2

Q7 Which is your current deanery?

▼ East Midlands (4) ... Other (40)

Display This Question:

    If Which is your current deanery? = Other

Q8 Please specify which deanery.

_____

Q7 Which is your current foundation school?

▼ East Anglia (1) ... Other (17)

Q8 Please specify which foundation school.

_____

End of Block: Deanery/Foundation School

Start of Block: Demographics

Q9 What is your marital status

○ Married/ Civil Partnership (1)

○ Unmarried/ Divorced/ Widowed (2)

○ Other (please specify) (3) _____

○ Prefer not to say (4)

Q10 Do you have any dependents?

○ Yes (1)

○ No (2)

○ Prefer not to say (3)

Q11 Please select the ethnicity that you feel best describes you.

○ White British/Irish/Other (1)

○ Asian/Asian British (Indian, Pakistani, Bangladeshi, Chinese and other) (10)

○ Black/African/Caribbean/Black British (2)

○ Mixed and Multiple Ethnic Groups (3)

○ Arab/Middle Eastern (4)

○ Other (please specify) (6) _____

○ Prefer not to say (7)

End of Block: Demographics

Start of Block: Impact of Gender

Q12 What impact, if any, do you feel your gender has had on the opportunities available to you whilst applying to your surgical training? ⌷SEP⌷
Can you rate it from a scale of 0-5. (0 = no impact, 3 = some impact, 5 = major impact)

| | 0 | 1 | 2 | 3 | 4 | 5 |

Level of impact ()

End of Block: Impact of Gender

Start of Block: Barriers

Q13 Rank the following deterrents based on the level of influence they've had on your application to surgical training programmes. Please order the following from most influential (1) to least influential (5).

_____ Career Structure (1)
_____ Male Dominance (2)
_____ Lack of Equal Opportunities (3)
_____ Discrimination from other HCPs (4)
_____ Work Life Balance (5)

End of Block: Barriers

Start of Block: Motivators

Q14 Rank the following motivators based on the level of influence they've had on your application to surgical training programmes. Please order the following from most influential (1) to least influential (6).
_____ Professional support in the specialties (1)
_____ Social support system (2)
_____ Positive changes to the organisational culture (3)
_____ Early exposure to surgical specialties (4)
_____ Income (5)
_____ Career progression is well defined (6)

End of Block: Motivators

Start of Block: Intervention

Q15 Rank the following interventions from what would be most (1) to least (5) valuable to you, when you considered applying to surgery
_____ Mentoring schemes (1)
_____ Flexible working hours (2)
_____ Financial support (3)

_____ Increased exposure to surgical specialities in undergraduate studies (4)

_____ Destigmatising non full time training (5)

End of Block: Intervention

Start of Block: Block 9

Q16 Are you happy to be contacted for a 20 minute online interview discussing your results in this questionnaire?

○ Yes (1)

○ No (2)

End of Block: Block 9

Start of Block: Follow up

Display This Question:

*   If Are you happy to be contacted for a 20 minute online interview discussing your results in this qu... = Yes*

By agreeing to interview we will collect identifiable information such as your name and contact details. We will securely store this information, linked to your answers from this questionnaire, for the duration of the study. Once the study has been concluded all identifiable will be removed and none of your answers will be linked to the identifiable information. If you still wish to participate in an interview an information sheet along with a further consent form will be sent to you. These will further clarify how we will use your information as well as outline what would you should expect from the interview. If you no longer wish to participate in an interview you may still submit the questionnaire anonymously.

To view the full consent form click here

Display This Question:

*   If Are you happy to be contacted for a 20 minute online interview discussing your results in this qu... = Yes*

 Do you still wish to participate in an interview:

○ Yes (1)

○ No (2)

Display This Question:

If Are you happy to be contacted for a 20 minute online interview discussing your results in this qu...
= Yes

 Please provide a digital signature below

Display This Question:

If Do you still wish to participate in an interview: = Yes

Q17 Name:

_____

Display This Question:

If Do you still wish to participate in an interview: = Yes

Q18 How can we get in contact with you?

☐   Email (1)

☐   Telephone (2)

Display This Question:

If How can we get in contact with you? = Email

Q19 Email address:

_____

_____

Q20 Telephone number:

_____

_____

End of Block: Follow up

Start of Block: Outro

Please click the arrow to submit your response.

Thank you for taking part in our research survey!

If you have any questions do feel free to contact us on **ram316@ic.ac.uk**

 Please click the arrow to submit your response.

End of Block: Outro

Start of Block: Block 11

Thank you for your time.

Unfortunately you are not able to take part in the research without consenting to us using your data. If you still wish to take part please go back to the previous question and read the information we have made available before consenting to us using your data.

End of Block: Block 11

Interview Schedule

Gender composition at the workplace
- What is your **opinion** of the ratio of male: female registrar trainees in your specialty?
- What is your **opinion** of the ratio of male: female consultants in your specialty?
- Make sure to ask their opinion on it and not just the ratio

Did you take any years out of your medical training, and if so, how many?

If YES:
        Why did you take years out of your training? Did this influence your decision to apply to surgical training?

If NO:
        Did you consider taking years out? If yes, why did you choose not to?

Which surgical specialties did you cover in your foundation year training?

Did this experience influence your decision to apply?

Which future surgical speciality would you like to specialise in?

What about this specialty made you want to specialise in it?
If not decided, why did they pursue a career in surgery?

What is your marital status

Was this ever a factor in you making decisions about your application to surgical training?

Do you have any dependents?

Was this ever a factor in you making decisions about your application to surgical training?

What impact, if any, do you feel your gender has had on the opportunities available to you whilst applying to your surgical training?

How do you think this differs to your male counterparts?

The following domains have been identified as motivators and deterrents to remaining/completing surgical training from the systematic literature review completed by Hirayama and Fernando and other supporting literature.

Barriers
Rank the following deterrents to applying for surgical training programmes.
Have you felt discouraged from applying for a surgical training position?
  ○ Can you tell me of an experience?
  ○ Did the discouragement come from experiences you have had at the work or was it because of personal reasons? Could you please expand?
How did you overcome this?

Why did you decide to rank these barriers in this order?
Are there any other barriers which you have come across?

Motivators
Rank the following motivators to applying for surgical training programmes. Please order the following from most influential to least influential

Why did you decide to rank these motivators in this order?
Are there any other motivators which you have come across?

Intervention
Rank the following interventions from what would be most to least valuable to you, when you considered applying to surgery
Is there a role model who motivated you to enter surgery?
  ○ What about them motivated you?
Why did you decide to rank these interventions in this order?

What do you think needs to be done to attract more females into surgery?

Did you feel you were adequately supported during the application process for your training position?
  ○ What was this support?
  ○ Was this a factor in you applying?
  ○ What extra support would have been useful?

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Appendix B

Participant Demographic Data

Stage of training	Number of Participants	Proportion of participants taking years out of training (%)	Mean years out of training
FY2	35	31	1
CT1	35	40	1.53
CT2	30	67	1.41

Table 1. Stage of training of participants when they participated in this study and proportion of participants taking years out of training at each stage. The training stage of the highest proportion of participants (66%) taking years out of training was core training 2 (CT2) with a mean duration of 1.37 years. Foundation Year 2 (FY2) was the training stage with the lowest proportion (31%) of participants taking time out from training, the mean duration of which was 1 year.

Figure 1. Geographical reach of deaneries by participants in this study.

Deanery/Foundation School	Participants (%)
East Anglia	2
East Midlands	5
East of England	11
Essex, Bedfordshire and Hertfordshire	1
Kent, Surrey and Sussex	4
Leicester, Northamptonshire and Rutland	1
London	17
London & KSS: (North Central and East London; North West London; South Thames)	14
Mersey Deanery	1
North East	3
North Western Deanery	4
Northern	2
Northern Ireland	2
Oxford	2
Scotland	3
Scotland East	1
Scotland West	1
Severn	5

South West Peninsula	5
Thames Valley	1
Wales	2
Wessex	1
West Midlands	5
Yorkshire & Humber	6
Other	1

Table 2. Geographical coverage of deaneries and proportion of participants in each deanery.

Figure 2. Participant Ethnicities: 46 (%) White/British/Other, 36 (%) Asian/Asian British, 5 (%) Black/African/Carribean/Black British, 6 (%) Arab/Middle Eastern, 4 (%) Mixed/multiple ethnic groups.

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Figure 3. Participant Marital Status: 77 (%) unmarried, 19 (%) married and 4 (%) prefer not to say.

Appendix C

Gender Impact Rating (GIR) and Rankings data

Stage of Training	Median Gender Impact Rating
FY2	3
CT1	3
CT2	2

Table 1.1. Gender Impact Rating (GIR) at foundation year 2 (FY2), core training 1 (CT1) and core training 2 (CT2) stages of medical training. CT2 trainees had a median GIR of 2, whereas CT1 and FY2 trainees both had higher GIR of 3.

Independent–Samples Kruskal–Wallis Test Summary

Total N	100
Test Statistic	1.657[a,b]
Degree Of Freedom	2
Asymptotic Sig.(2–sided test)	.437

a. The test statistic is adjusted for ties.

b. Multiple comparisons are not performed because the overall test does not show significant differences across samples.

Table 1.2. Table showing insignificant results of Kruskal Wallis Significance Test on median gender impact rating for pre- and post-core training, showing an asymptotic significance (p-value) of 0.437 which was not significant ($\alpha = 0.05$).

Ethnicity	Median Gender Impact Rating
White British/Irish/Other	2
Black, Asian and Minority Ethnic	3

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Table 2.1. A comparison of the Gender Impact Rating (GIR) between White/British/Other participants and Black, Asian and Minority Ethinic (BAME) participants. GIR of White/British/Other participants skewed towards lower values with the median rating of 2 which is lower than the BAME median of 3. Difference in GIR of BAME and White/British/Other respondents was not statistically significant.

Independent–Samples Kruskal–Wallis Test Summary

Total N	97
Test Statistic	3.025[a,b]
Degree Of Freedom	1
Asymptotic Sig.(2–sided test)	.082

a. The test statistic is adjusted for ties.

b. Multiple comparisons are not performed because the overall test does not show significant differences across samples.

Table 2.2. Table showing insignificant results from Kruskal-Wallis Test on Gender Impact Ratings of Black, Asian Minority Ethnic and White/British/Other respondents, showing an asymptotic significance (p-value) of 0.082 which was not significant ($\alpha = 0.05$).

Top ranked motivator * Marital status Crosstabulation

		Marital status				Total	
		Unmarried		Married/Civil Partnership			
		N	%	N	%	N	%
Top ranked motivator	Professional support in the specialties	15a	19.2%	11b	57.9%	26	26.8%
	Social support system	10a	12.8%	1a	5.3%	11	11.3%
	Positive changes to the orginisational culture	4a	5.1%	0a	0.0%	4	4.1%
	Early exposure to surgical specialities	37a	47.4%	7a	36.8%	44	45.4%
	Income	1a	1.3%	0a	0.0%	1	1.0%
	Career progression is well defined	11a	14.1%	0a	0.0%	11	11.3%
Total		78	100.0%	19	100.0%	97	100.0%

Each subscript letter denotes a subset of Marital status categories whose column proportions do not differ significantly from each other at the .05 level.

Table 3.1. Cross Tabulation of top ranked motivators against married and unmarried participants showing the significant ($\alpha = 0.05$) difference in the proportion of top ranking professional support between married and unmarried individuals.

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Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	13.566[a]	5	.019
Likelihood Ratio	15.273	5	.009
Linear-by-Linear Association	8.870	1	.003
N of Valid Cases	97		

a. 6 cells (50.0%) have expected count less than 5. The minimum expected count is .20.

Table 3.2. Results of Pearson's Chi-Square test of the most influential motivators against marital status showing a significant difference between the two groups (p=0.019).

Appendix D

Breakdown of specialty choices data

Future choices in specialty training

	n	n (%)
Number of participants choosing specialties they have not previously taken as part of their foundation training	21	21%
Number of participants considering multiple specialties, some of which they have not previously taken as part of their foundation training	16	16%
Number of participants who are unsure of which surgical specialty to pursue, "none"	8	8%
Number of participants considering surgical specialities alongside "none"	1	1%
Total number of participants who are considering specialties they have not previously taken as part of their foundation training	37	37%

Table 1. Table showing the number of participants considering each specialty. Participants who are unsure of which surgical specialty to pursue are titled "none". The second column shows the number of participants (n=100) and the final column expresses the results as a percentage.

Specialty	Number of participants considering each specialty
None	9
General	42
Trauma and orthopaedics	16
Vascular	4
Urology	13
Plastic	17

Cardiothoracic	5
Paediatric	6
Otolaryngology (ENT)	15
Neurosurgery	5
Academic	6
Oral and Maxillofacial surgery (OMFS)	3
TOTAL	141

Table 2. Table showing the number of participants considering each specialty. There were 100 participants, some participants chose more than one specialty that they wish to do in the future, therefore bringing the total to 141.

Run-through programmes

	n	n (%)
Number of people considering specialties with no run-through programmes available	12	12%
Number of people considering specialties with a mixture of run-through and no run-through programmes	14	14%

Table 3. Table showing the number of participants considering a mixture or no run-through programmes. The second column shows the number of participants (n=100) and the final column expresses the results as a percentage.

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Specialty choice: Neurosurgery

Total number: 5

Marital status:

Marital status	Number of participants	Percentage of total number of participants (%)
Unmarried	3	60%
Married	1	20%
Prefer not to say	1	20%
Total	5	

Table 4. Table showing the marital status of participants choosing this specialty. The second column shows the number of participants (n=5) and the final column expresses the results as a percentage.

Ethnicity:

Ethnicity	Number of participants	Percentage of total number of participants (%)
White	1	20%
Asian	2	40%
Black	1	20%
Prefer not to say	1	20%
Total	5	

Table 5. Table showing the ethnicity of participants choosing this specialty. The second column shows the number of participants (n=5) and the final column expresses the results as a percentage.

Median results for GIR, Deterrents, Motivators, Interventions:

Gender Impact Rating (GIR): 4

Deterrents		Motivators		Interventions	
Career structure	2	Professional support	3	Mentoring schemes	3
Male dominance	4	Social support	5	Flexible working hours	3
Lack of equal opportunities	3	Organisational culture	4	Financial support	5
Discrimination from other HCPs	3	Early exposure	2	Increased exposure	3
Work life balance	3	Income	6	Destigmatising non-full time working	2
		Career progression	2		

Table 6. Table showing the median results of participants for deterrents, motivators and interventions. For deterrents and interventions, each choice is given a result from 1=most influential and 5=least influential. For motivators, each choice is given a result from 1=most influential and 6=least influential.

Participants considering Neurosurgery ranked the impact of their gender on opportunities available to them as 4. This was on a scale of 0-5, (0 = no impact, 3 = some impact, 5 = major impact). This was opposed in their deterrents with male dominance ranking second least influential deterrent. Financial support was ranked as least influential intervention. Motivators were ranked consistently, from most to least influential: career progression and early exposure had a joint first place, followed by professional support, positive changes to organisational culture, social support and income.

Specialty choice: Oral and Maxillofacial surgery

Total number: 3

Marital status:

Marital status	Number of participants	Percentage of total number of participants (%)
Unmarried	2	67%
Prefer not to say	1	33%
	3	

Table 7. Table showing the marital status of participants choosing this specialty. The second column shows the number of participants (n=3) and the final column expresses the results as a percentage.

Ethnicity:

Ethnicity	Number of participants	Percentage of total number of participants (%)
White	2	67%
Prefer not to say	1	33%
	3	

Table 8. Table showing the ethnicity of participants choosing this specialty. The second column shows the number of participants (n=3) and the final column expresses the results as a percentage.

Median results for GIR, Deterrents, Motivators, Interventions:

GIR: 1

Deterrents		Motivators		Interventions	
Career structure	2	Professional support	2	Mentoring schemes	3
Male dominance	4	Social support	4	Flexible working hours	1
Lack of equal opportunities	4	Organisational culture	4	Financial support	4

Discrimination from other HCPs	3	Early exposure	2	Increased exposure	4
Work life balance	1	Income	6	Destigmatising non-full time working	2
		Career progression	2		

Table 9. Table showing the median results of participants for deterrents, motivators and interventions. For deterrents and interventions, each choice is given a result from 1=most influential and 5=least influential. For motivators, each choice is given a result from 1=most influential and 6=least influential.

Participants considering Oral and Maxillofacial surgery ranked the impact of their gender on opportunities available to them as 1, close to no impact. Deterrents were ranked in the following order, from most to least influential: work life balance, career structure, discrimination from other HCPs, with male dominance and lack of equal opportunities ranking equally as least influential. Interventions were ranked in the following order, from most to least influential: flexible working hours, destigmatising non-full time working, mentoring schemes, with financial support and increased exposure ranking equally as least influential. Income was ranked the least influential factor in motivating them to choose this specialty.

Specialty choice: Academic

Total number: 6

Marital status:

Marital status	Number of participants	Percentage of total number of participants (%)
Unmarried	6	100%
	6	

Table 10. Table showing the marital status of participants choosing this specialty. The second column shows the number of participants (n=6) and the final column expresses the results as a percentage.

Ethnicity:

Ethnicity	Number of participants	Percentage of total number of participants (%)
White	3	50%
Asian	2	33%
Black	1	17%
	6	

Table 11. Table showing the ethnicity of participants choosing this specialty. The second column shows the number of participants (n=6) and the final column expresses the results as a percentage.

Median results for GIR, Deterrents, Motivators, Interventions:

GIR: 3.5

Deterrents		Motivators		Interventions	
Career structure	4	Professional support	3	Mentoring schemes	3
Male dominance	2.5	Social support	3.5	Flexible working hours	2.5
Lack of equal opportunities	3	Organisational culture	3.5	Financial support	4.5
Discrimination from other HCPs	1	Early exposure	1.5	Increased exposure	3.5

Work life balance	3.5	Income	6	Destigmatising non-full time working	2
		Career progression	4.5		

Table 12. Table showing the median results of participants for deterrents, motivators and interventions. For deterrents and interventions, each choice is given a result from 1=most influential and 5=least influential. For motivators, each choice is given a result from 1=most influential and 6=least influential.

Participants considering an Academic pathway ranked discrimination from other HCPs as the most influential deterrent. Income was ranked the least influential factor in motivating them to choose this specialty. All participants considering Academics were "Unmarried/ Divorced/ Widowed".

Specialty choice: Trauma and orthopaedic

Total number: 16

Marital status:

Marital status	Number of participants	Percentage of total number of participants (%)
Unmarried	16	100%
	16	

Table 13. Table showing the marital status of participants choosing this specialty. The second column shows the number of participants (n=16) and the final column expresses the results as a percentage.

Ethnicity:

Ethnicity	Number of participants	Percentage of total number of participants (%)
White	10	63%
Asian	3	19%
Mixed	3	19%
	16	

Table 14. Table showing the ethnicity of participants choosing this specialty. The second column shows the number of participants (n=16) and the final column expresses the results as a percentage.

Median results for GIR, Deterrents, Motivators, Interventions:

GIR: 2.5

Deterrents		Motivators		Interventions	
Career structure	3	Professional support	2	Mentoring schemes	2
Male dominance	3	Social support	4	Flexible working hours	2.5
Lack of equal opportunities	4	Organisational culture	4	Financial support	4.5
Discrimination from other HCPs	3	Early exposure	2	Increased exposure	2.5

Work life balance	2	Income	6	Destigmatising non-full time working	3
		Career progression	3.5		

Table 15. Table showing the median results of participants for deterrents, motivators and interventions. For deterrents and interventions, each choice is given a result from 1=most influential and 5=least influential. For motivators, each choice is given a result from 1=most influential and 6=least influential.

Income was ranked the least influential factor in motivating them to choose this specialty. All participants considering Trauma and Orthopaedic surgery were "Unmarried/ Divorced/ Widowed".

Specialty choice: Paediatric

Total number: 6

Marital status:

Marital status	Number of participants	Percentage of total number of participants (%)
Unmarried	5	83%
Prefer not to say	1	17%
	6	

Table 16. Table showing the marital status of participants choosing this specialty. The second column shows the number of participants (n=6) and the final column expresses the results as a percentage.

Ethnicity:

Ethnicity	Number of participants	Percentage of total number of participants (%)
White	2	33%
Asian	3	50%
Prefer not to say	1	17%
	6	

Table 17. Table showing the ethnicity of participants choosing this specialty. The second column shows the number of participants (n=6) and the final column expresses the results as a percentage.

Median results for GIR, Deterrents, Motivators, Interventions:

GIR: 3

Deterrents		Motivators		Interventions	
Career structure	2	Professional support	2	Mentoring schemes	2.5
Male dominance	4	Social support	4	Flexible working hours	2
Lack of equal opportunities	4	Organisational culture	3.5	Financial support	4.5

Discrimination from other HCPs	4.5	Early exposure	2	Increased exposure	3.5
Work life balance	1	Income	6	Destigmatising non-full time working	3.5
		Career progression	3		

Table 18. Table showing the median results of participants for deterrents, motivators and interventions. For deterrents and interventions, each choice is given a result from 1=most influential and 5=least influential. For motivators, each choice is given a result from 1=most influential and 6=least influential.

Participants considering Paediatric surgery were in disagreement for all interventions, however work life balance was ranked as the most influential deterrent. Income was ranked the least influential factor in motivating them to choose this specialty.

Specialty choice: Otolaryngology (ENT)

Total number: 15

Marital status:

Marital status	Number of participants	Percentage of total number of participants (%)
Unmarried	13	87%
Married	2	13%
Total	15	

Table 19. Table showing the marital status of participants choosing this specialty. The second column shows the number of participants (n=15) and the final column expresses the results as a percentage.

Ethnicity:

Ethnicity	Number of participants	Percentage of total number of participants (%)
White	9	60%
Asian	3	20%
Arab	1	7%
Black	2	13%
Total	15	

Table 20. Table showing the ethnicity of participants choosing this specialty. The second column shows the number of participants (n=15) and the final column expresses the results as a percentage.

<u>Median results for GIR, Deterrents, Motivators, Interventions:</u>

GIR: 3

Deterrents	Motivators	Interventions

Career structure	2	Professional support	3	Mentoring schemes	2
Male dominance	3	Social support	4	Flexible working hours	2
Lack of equal opportunities	3	Organisational culture	4	Financial support	5
Discrimination from other HCPs	3	Early exposure	2	Increased exposure	4
Work life balance	2	Income	6	Destigmatising non-full time working	2
		Career progression	5		

Table 21. Table showing the median results of participants for deterrents, motivators and interventions. For deterrents and interventions, each choice is given a result from 1=most influential and 5=least influential. For motivators, each choice is given a result from 1=most influential and 6=least influential.

Participants considering Otolaryngology (ENT) surgery ranked financial support as their least influential intervention followed by increased exposure. Career progression was ranked as second least influential motivator. Income was ranked the least influential factor in motivating them to choose this specialty.

Specialty choice: Vascular

Total number: 4

Marital status:

Marital status	Number of participants	Percentage of total number of participants (%)
Unmarried	3	75%
Married	1	25%
Total	4	

Table 22. Table showing the marital status of participants choosing this specialty. The second column shows the number of participants (n=4) and the final column expresses the results as a percentage.

Ethnicity:

Ethnicity	Number of participants	Percentage of total number of participants (%)
White	3	75%
Asian	1	25%
Total	4	

Table 23. Table showing the ethnicity of participants choosing this specialty. The second column shows the number of participants (n=4) and the final column expresses the results as a percentage.

Median results for GIR, Deterrents, Motivators, Interventions:

GIR: 2

Deterrents		Motivators		Interventions	
Career structure	2.5	Professional support	2	Mentoring schemes	3
Male dominance	3.5	Social support	3	Flexible working hours	2
Lack of equal opportunities	3	Organisational culture	4.5	Financial support	4

Discrimination from other HCPs	4.5	Early exposure	1	Increased exposure	2
Work life balance	2	Income	6	Destigmatising non-full time working	3.5
		Career progression	4		

Table 24. Table showing the median results of participants for deterrents, motivators and interventions. For deterrents and interventions, each choice is given a result from 1=most influential and 5=least influential. For motivators, each choice is given a result from 1=most influential and 6=least influential.

Participants considering Vascular surgery ranked early exposure as the most influential factor in motivating them to choose this specialty. Income was ranked the least influential factor in motivating them to choose this specialty.

Specialty choice: General

Total number of participants: 42

Marital status:

Marital status	Number of participants	Percentage of total number of participants (%)
Unmarried	34	81%
Married	5	12%
Prefer not to say	3	7%
Total	42	

Table 25. Table showing the marital status of participants choosing this specialty. The second column shows the number of participants (n=42) and the final column expresses the results as a percentage.

Ethnicity:

Ethnicity	Number of participants	Percentage of total number of participants choosing specialty (%)
White	18	43
Asian	17	40
Arab	2	5
Black	3	7
Prefer not to say	2	5
Total	42	

Table 26. Table showing the ethnicity of participants choosing this specialty. The second column shows the number of participants (n=42) and the final column expresses the results as a percentage.

Median results for GIR, Deterrents, motivators, interventions:

GIR: 2

Deterrents		Motivators		Interventions	
Career structure	3	Professional support	2.5	Mentoring schemes	2
Male dominance	3	Social support	3	Flexible working hours	3
Lack of equal opportunities	3	Organisational culture	4	Financial support	5
Discrimination from other HCPs	4	Early exposure	2	Increased exposure	3
Work life balance	1.5	Income	6	Destigmatising non-full time working	3
		Career progression	4		

Table 27. Table showing the median results of participants for deterrents, motivators and interventions. For deterrents and interventions, each choice is given a result from 1=most influential and 5=least influential. For motivators, each choice is given a result from 1=most influential and 6=least influential.

Participants considering General surgery ranked income as the least influential factor in motivating them to choose this specialty. Financial support was ranked as the least influential intervention, with mixed responses for deterrents and motivators.

Specialty choice: Urology

Total number: 13

Marital status:

Marital status	Number of participants	Percentage of total number of participants (%)
Unmarried	8	62%
Married	5	38%
Total	13	

Table 28. Table showing the marital status of participants choosing this specialty. The second column shows the number of participants (n=13) and the final column expresses the results as a percentage.

Ethnicity:

Ethnicity	Number of participants	Percentage of total number of participants (%)
White	5	38%
Asian	7	54%
Arab	1	8%
Total	13	

Table 29. Table showing the ethnicity of participants choosing this specialty. The second column shows the number of participants (n=13) and the final column expresses the results as a percentage.

Median results for GIR, Deterrents, Motivators, Interventions:

GIR: 2

Deterrents		Motivators		Interventions	
Career structure	3	Professional support	2	Mentoring schemes	2
Male dominance	3	Social support	3	Flexible working hours	3

Lack of equal opportunities	3	Organisational culture	4	Financial support	4
Discrimination from other HCPs	3	Early exposure	2	Increased exposure	1
Work life balance	2	Income	6	Destigmatising non-full time working	3
		Career progression	5		

Table 30. Table showing the median results of participants for deterrents, motivators and interventions. For deterrents and interventions, each choice is given a result from 1=most influential and 5=least influential. For motivators, each choice is given a result from 1=most influential and 6=least influential.

Participants considering Urology surgery ranked income as the least influential factor in motivating them to choose this specialty. Career progression was ranked the second least influential motivator, followed by positive changes in organisational culture then social support system. They ranked increased exposure as the most influential intervention, followed secondly by mentoring schemes.

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Specialty choice: Plastic

Total number: 17

Marital status:

Marital status	Number of participants	Percentage of total number of participants (%)
Unmarried	13	76%
Married	4	24%
Total	17	

Table 31. Table showing the marital status of participants choosing this specialty. The second column shows the number of participants (n=17) and the final column expresses the results as a percentage.

Ethnicity:

Ethnicity	Number of participants	Percentage of total number of participants (%)
White	8	47%
Asian	7	41%
Arab	1	6%
Black	1	6%
Total	17	

Table 32. Table showing the ethnicity of participants choosing this specialty. The second column shows the number of participants (n=17) and the final column expresses the results as a percentage.

Median results for GIR, Deterrents, Motivators, Interventions:

GIR: 3

Deterrents	Motivators	Interventions

Career structure	3	Professional support	2	Mentoring schemes	2
Male dominance	4	Social support	4	Flexible working hours	2
Lack of equal opportunities	3	Organisational culture	4	Financial support	4
Discrimination from other HCPs	4	Early exposure	1	Increased exposure	3
Work life balance	1	Income	6	Destigmatising non-full time working	3
		Career progression	4		

Table 33. Table showing the median results of participants for deterrents, motivators and interventions. For deterrents and interventions, each choice is given a result from 1=most influential and 5=least influential. For motivators, each choice is given a result from 1=most influential and 6=least influential.

Participants considering Plastic surgery ranked early exposure as the most influential factor in motivating them to choose this specialty. Income was ranked the least influential factor in motivating them. Participants considering Plastic surgery chose work-life balance as their most influential deterrent and professional support as their second most influential motivator.

Specialty choice: Cardiothoracic

Total number: 5

Marital status:

Marital status	Number of participants	Percentage of total number of participants (%)
Unmarried	3	60%
Married	1	20%
Prefer not to say	1	20%
Total	5	

Table 34. Table showing the marital status of participants choosing this specialty. The second column shows the number of participants (n=5) and the final column expresses the results as a percentage.

Ethnicity:

Ethnicity	Number of participants	Percentage of total number of participants (%)
White	2	40%
Asian	1	20%
Arab	1	20%
Prefer not to say	1	20%
Total	5	

Table 35. Table showing the ethnicity of participants choosing this specialty. The second column shows the number of participants (n=5) and the final column expresses the results as a percentage.

Median results for GIR, Deterrents, Motivators, Interventions:

GIR: 2

Deterrents		Motivators		Interventions	
Career structure	2	Professional support	2	Mentoring schemes	1
Male dominance	4	Social support	3	Flexible working hours	3
Lack of equal opportunities	3	Organisational culture	4	Financial support	5
Discrimination from other HCPs	3	Early exposure	1	Increased exposure	2
Work life balance	4	Income	5	Destigmatising non-full time working	4
		Career progression	5		

Table 36. Table showing the median results of participants for deterrents, motivators and interventions. For deterrents and interventions, each choice is given a result from 1=most influential and 5=least influential. For motivators, each choice is given a result from 1=most influential and 6=least influential.

Participants considering Cardiothoracic surgery were in agreement for the interventions and motivators. They ranked the interventions in the following order, from most to least valuable: mentoring schemes, early exposure, flexible working hours, destigmatising non-full time working and financial support. Participants ranked motivators in the following order, from most to least influential: early exposure, professional support, social support system, positive changes in organisational culture, with income and career progression being equally ranked lowest.

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Specialty choice: None

Total number: 9

Marital status:

Marital status	Number of participants	Percentage of total number of participants (%)
Unmarried	7	78%
Married	2	22%
Total	9	

Table 37. Table showing the marital status of participants choosing this specialty. The second column shows the number of participants (n=9) and the final column expresses the results as a percentage.

Ethnicity:

Ethnicity	Number of participants	Percentage of total number of participants (%)
White	4	44%
Asian	4	44%
Mixed	1	11%
Total	9	

Table 38. Table showing the ethnicity of participants choosing this specialty. The second column shows the number of participants (n=9) and the final column expresses the results as a percentage.

Median results for GIR, Deterrents, Motivators, Interventions:

GIR: 2

Deterrents		Motivators		Interventions	
Career structure	3	Professional support	2	Mentoring schemes	3
Male dominance	4	Social support	3	Flexible working hours	2
Lack of equal opportunities	3	Organisational culture	4	Financial support	4

Discrimination from other HCPs	4	Early exposure	4	Increased exposure	4
Work life balance	2	Income	5	Destigmatising non-full time working	2
		Career progression	3		

Table 39. Table showing the median results of participants for deterrents, motivators and interventions. For deterrents and interventions, each choice is given a result from 1=most influential and 5=least influential. For motivators, each choice is given a result from 1=most influential and 6=least influential.

Participants who are unsure of which surgical specialty to pursue ("None") had a mixed response for the influence of deterrents, motivators and interventions.

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COREQ (COnsolidated criteria for REporting Qualitative research) Checklist

A checklist of items that should be included in reports of qualitative research. You must report the page number in your manuscript where you consider each of the items listed in this checklist. If you have not included this information, either revise your manuscript accordingly before submitting or note N/A.

Topic	Item No.	Guide Questions/Description	Reported on Page No.
Domain 1: Research team and reflexivity			
Personal characteristics			
Interviewer/facilitator	1	Which author/s conducted the interview or focus group?	
Credentials	2	What were the researcher's credentials? E.g. PhD, MD	
Occupation	3	What was their occupation at the time of the study?	
Gender	4	Was the researcher male or female?	
Experience and training	5	What experience or training did the researcher have?	
Relationship with participants			
Relationship established	6	Was a relationship established prior to study commencement?	
Participant knowledge of the interviewer	7	What did the participants know about the researcher? e.g. personal goals, reasons for doing the research	
Interviewer characteristics	8	What characteristics were reported about the inter viewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic	
Domain 2: Study design			
Theoretical framework			
Methodological orientation and Theory	9	What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	
Participant selection			
Sampling	10	How were participants selected? e.g. purposive, convenience, consecutive, snowball	
Method of approach	11	How were participants approached? e.g. face-to-face, telephone, mail, email	
Sample size	12	How many participants were in the study?	
Non-participation	13	How many people refused to participate or dropped out? Reasons?	
Setting			
Setting of data collection	14	Where was the data collected? e.g. home, clinic, workplace	
Presence of non-participants	15	Was anyone else present besides the participants and researchers?	
Description of sample	16	What are the important characteristics of the sample? e.g. demographic data, date	
Data collection			
Interview guide	17	Were questions, prompts, guides provided by the authors? Was it pilot tested?	
Repeat interviews	18	Were repeat inter views carried out? If yes, how many?	
Audio/visual recording	19	Did the research use audio or visual recording to collect the data?	
Field notes	20	Were field notes made during and/or after the inter view or focus group?	
Duration	21	What was the duration of the inter views or focus group?	
Data saturation	22	Was data saturation discussed?	
Transcripts returned	23	Were transcripts returned to participants for comment and/or	

Topic	Item No.	Guide Questions/Description	Reported on Page No.
		correction?	
Domain 3: analysis and findings			
Data analysis			
Number of data coders	24	How many data coders coded the data?	
Description of the coding tree	25	Did authors provide a description of the coding tree?	
Derivation of themes	26	Were themes identified in advance or derived from the data?	
Software	27	What software, if applicable, was used to manage the data?	
Participant checking	28	Did participants provide feedback on the findings?	
Reporting			
Quotations presented	29	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number	
Data and findings consistent	30	Was there consistency between the data presented and the findings?	
Clarity of major themes	31	Were major themes clearly presented in the findings?	
Clarity of minor themes	32	Is there a description of diverse cases or discussion of minor themes?	

Developed from: Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*. 2007. Volume 19, Number 6: pp. 349 – 357

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Motivators and deterrents for early career female doctors applying to surgical training programmes in the United Kingdom National Health Service – a mixed-methods study.

Motivators and deterrents for early career female doctors applying to surgical training programmes in the United Kingdom National Health Service – a mixed-methods study

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Abstract

Word Count: 303

Objectives
To perform a mixed-methods study identifying motivators and deterrents to female doctors interested in core surgical training (CST). To provide tangible implementations based on the findings.

Design:
This study used quantitative (questionnaires) and qualitative (semi-structured interviews (SSIs)) analysis. Participants completed online questionnaires on Qualtrics and SSIs were conducted remotely on Microsoft Teams. Questions were derived from previous studies and a novel term, the Gender Impact Rating (GIR), was coined to assess the impact of gender on opportunities available during CST application.

Setting:
Participants were working in the United Kingdom National Health Service and data collected from December 2020 to January 2021.

Participants:
A total of 100 female surgical trainees in the UK ranging from Foundation Year 2 to Core Training Year 2.

Main Outcome Measures:
Participants ranked factors by their influence on their CST application. Of the 100 trainees, 21 were randomly selected for an SSI, to explore their questionnaire responses. Statistical analyses were performed using Matlab and SPSS, alongside a thematic analysis of the interviews.

Results:
A total of 44 out of 100 questionnaire respondents ranked early exposure to surgery as the most influential motivator, whilst 43 (%) selected work-life balance as the greatest deterrent and 33 (%) suggested mentoring schemes to encourage women to apply to CST. The median GIR was 3 out of 5, indicating a moderate perceived impact of gender on opportunities available during CST application. Qualitative analysis found four overarching themes: institutional factors (including mentorship schemes), organisational culture (including active engagement), social factors, and personal factors.

Conclusion:
Thematic analysis suggested that seniors involving women in theatre and a supportive work environment would encourage entry of more female surgeons. Therefore, the proposed implementations are the active engagement of women in theatre and destigmatising less than

full-time training. Further research into ethnicity and personality on motivations to enter surgery is advised.

Strengths and Limitations

Strengths
- First mixed methods study covering motivators and deterrents in the NHS
- Most recent study looking at entry level surgical trainees
- First study to implement ranking system for factors
- Extensive reach across the UK
- Saturation was reached for thematic analysis

Limitations
- Limited generalisability of statistical analysis due to sample size
- 15 minute interviews may not be enough time to explore entire narrative
- Participants agreeing to be interviewed may have stronger opinions than those who don't, thus skewing results

Background

Currently in the United Kingdom, just over half of all medicine graduates identify as female.[1] However, this is not reflected in senior roles (e.g. consultant or professor), and neither is the disparity explained by the time lag between the increase in female graduates and their progression through surgical training.[2]

Previous studies have examined factors that affect the career choices of women considering surgical training.[2,3] Hirayama and Fernando[2] conducted a systematic literature review using studies from the UK, US, and Canada and identified 7 studies which cited the common organisational barriers as "career structure, male dominance, and lack of equal opportunities" in hindering career progression. They also identified role models and early exposure to surgery as important decision-making factors. Previous surveys of members of the Royal College of Surgeons (RCS) have found that surgery is perceived by a significant proportion of female trainees as an 'old boys' club leading to some respondents feeling out of place.[3]

Whilst previous research has focused on female medical students and surgeons completing their training, there are no studies examining the perceptions and attitudes of female trainees who are at a level of training immediately prior to the surgical application process. This a key cohort as it is the juncture at which the decision to pursue a career in surgery is pivotal, and studies that analyse the perceptions of females who are already in core surgical training (CST) using retrospective recall are subject to recall bias.[4]

Aims

To understand the motivators and deterrents for women entering surgical specialties, and provide tangible interventions to overcome these, using a combination of quantitative and qualitative analysis.

Methods

Setting, study design and participants

This study was motivated by the application of feminist theory to medicine,[5] which promotes that men and women are equal and so gender issues from a feminist perspective need to be addressed to encourage more women into surgery. The approach to qualitative research was guided by the grounded theory which was used to identify influential factors of applying to surgery and produce tangible implementations.[6] From previous studies and these theories, it was sought to perform a convergent parallel mixed-methods study in the UK, encompassing a national approach.

Data was collected during December 2020 to January 2021. Social media adverts promoted the online questionnaire and snowball sampling enabled a wide reach across the UK. Participants were encouraged to share the social media adverts with their friends and colleagues but participants were not known to the investigators.

Questionnaire

Our questionnaire was based on a combination of previous studies, which were further refined following a pilot interview.[2] Questions were tailored to suit females who are applying or just completed application to CST. A self-administered, online programme was developed using Qualtrics.[7] The introduction page had information about the rationale of the study and how the answers would be used. Participants would need to click "consent" before being allowed to continue. The participants were asked to rank the influence of popular identified motivators and deterrents. A Likert scale assessed the impact of gender on opportunities available during

surgical training application. This novel concept was termed the Gender Impact Rating (GIR) on a scale of 0 to 5, whereby 0=no impact and 5=major impact. A copy of the questionnaire can be found in Appendix A.

Semi-structured interviews

The methodology of this study was concurrent with the Consolidated Criteria for Reporting Qualitative Research Checklist.[8] The TACT (Trustworthiness, Auditability, Credibility and Transferability) Framework was used to ensure a rigorous approach.[9]

The interviews were recorded, limited to 15 minutes per participant and were held via Microsoft Teams[10] due to the COVID-19 pandemic restrictions. These questions (Appendix A) allowed participants to elaborate on and contextualise their answers from the questionnaire. Pilot interviews were carried out to test the quality of data extracted.

All interviews were audio recorded, transcribed, and anonymised. The resulting transcripts were then analysed using the Braun & Clarke method of qualitative analysis. No interviews were repeated and interviews were not given back to participants for feedback. Important features from the dataset of transcripts were identified and coded. Themes were then inductively and semantically determined from the collated codes. These themes were validated against the dataset and the themes that reflected the data were retained, which were further analysed and more fully described. This thematic and analytic narrative was then interwoven with the quantitative data derived from the questionnaire. 20 interviews were sufficient as data saturation was reached and we gained no new information after 15 interviews.

Inclusion and exclusion criteria

The inclusion criteria were as follows: female, doctor employed by the NHS, foundation doctor year 2 (FY2) or core trainee years 1 (CT1) and 2 (CT2). Non-surgical trainees and trainees identifying as male or non-female were excluded.

Data Analysis

Questionnaire data was collated from the online hosting solution and imported into IBM SPSS Version 27.[11] As the data consisted primarily of Likert scales and rankings, non-parametric tests were used in the analysis, which included independent sample median tests. As individuals could select multiple surgical specialities, it was not possible to assess the impact of the subspeciality itself on the dependent factors. Some individuals chose more than one surgical speciality, and therefore existed within multiple groups simultaneously, making a chi-squared test invalid.

Reflexive Statement

The researchers acknowledge their biases and influence on the outcomes of this study. The research team consisted of 4 female and 2 male medical students, and a male consultant surgeon as the supervisor. The diverse backgrounds and experiences have led to personal aims and impetuses that influence the research process. To minimise this bias, multiple interviewers carried out the interviews so that the perception of the qualitative data was done with many different perspectives to increase the validity.

Results

Quantitative analysis – Overall*

A total of 100 participants were questioned of which 35 (%) were FY2, 36 (%) were CT1, and 29 (%) were CT2. The respondents spanned all 24 of the geographically distributed UK deaneries. The median age was 27 (range: 23-40); 55% identified as Black, Asian, and Minority Ethnic (BAME), 46% White/British/Other; 19% were married and 4% had dependents. The typical respondent was between 26 and 29 years of age, identified as White/British/Other, was unmarried with no dependents and completing CT1 at a deanery outside of London.

Gender Impact Rating (GIR)

Differences in median GIR were noted across training stages and ethnic groups. CT2s had a median GIR of 2, whereas CT1 and FY2s had a higher GIR of 3 (figure 1A). GIR of White/British/Other respondents was skewed towards lower values with the median rating of 2 which was lower than both the BAME and global median of 3 (figure 1B). Both results were not statistically significant ($\alpha = 0.05$)**, see appendix B tables 1.2 & 2.2.

Motivators, Deterrents, and Interventions

Of the factors that participants regarded as influential to their application to CST programmes, "early exposure to surgical specialties" and "professional support" were the highest median ranked motivators (Mdn=4, figure 2A). "Work-Life Balance" was the deterrent with highest median ranking (Mdn=3, figure 2B) and "mentoring schemes" (Mdn=3, figure 2C) had the highest median ranking as the most valuable intervention to CST application suggested by our applicants.

The highest-ranked motivator in "Married/Civil Partnership" participants was "Professional Support in Specialties", whereas "Early Exposure to Surgical Specialties" was the highest-ranked motivator in "Unmarried/Divorced/Widowed" participants. **

*More information in appendix B.
**More information in appendix C.

Qualitative analysis

Meta themes that arose were of deterrents, motivators, and implementations. Each of these sections could be further categorised into the following 4 themes:

1. Institutional factors which included aspects of the RCS.
2. Organisational culture, including the hospital environment.
3. Social factors which included friends/family.
4. Personal factors which were individualistic.

The main deterrents mentioned in the interviews were career progression, discouragement and discrimination by other staff, difficulties with family planning and finance.

Positive motivational factors included exposure to surgery throughout medical school, conferences, mentors, positive changes to attitudes towards female surgeons and the varied, technical aspect of surgery.

The implementations participants viewed as most valuable were increasing exposure to surgical specialties. Furthermore, improving the work environment by raising awareness of existing stigmas, social and professional support from mentors and allocating time for self-improvement. Run-through programmes were highly praised and encouraged to be more prevalent. These programmes allowed trainees to stay under the same deanery after a single competitive selection process.[12] Currently, there are only 3 specialties not offering a run-through programme; paediatrics, plastics and academic.[12]

Deterrents		
Institutional Factors		Quote
Career Pathway	Taking years out of training	"Experience out of surgical training seen as negative in surgery, like if you've had to take more than a year's experience outside the foundation programme. Whereas, for example, in anaesthetics, that's favoured so you get points for that"
	Pay Gap	"Surgical specialties have the biggest pay gap"
	Expenses	"Expenses caused an issue as it is "certainly very expensive doing surgical training and paying for the courses""
Work-Life Balance	Flexible working hours	"Financial support and flexible working hours is not a thing" "I think it's the way our training works, and you know it's not all that flexible and I find out a bit frustrating"

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	Balancing responsibilities with dependents	"Enough time, effort and family support to look after [children] or arrange childcare"
Application Process	Too many requirements	"I didn't have a full quality improvement project but had 5 published papers. But when I applied, that actually disadvantaged me, because I haven't jumped through some of the heaps that I needed to"
	Lack of support from the deanery	"Deanery didn't do anything to support my application process"
Organisational Culture		Quote
Discouragement	Discouragement from non-surgical specialties	"A lot of the discouragement comes from people who don't do surgery"
	Discouragement from family	"My whole family basically said don't do medicine and then they said don't do surgery"
	Stigma surrounding family life and women	"You're doing surgery that's the end of you having any children"
Discrimination	Male validation	"They validate them more than you even though they're more junior than you"
	Proving yourself	"You've got to spend a lot more time proving yourself and the bar will be set different"
	Sexism	"Male colleagues making sort of sexist remarks"
	Prejudice	"I do think slightly that women when they are at early stages of their surgical career, people still don't fully assume you that you want to become a surgeon"
Surgical Type	Stereotypes of female surgeons	"Someone who's very… I would say… maybe male, maybe white middle class, maybe you know when you think about a surgeon… someone quite cold"
	Stereotype of surgeons	"Everyone thinks surgeons are going to be quite mean"
Work Environment	Lack of equal opportunities	"People who are the loudest and the mouthiest will only get the opportunity and no one else" "Subtle undertone sometimes of men being given opportunities"
	Male dominance	"there will not only be more of them, but they will also have those positions of essentially running the other parts of the Department and having a greater say"
	Resentment over less than full-time workers	As soon as someone on the rota goes part-time, it makes life harder for everyone else… [so] I think instead of resenting the system... you end up resenting the person who's part time"
	Sexual harassment by consultants	"And the consultant who had scrubbed in turned round to me and said 'well, only if you give me a kiss' and stuck his cheek out. So I think that's probably the worst example I've had. Stuff like that is really common that women have experienced particularly in surgery"
Social Factors		Quote

	Having children means that training takes longer	"I do know people who do have children and they've done less than full time training, but it does take a really long time"
Dependents	Wanting to have children is a deterrent	"If I did have children, I'd- I wouldn't go down the surgical route"
	Geographical limitations due to dependants	"If I had dependents that were committed to a specific geographical location, for whatever reason, because that's where our support network is and so on that is then another"
Family Life	Impact of training on future relationships	"This path would have some kind of impact on... future personal relationships, marriage relationships, and relationships that weren't even formed"
	Wanting a family life is a deterrent	"I'm not married and I'm single, but it's something that is constantly there at the back of my mind"
	Compromise is necessary	"Quite a lot of sacrifices to keep their family together"
Personal Factors		Quote
Exposure	Negative experiences in foundation training can be a deterrent	"What you were exposed to as an F1 and F2 probably does really influence your decision-making process or bias"
	Lack of early exposure to surgery	"Surgery gets shoved under in the curriculum and you don't get much exposure to it as a student"
Finance	Financial burden of extra courses needed for applications	"To pay for all of the exams and courses that you're expected to go on...if you want to have a kind of competitive CV for getting into higher specialty training"
	Financial problems	"I think if I had all of those at the back of my mind, then I may consider taking a year or something"
Resilience	Necessity to handle negative comments	"Develop a thick skin after a while"
	Wanting to pursue extra hobbies but afraid of stigma	"Don't want to be seen as being lazy or not interested… [but I] want to do a lot of singing and basically piano…and all of those things have largely slipped away"
	Personality affects the number of perceived barriers	"Probably difference between like perceived barriers there and actual barriers"

Table 1: A table summarising the deterrents for women against applying for core surgical training.

Motivators	
Institutional Factors	Quote
Informative Events	Going to conferences and courses for advice and application process	"I just got lots of verbal advice from lots of registrars. Went to conferences, went to preparation courses and that sort of got me into it"
	Going to conferences and courses for increased motivation	"Just being in those conferences, which is very inspirational talks, so I think that was one of my motivation factors as well"

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Career Progression		"One of the better fields to work in with regards to career progression"
		"But like practically I thought "okay some specialties are better suited to private work"
Work-Life	The variety of work in surgery	"Nice balance between, yes you've got lots of surgery but you do also still use some medical skills"
	No difference in workload when compared to medicine	"The same whether you do medicine or surgery"
	Less than full time training is available in surgery	"You know less than full-time work is there and is available and you see lots of people make it work"
Organisational Culture		Quote
Cultural Shift	Reduce stigma about less than full-time training	"Reduction in stigma about less than full-time training"
	Encourage diversity, both ethnic and females	"I think just generally within surgery there has been a move to encourage diversity, and I kind of saw that more when I started working within surgical specialties"
Female Presence	Increased female presence	"There were actually a lot of female registrars where I was and that really motivated me to apply"
	Inspirational female team members	"She knows her stuff, she's confident, she's funny, she's sociable, she's nice, she's the kind of person that you'd happily, sort of, sit down and have a chat with and just completely respect clinically and I think it was that kind of eye-opening moment; oh actually, you know, you don't have to be a certain way to be a woman surgery you just have to be a woman who wants to do surgery"
Active Engagement	Having consultants who motivate and engage trainees	"I had great, great consultants who were really motivating and really enthusiastic about their field, so absolutely"
	Having a good team that actively got participants involved	"Encouraging CTs and they yeah they were very encouraging and I was in a small District Hospital so they were constantly teaching us and they allowed us to do things to help operate so I think that's what inspired me to do it"
Social Factors		Quote
Mentor	Mentors had an influence	"They have definitely had a massive impact in my choices"
	Impact of female presence throughout the training process, especially at senior levels	"I think it is incredibly, incredibly just reaffirming and heart-warming to see other women at a consultancy level, registrar level or even just a year or two ahead of me"
Social Support	Having a good team environment	"I really like when you're in a good team and with really supportive, you know, seniors like it's kind of an amazing

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		experience"
	Support from family	"my family and husband always said just that go for it whatever you want to do, do that, you may as well"
Personal Factors		Quote
Exposure	Positive early exposure in foundation years	"I did not have the early exposure that I had during a really good surgical rotation I don't think I'd be even remotely interested as much as I am now"
	Being actively involved by a team in medical school	"Being taken on by that team quite early on and having that early operative exposure is quite important"
	Positive exposure in foundation training	"To balance that out, like I was, I enjoyed the specialty, and I was really interested in in the specialty then I decided to choose it"
Intrinsic Motivation	Early goal and motivation to do surgery	"I wanted to do surgery before I went to medical school so that was always the plan"
	Proving stereotypes wrong about women in surgery	"Proving yourself and the bar will be set different. But sometimes I actually use that as more of a motivation than deterrent"
Nature of Surgery	Personal interest in physiology	"I understand the range of pathology easily, mechanisms of disease comes naturally to me, I enjoy this abdominal anatomy"
	Technical aspects and variety offered by surgery	"Think just the surgical specialties themselves being quite straightforward. And I think there's the technical aspects I think which is another motivator. You really get to use your hands and you don't get very often in medical specialties"

Table 2: A table summarising the motivators for women against applying for core surgical training.

Implementations		
Institutional Factors		Quote
Early Exposure	Increased hands-on exposure in undergraduate level	"Increased exposure to surgical specialities, I think it's got to be fairly hands-on exposure"
	Increased hands-on exposure in foundation level	"Think that's probably why there's a reasonable number of people who pull out of training during- because you just don't really ever get a true idea of what life as a surgical trainee is going to be like. But then I would think that increased exposure, because that's what I would enjoy"
Representation	Increased female representation	"There needs to be more gender representation. There needs to be more diversity"
	Having more females in positions of leadership	"I think more female leadership, more so. ****, she's the head of the GMC at the moment. She is a female surgeon which is great and I think that's important as well"
Support	Offering maternal support to women	"Identifying the need for it and then addressing the actual day to day practical factors, like less than full-time work and work

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		challenges you might have. Like mothers for financial support, support with coming back to work and flexible training and working hours"
	Having a standardised checklist of application requirements in one accessible place	"Because it changes every year, it's changed for us this year compared to last year and there's a lot of new things but just having that and then the option to sit down with someone to go through your portfolio if you can, that's probably the main thing"
	Application support from senior medical professionals (professional support)	"Consultants taking an interest in you, and saying that they'll look through your portfolio and give you interview practise"
Training process	Availability of run-through programmes	"Run-through training programmes are great for that. So, my friend is married and has two kids and she's run-through training ENT"
	Alternative pathways to training	"It would be much easier to sort of carve your own training without going through a training programme and I think for me that would be- yeah that's a useful change"
	Workshops to educate applicants	"I think it would be useful to have some like workshops and understand the patient process and what's required of you and what they are looking for and expecting"
Organisational Culture		Quote
Cultural Shift	Help with conversations about comments in the workplace	"Frank conversation with them when I said as much as I appreciate where you're trying to see my best interest. I personally don't have those challenges, and if it comes to that point where, um, you know, say I do have children and I do. I need time off, the Deanery does support that and there are some kickass women with three children working less than full time and doing their thing and they've managed it"
	Surgical teams need to accommodate females	"Just making the culture more accepting of having more female trainees"
	Reduce prejudices against women	"Is possible and people just being generally supportive of 'oh you want to be surgeon, great' rather than 'oh you want to be a surgeon but you're a woman'"
Destigmatisation	Active engagement in undergraduate level	"I think just the engagement is really important, just show that you actually care and you know that this student exists somewhere in the theatres. You know like, just go "can you help me hold it" - like get them involved"
	Breaking stigma of the surgical type of woman	"Maybe reducing I would say but it's kind of again the notion, thing that women in surgery are real hard and cold and you know not very nice which is completely untrue"
	Normalising less than full-time training in the workplace	"I still I find that quite daunting concept and I I know that's quite far away for me at the moment, but trying to get that understanding in the Department without being feeling like you are doing less because you are not there as much as some others, and to normalize that behaviour"
	Destigmatising less than full-time training and its impact on life	"And just this kind of it will take away so much of the pressure to be a perfect surgical trainee or a perfect partner or a perfect parent. I think it will actually mean that you have a

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	out of medicine	longer term."
Social Factors		Quote
Mentorship Schemes	Mentoring schemes should start in medical school	"There's tonnes of buddy schemes out there at the moment, but I think maybe starting this from undergraduate level would be nice"
	Female role models established early	"Setting role models early and making female medical students think that they can do it, and know that it's a possibility at that stage"
	A mentor should be close in training position to help with applications	"So you might want to know like someone directly above you, like a year or two, that can get you through the applications. I think that will really make a difference"
Networking Opportunities	Spaces to get involved with research projects	"Setting up networking meetings at hospitals and stuff where people could give projects, show what projects have got on offer and if they need any help and things"
	Joint groups with peers to practice interviews	"I think having a local group will be useful, where you can do face-to-face practise. I think that that's a huge goal within the interview checklist itself"
Personal Factors		Quote
Self-Development	Time should be scheduled in the rota to be able to increase theatre time and grow professionally	"My job as an F1/F2 has been purely service provision and I really do feel, apart from if I came in on day-offs, I had no opportunity to go to theatre or go to clinic or do anything that like a specialty trainee might do. I do think that into the rota, it should have been scheduled for you to sometimes go to the theatre"
	Time for self-development and career development	"F1 is really critical, because by the time you get to F2 and your first placement like literally the end of your first placement. I think having some of those afternoons, or even like a couple of hours, where you can just go and assist in a case or you can go to clinics, is so important for people's choices. And those career conversations that go on very early on are really important, so I think if you were going to target anything to make a successful intervention, I'd really try and push up the F1 stage"

Table 3: A table summarising the proposed implementations for women applying for core surgical training.

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Discussion

Our mixed-methods study utilised a questionnaire and semi-structured interviews (SSIs) to determine deterrents and motivators considered by female trainees early in their career when applying for a surgical training programme. This study confirmed that the most influential motivator was "early exposure to surgical specialties" (Table 2), whilst the greatest deterrent was "work-life balance". Income was ranked as the least influential motivator. The establishment of mentoring schemes was suggested as the most valuable implementation to the surgical training application process (Table 3). Furthermore, median GIR of the cohort was 3 (some impact) out of 5 (major impact), confirming that there continue to be significant barriers that discourage females from applying for a career in surgery.

Motivators, Deterrents, and Interventions

The findings of this study concur with those of Singh et al.[13] which showed early exposure to surgical specialties and professional support were the most influential motivators. However, Walker et al.[14] contradicts these results having found, in a cohort of male and female surgeons, that role models and well-structured career progression were more important driving factors than early exposure. Walker et al.[14] further contradicts our study finding that 90% of their participants believed there was sufficient time for training during working hours. The women interviewed in our study believed that more time is needed to be allocated for self-development and training activities. Further analysis of our qualitative data suggests that this difference may be due the perceived greater involvement of male doctors in surgery by consultants leading to less training opportunities being available to females.

The results showed that work-life balance was ranked the most influential deterrent which corroborates with a questionnaire conducted by the RCS.[3] Qualitative analyses suggest that this is due to the lack of flexible working hours as well as stigma around less than full-time training (LTFT).

The most valuable intervention found in the quantitative analysis was the establishment and availability of mentoring schemes. In 2017, Faucett et al.[15] emphasised that same-sex role models were essential to promote the entry of women into surgical specialties, as well as motivating them to take higher academic roles in the field. This study also highlighted a statistically significant

difference in exposure to role models between the genders, which further emphasises the importance of providing these, particularly from an undergraduate level.[15]

Income as a motivator was ranked lowest in most specialties, which is supported by existing literature.[14,16] Financial support was also often a low priority implementation in our cohort. However, participants who ranked it higher, often mentioned that training courses and entry examinations were "very expensive". Financial support could potentially be a more important factor for women than expected, due to the gender pay gap as mentioned in interviews. Stephens et al.[17] suggested that women in surgical subspecialties have the largest difference in mean income compared to their male counterparts than other specialties, which alongside the increased cost of surgical career pathways, makes entrance and progression through CST more difficult.

GIR

The median GIR of participants varied by specialty, similar to Dixon et al. who identified variation in the disadvantages faced by women in the entry to different specialties.[18] In our study, Neurosurgery had the highest GIR, drawing parallels to a previous study that found >70% of female medical students expected inequality in a male-dominated profession like neurosurgery (Appendix D).[18,19] However, female neurosurgeons in our study ranked male dominance the second least influential deterring factor to application. Qualitative analysis suggests women are already aware of the male dominance hence it does not deter them from entering the speciality.

Our quantitative data highlighted differences in the application experience of CT2s compared with CT1s and FY2s, having completed their application only 2 years earlier. The median GIR for CT2s ($Mdn_{CT2}=2$) was lower than that of both FY2s ($Mdn_{FY2}=3$) and CT1s ($Mdn_{CT1}=3$). This reduction in GIR among CT2s may be because of their place in the team hierarchies. The qualitative analysis showed that treatment was dependent on one's position in the workplace hierarchy as well as seniors noticing a reduction in the need to "prove themselves". A possible explanation for why they believe their gender has less of an impact, is the recall bias CT2s experience when recollecting the application process given their current seniority, a phenomenon that is well explored in literature.[4,20]

The median GIR for BAME individuals ($Mdn_{BAME}=3$) was higher than that of individuals who identified as White/British/other ($Mdn_{White/British/other}=2$). Notably, the GIR of the white identifying

group was negatively skewed towards lower values. The difference in GIR between these groups could be explained by the intersection of one's gender and ethnicity. BAME participants in the interviews described cultural norms and expectations they had to overcome to pursue surgery. Cultural norms and attitudes to females in surgical specialities vary between ethnocultural groups and geographical regions.[21] A scoping review on the topic identified that countries with extended family support systems allowed female surgeons to have children during training.[21] These cultural norms allowed better support for female surgeons.[21] Whereas studies in Pakistan and Zimbabwe have shown that cultural norms and expectations may also act as deterrents for female surgeons, such as the belief that surgery is not compatible with the expected role of women as the primary caregiver of children.[22,23]

<u>Marital Status and Dependents</u>

Majority of the cohort was unmarried and expressed concern over the compatibility of surgery with a fulfilling family life. Quantitative analysis showed a significant number of married participants ranking "Professional support within the specialties" as their most influential motivator. Difficulties in parental leave and LTFT were quoted by participants, which could explain this trend. Previous studies showed that females of child-bearing age stated organisational/financial worries when planning, and upon return from maternity leave.[16] Therefore, doctors considering having children may value professional support to overcome this barrier.

In contrast, the deterrents emphasised by interviewees were around sustaining long-term relationships and choosing an appropriate child-bearing time. The current selection process of CST does not consider the location and marital status of applicants resulting in many relocating multiple times during their career.[24] This creates uncertainty towards settling down and building a family home, which could explain the popularity and preference in the interviewees towards run-through CST programmes.

<u>Flexible Working Hours</u>

Flexible working was ranked highest amongst CT2s and FY2s. However, destigmatising LTFT was ranked equally for all levels of training. This suggests that flexible working hours are needed to meet the requirements for progression onto surgical training programmes. This was reflected in the qualitative study where participants described the need to find time to complete "check box" tasks (e.g., basic surgical skills courses, trauma courses) to be eligible to apply for surgical training, especially during FY1. A 2019 study by Walker et al.[14] also supports our study's finding as pre-CST individuals are more likely to suggest flexible working/LTFT as an intervention than those currently in a CST programme.

Discrimination

Interviewees reported experiencing discrimination at work, especially from other healthcare professionals. Participants also mentioned unwanted comments, showing sexual harassment is still an issue. A questionnaire by Freedman-Weiss et al.[25] found only 7% of incidents being reported by surgical trainees, especially if perpetrated by a senior clinician who may impact an individual's progression. Literature also showed that women were held to higher standards when applying to surgical specialities.[26] Moreover, our participants described a stereotypical view of senior female consultants; cold, detached and unapproachable by other staff. Previous literature established this phenomenon as a female "surgical type", without providing a successful intervention.[27] Our participants said this motivated them to pursue surgery to dispel these perceptions and encourage other women to pursue the field.

Implementations

The implementations suggested by the questionnaires were varied, yet they are not specific enough to address the issues discussed by the interviewees. However we propose a few ideas as suggested by the interviewees.

- A centralised, easily accessible portfolio checklist to guide trainees in their application process
  - o Qualitative results highlighted interviewee's frustration in the application process due to difficulties in finding easily accessible information
- Bulletins for up-to-date information when applying
  - o Especially given the current uncertainty after the COVID-19 pandemic, interviewees stated the importance of wanting up to date information
- Networking events led by female consultant surgeons, inspiring young applicants

- o Literature states the importance of role models, which echoed the sentiments of the interviewees. These events would also serve as networking opportunities to enable trainees to build contacts and get involved in projects
- Workshops to encourage open dialogue about destigmatising less than full-time training and how to handle negative comments in the workplace
  - o Participants expressed that there is a stigma surrounding less than full time training and a culture of discrimination of women in surgery
- Undergraduate same-sex mentorship schemes with mentors gaining points to enhance CV
  - o The benefits of mentoring schemes for the mentees are discussed extensively. This combined with a point system to incentivise mentors would lead to a mutually beneficial scheme
- Groups to practice surgical application interviews, led by a senior surgical trainee
  - o Interviewees mentioned having informal practice groups which they found helpful during applying
- Allocated time during working hours for professional development including being on a rota for theatre
  - o Existing literature and our study found that trainees need extra time to develop skills and gain experience to build their portfolios which is not currently adequate

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Strength and Limitations

This is one of the most recent studies discussing the deterrents and motivators for women entering surgery, making the implementations relevant to current CST applicants. Other strengths include the extensive reach of the questionnaire and interviews across the UK. Furthermore, the use of mixed methods of both quantitative and qualitative data aided in verifying themes observed in the interviews. Additionally, a ranking system for factors was used, which has not been done in previous literature. In line with the TACT Framework, the study shows transferability as the demographics of participants were recorded. Consequently, the findings from this study can be generalised to the wider population dependent on certain demographics.

However, this study also faces some limitations. The small sample size for quantitative analysis means that the conclusions may not be generalised. However, for qualitative analysis, data saturation was reached as after 15 interviews, no new themes were recorded. The use of snowball sampling can cause selection bias. Additionally, 15-minute interviews were performed, which may not allow sufficient time for participants to explore the whole narrative. Another limitation of this study is that it only explored the perspective of women pursuing surgery, hence those who decided against applying due to their gender were unaccounted for. Furthermore, the questionnaire format of ranking existing factors may cloud and bias their judgment when asked to explore other factors and themes. This may have caused difficulty to bring out any new themes from the women. Similar to any study involving interviews, participants who agree to be interviewed often have stronger opinions than those who refuse,[28] which may explain the lack of significance in quantitative results despite recurrent themes in the qualitative interviews.

Future Scope

Further studies should explore motivators and deterrents that arise in various surgical specialties as studies show disparities across the CST programmes. A larger cohort for the study would also allow the exploration of the impact of ethnicity and gender together, as well as the importance of ethnic representation and its contribution to GIR. It would also be helpful to recruit international cohorts to investigate the continuing paucity in female surgical trainees seen globally,[21] and compare geographical differences, as well as those between different healthcare systems (e.g., state-funded versus private).[26] Additionally, future research should explore personality traits

commonly shared by female surgeons, which drive their intrinsic motivation against deterrents during their career as exhibited by the interviewees.

Conclusion

This mixed-methods study aimed to identify the deterrents and motivators to women entering surgery, followed by suggesting implementations for healthcare organisations. In concordance with existing literature, this study found work-life balance and early exposure to surgical specialties the most influential factors and suggested mentoring schemes and normalising LTFT as the most suitable interventions for women in surgery. Although there is much change afoot to encourage female surgeons in the NHS, acceptance of diversity and flexibility would be a key factor in this.

Author Contributions
KR, RB, RT and SC are co-first authors and have contributed substantially to the conduct of this study and the writing of the manuscript.
All researchers were responsible for data collection.
KR, RB and AR have prior experience with qualitative studies and were responsible for transcribing, coding, data analysis and interpretation.
RT, SC and RM contributed to the statistical analysis and interpretation.
CG was responsible for overseeing the study design, process and writing of the manuscript.

Authors Information
KR, RB, SC and RT are female 5th year medical students, RM and AR are male 5th year medical students.

CG (PhD, FRCS(Tr&Orth), MA, BMBCh (Oxon)) is a male consultant Trauma & Orthopaedics surgeon at Imperial College NHS Trust.

Figure Legends

Figure 1: Boxplot showing the range of participant Gender Impact Rating (GIR) at Foundation Year 2 (FY2), Core Trainee 1 (CT1) and Core Trainee 2 (CT2) of training (1A), and GIR in White/British/Other and Black, Asian and Minority Ethnic (BAME) (1B).

Figure 2: Radar graphs showing the median ranking of motivators (A), deterrents (B), and suggested implementations (C) for core surgical training programme applications. Points further away from the centre (0) indicate a greater influence of the factor, whilst those closer to the centre indicate a lower influence.

Declaration

Competing Interests
There are no competing interests for any author

Ethics Approval and Consent to Participate
This study was granted Ethical Approval by Imperial College Research Governance and Integrity Team (RGIT). Informed consent was obtained from all participants. Reference number: 20IC6452

Data Sharing
No data are available

Patient and Public Involvement
No patient involved.

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Figure 1

Figure 2

A

Median Ranking of Motivators for Surgical Training Application

Radar chart with axes: Professional support in the specialties, Social support system, Positive changes to the organisational culture, Early exposure to surgical specialties, Income, Career progression is well defined. Scale 0 to 5.

B

Median Ranking of Deterrents for Surgical Training Application

Radar chart with axes: Career Structure, Male Dominance, Lack of Equal Opportunities, Discrimination from other HCPs, Work Life Balance. Scale 0 to 5.

C

Median Ranking of Potentially Valuable Intervention for Surgical Training Application

Radar chart with axes: Mentoring schemes, Flexible working hours, Financial support, Increased exposure to surgical specialities in undergraduate studies, Destigmatising non-full time training. Scale 0 to 5.

Qualtrics Questionnaire

By clicking I agree you confirm that you have read and understood the participant information sheet (linked below). You also agree to the use of your questionnaire response in our study as outlined in the participant information sheet. If you have any further questions about how we will use your data please contact the study organisers before agreeing and completing this questionnaire. By clicking agree you also confirm that you understand your participation is voluntary and that you are able to withdraw at any point without needing to give a reason. You also understand that your response will be anonymous and no identifiable information will be submitted unless you consent later in the questionnaire. You are also consenting to your data being used to support future research which may be outside the EEA.

To view the full participant information sheet click here

 If you understand these terms and wish to participate in the study please select I agree.

○ I agree (1)

End of Block: Consent

Start of Block: Demographics

Q1 What is your gender?

○ Male (1)

○ Female (2)

Skip To: End of Survey If What is your gender? = Male

Q2 How old are you?

_____

Q3 What level of training are you currently at?

○ F2 (1)

○ CT1 (2)

○ CT2 (3)

Q4 Did you take any years out of your medical training, and if so, how many?

○ Yes (1) _____

○ No (2)

Q5 Which surgical specialties did you cover in your foundation year training?

☐   Cardiothoracic (4)

☐   General (5)

☐   Neurosurgery (6)

☐   Oral and Maxillofacial (7)

☐   Otolaryngology (ENT) (8)

☐   Paediatric (9)

☐   Plastic (10)

☐   Trauma and Orthopaedic (11)

☐   Urology (12)

☐   Vascular (13)

☐   Academic (14)

☐   None (15)

Q6 Which surgical speciality would you like to specialise in, if any?

☐   Cardiothoracic (4)

☐   General (5)

☐   Neurosurgery (6)

☐   Oral and Maxillofacial (7)

☐   Otolaryngology (ENT) (8)

☐   Paediatric (9)

☐   Plastic (10)

☐   Trauma and Orthopaedic (11)

☐   Urology (12)

☐   Vascular (13)

☐   Academic (14)

☐   None (15)

End of Block: Demographics

Start of Block: Deanery/Foundation School

Display This Question:

   If What level of training are you currently at? = CT1

   Or What level of training are you currently at? = CT2

Q7 Which is your current deanery?

▼ East Midlands (4) ... Other (40)

Display This Question:

   If Which is your current deanery? = Other

Q8 Please specify which deanery.

_____

Q7 Which is your current foundation school?

▼ East Anglia (1) ... Other (17)

Q8 Please specify which foundation school.

_____

End of Block: Deanery/Foundation School

Start of Block: Demographics

Q9 What is your marital status

◯ Married/ Civil Partnership (1)

◯ Unmarried/ Divorced/ Widowed (2)

◯ Other (please specify) (3) _____

◯ Prefer not to say (4)

Q10 Do you have any dependents?

◯ Yes (1)

◯ No (2)

◯ Prefer not to say (3)

Q11 Please select the ethnicity that you feel best describes you.

◯ White British/Irish/Other (1)

◯ Asian/Asian British (Indian, Pakistani, Bangladeshi, Chinese and other) (10)

◯ Black/African/Caribbean/Black British (2)

◯ Mixed and Multiple Ethnic Groups (3)

◯ Arab/Middle Eastern (4)

◯ Other (please specify) (6) _____

◯ Prefer not to say (7)

End of Block: Demographics

Start of Block: Impact of Gender

Q12 What impact, if any, do you feel your gender has had on the opportunities available to you whilst applying to your surgical training? ⸬
Can you rate it from a scale of 0-5. (0 = no impact, 3 = some impact, 5 = major impact)

	0	1	2	3	4	5

Level of impact ()	

End of Block: Impact of Gender

Start of Block: Barriers

Q13 Rank the following deterrents based on the level of influence they've had on your application to surgical training programmes. Please order the following from most influential (1) to least influential (5).

_____ Career Structure (1)
_____ Male Dominance (2)
_____ Lack of Equal Opportunities (3)
_____ Discrimination from other HCPs (4)
_____ Work Life Balance (5)

End of Block: Barriers

Start of Block: Motivators

Q14 Rank the following motivators based on the level of influence they've had on your application to surgical training programmes. Please order the following from most influential (1) to least influential (6).
_____ Professional support in the specialties (1)
_____ Social support system (2)
_____ Positive changes to the organisational culture (3)
_____ Early exposure to surgical specialties (4)
_____ Income (5)
_____ Career progression is well defined (6)

End of Block: Motivators

Start of Block: Intervention

Q15 Rank the following interventions from what would be most (1) to least (5) valuable to you, when you considered applying to surgery
_____ Mentoring schemes (1)
_____ Flexible working hours (2)
_____ Financial support (3)

_____ Increased exposure to surgical specialities in undergraduate studies (4)

_____ Destigmatising non full time training (5)

End of Block: Intervention

Start of Block: Block 9

Q16 Are you happy to be contacted for a 20 minute online interview discussing your results in this questionnaire?

○ Yes (1)

○ No (2)

End of Block: Block 9

Start of Block: Follow up

Display This Question:

If Are you happy to be contacted for a 20 minute online interview discussing your results in this qu... = Yes

By agreeing to interview we will collect identifiable information such as your name and contact details. We will securely store this information, linked to your answers from this questionnaire, for the duration of the study. Once the study has been concluded all identifiable will be removed and none of your answers will be linked to the identifiable information. If you still wish to participate in an interview an information sheet along with a further consent form will be sent to you. These will further clarify how we will use your information as well as outline what would you should expect from the interview. If you no longer wish to participate in an interview you may still submit the questionnaire anonymously.

To view the full consent form click here

Display This Question:

If Are you happy to be contacted for a 20 minute online interview discussing your results in this qu... = Yes

Do you still wish to participate in an interview:

○ Yes (1)

○ No (2)

 Please provide a digital signature below

Q17 Name:

_____

Q18 How can we get in contact with you?

☐   Email (1)

☐   Telephone (2)

Q19 Email address:

Display This Question:

If How can we get in contact with you? = Telephone

Q20 Telephone number:

End of Block: Follow up

Start of Block: Outro

Please click the arrow to submit your response.

Thank you for taking part in our research survey!

If you have any questions do feel free to contact us on **ram316@ic.ac.uk**

 Please click the arrow to submit your response.

End of Block: Outro

Start of Block: Block 11

Thank you for your time.

Unfortunately you are not able to take part in the research without consenting to us using your data. If you still wish to take part please go back to the previous question and read the information we have made available before consenting to us using your data.

Interview Schedule

Gender composition at the workplace
- What is your **opinion** of the ratio of male: female registrar trainees in your specialty?
- What is your **opinion** of the ratio of male: female consultants in your specialty?
- Make sure to ask their opinion on it and not just the ratio

Did you take any years out of your medical training, and if so, how many?

If YES:
 Why did you take years out of your training? Did this influence your decision to apply to surgical training?

If NO:
 Did you consider taking years out? If yes, why did you choose not to?

Which surgical specialties did you cover in your foundation year training?

Did this experience influence your decision to apply?

Which future surgical speciality would you like to specialise in?

What about this specialty made you want to specialise in it?
If not decided, why did they pursue a career in surgery?

What is your marital status

Was this ever a factor in you making decisions about your application to surgical training?

Do you have any dependents?

Was this ever a factor in you making decisions about your application to surgical training?

What impact, if any, do you feel your gender has had on the opportunities available to you whilst applying to your surgical training?

How do you think this differs to your male counterparts?

The following domains have been identified as motivators and deterrents to remaining/completing surgical training from the systematic literature review completed by Hirayama and Fernando and other supporting literature.

Barriers

Rank the following deterrents to applying for surgical training programmes.

Have you felt discouraged from applying for a surgical training position?
- ○ Can you tell me of an experience?
- ○ Did the discouragement come from experiences you have had at the work or was it because of personal reasons? Could you please expand?

How did you overcome this?

Why did you decide to rank these barriers in this order?

Are there any other barriers which you have come across?

Motivators

Rank the following motivators to applying for surgical training programmes. Please order the following from most influential to least influential

Why did you decide to rank these motivators in this order?

Are there any other motivators which you have come across?

Intervention

Rank the following interventions from what would be most to least valuable to you, when you considered applying to surgery

Is there a role model who motivated you to enter surgery?
- ○ What about them motivated you?

Why did you decide to rank these interventions in this order?

What do you think needs to be done to attract more females into surgery?

Did you feel you were adequately supported during the application process for your training position?
- ○ What was this support?
- ○ Was this a factor in you applying?
- ○ What extra support would have been useful?

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Appendix B

Gender Impact Rating (GIR) and Rankings data

Stage of Training	Median Gender Impact Rating
FY2	3
CT1	3
CT2	2

Table 1.1. Gender Impact Rating (GIR) at foundation year 2 (FY2), core training 1 (CT1) and core training 2 (CT2) stages of medical training. CT2 trainees had a median GIR of 2, whereas CT1 and FY2 trainees both had higher GIR of 3.

Independent–Samples Kruskal–Wallis Test Summary

Total N	100
Test Statistic	1.657[a,b]
Degree Of Freedom	2
Asymptotic Sig.(2–sided test)	.437

a. The test statistic is adjusted for ties.

b. Multiple comparisons are not performed because the overall test does not show significant differences across samples.

Table 1.2. Table showing insignificant results of Kruskal Wallis Significance Test on median gender impact rating for pre- and post-core training, showing an asymptotic significance (p-value) of 0.437 which was not significant ($\alpha = 0.05$).

Ethnicity	Median Gender Impact Rating
White British/Irish/Other	2
Black, Asian and Minority Ethnic	3

Table 2.1. A comparison of the Gender Impact Rating (GIR) between White/British/Other participants and Black, Asian and Minority Ethinic (BAME) participants. GIR of White/British/Other participants skewed towards lower values with the median rating of 2 which is lower than the BAME median of 3. Difference in GIR of BAME and White/British/Other respondents was not statistically significant.

Independent–Samples Kruskal–Wallis Test Summary

Total N	97
Test Statistic	3.025[a,b]
Degree Of Freedom	1
Asymptotic Sig.(2–sided test)	.082

a. The test statistic is adjusted for ties.

b. Multiple comparisons are not performed because the overall test does not show significant differences across samples.

Table 2.2. Table showing insignificant results from Kruskal-Wallis Test on Gender Impact Ratings of Black, Asian Minority Ethnic and White/British/Other respondents, showing an asymptotic significance (p-value) of 0.082 which was not significant ($\alpha = 0.05$).

Top ranked motivator * Marital status Crosstabulation

		Marital status				Total	
		Unmarried		Married/Civil Partnership			
		N	%	N	%	N	%
Top ranked motivator	Professional support in the specialties	15a	19.2%	11b	57.9%	26	26.8%
	Social support system	10a	12.8%	1a	5.3%	11	11.3%
	Positive changes to the orginisational culture	4a	5.1%	0a	0.0%	4	4.1%
	Early exposure to surgical specialities	37a	47.4%	7a	36.8%	44	45.4%
	Income	1a	1.3%	0a	0.0%	1	1.0%
	Career progression is well defined	11a	14.1%	0a	0.0%	11	11.3%
Total		78	100.0%	19	100.0%	97	100.0%

Each subscript letter denotes a subset of Marital status categories whose column proportions do not differ significantly from each other at the .05 level.

Table 3.1. Cross Tabulation of top ranked motivators against married and unmarried participants showing the significant ($\alpha = 0.05$) difference in the proportion of top ranking professional support between married and unmarried individuals.

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Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	13.566[a]	5	.019
Likelihood Ratio	15.273	5	.009
Linear-by-Linear Association	8.870	1	.003
N of Valid Cases	97		

a. 6 cells (50.0%) have expected count less than 5. The minimum expected count is .20.

Table 3.2. Results of Pearson's Chi-Square test of the most influential motivators against marital status showing a significant difference between the two groups (p=0.019).

Appendix C

Participant Demographic Data

Stage of training	Number of Participants	Proportion of participants taking years out of training (%)	Mean years out of training
FY2	35	31	1
CT1	35	40	1.53
CT2	30	67	1.41

Table 1. Stage of training of participants when they participated in this study and proportion of participants taking years out of training at each stage. The training stage of the highest proportion of participants (66%) taking years out of training was core training 2 (CT2) with a mean duration of 1.37 years. Foundation Year 2 (FY2) was the training stage with the lowest proportion (31%) of participants taking time out from training, the mean duration of which was 1 year.

Figure 1. Geographical reach of deaneries by participants in this study.

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Deanery/Foundation School	Participants (%)
East Anglia	2
East Midlands	5
East of England	11
Essex, Bedfordshire and Hertfordshire	1
Kent, Surrey and Sussex	4
Leicester, Northamptonshire and Rutland	1
London	17
London & KSS: (North Central and East London; North West London; South Thames)	14
Mersey Deanery	1
North East	3
North Western Deanery	4
Northern	2
Northern Ireland	2
Oxford	2
Scotland	3
Scotland East	1
Scotland West	1
Severn	5

South West Peninsula	5
Thames Valley	1
Wales	2
Wessex	1
West Midlands	5
Yorkshire & Humber	6
Other	1

Table 2. Geographical coverage of deaneries and proportion of participants in each deanery.

Figure 2. Participant Ethnicities: 46 (%) White/British/Other, 36 (%) Asian/Asian British, 5 (%) Black/African/Carribean/Black British, 6 (%) Arab/Middle Eastern, 4 (%) Mixed/multiple ethnic groups.

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Figure 3. Participant Marital Status: 77 (%) unmarried, 19 (%) married and 4 (%) prefer not to say.

Appendix D

Breakdown of specialty choices data

Future choices in specialty training

	n	n (%)
Number of participants choosing specialties they have not previously taken as part of their foundation training	21	21%
Number of participants considering multiple specialties, some of which they have not previously taken as part of their foundation training	16	16%
Number of participants who are unsure of which surgical specialty to pursue, "none"	8	8%
Number of participants considering surgical specialities alongside "none"	1	1%
Total number of participants who are considering specialties they have not previously taken as part of their foundation training	37	37%

Table 1. Table showing the number of participants considering each specialty. Participants who are unsure of which surgical specialty to pursue are titled "none". The second column shows the number of participants (n=100) and the final column expresses the results as a percentage.

Specialty	Number of participants considering each specialty
None	9
General	42
Trauma and orthopaedics	16
Vascular	4
Urology	13
Plastic	17

Cardiothoracic	5
Paediatric	6
Otolaryngology (ENT)	15
Neurosurgery	5
Academic	6
Oral and Maxillofacial surgery (OMFS)	3
TOTAL	141

Table 2. Table showing the number of participants considering each specialty. There were 100 participants, some participants chose more than one specialty that they wish to do in the future, therefore bringing the total to 141.

Run-through programmes

	n	n (%)
Number of people considering specialties with no run-through programmes available	12	12%
Number of people considering specialties with a mixture of run-through and no run-through programmes	14	14%

Table 3. Table showing the number of participants considering a mixture or no run-through programmes. The second column shows the number of participants (n=100) and the final column expresses the results as a percentage.

Specialty choice: Neurosurgery

Total number: 5

Marital status:

Marital status	Number of participants	Percentage of total number of participants (%)
Unmarried	3	60%
Married	1	20%
Prefer not to say	1	20%
Total	5	

Table 4. Table showing the marital status of participants choosing this specialty. The second column shows the number of participants (n=5) and the final column expresses the results as a percentage.

Ethnicity:

Ethnicity	Number of participants	Percentage of total number of participants (%)
White	1	20%
Asian	2	40%
Black	1	20%
Prefer not to say	1	20%
Total	5	

Table 5. Table showing the ethnicity of participants choosing this specialty. The second column shows the number of participants (n=5) and the final column expresses the results as a percentage.

Median results for GIR, Deterrents, Motivators, Interventions:

Gender Impact Rating (GIR): 4

Deterrents		Motivators		Interventions	
Career structure	2	Professional support	3	Mentoring schemes	3
Male dominance	4	Social support	5	Flexible working hours	3
Lack of equal opportunities	3	Organisational culture	4	Financial support	5
Discrimination from other HCPs	3	Early exposure	2	Increased exposure	3
Work life balance	3	Income	6	Destigmatising non-full time working	2
		Career progression	2		

Table 6. Table showing the median results of participants for deterrents, motivators and interventions. For deterrents and interventions, each choice is given a result from 1=most influential and 5=least influential. For motivators, each choice is given a result from 1=most influential and 6=least influential.

Participants considering Neurosurgery ranked the impact of their gender on opportunities available to them as 4. This was on a scale of 0-5, (0 = no impact, 3 = some impact, 5 = major impact). This was opposed in their deterrents with male dominance ranking second least influential deterrent. Financial support was ranked as least influential intervention. Motivators were ranked consistently, from most to least influential: career progression and early exposure had a joint first place, followed by professional support, positive changes to organisational culture, social support and income.

Specialty choice: Oral and Maxillofacial surgery

Total number: 3

Marital status:

Marital status	Number of participants	Percentage of total number of participants (%)
Unmarried	2	67%
Prefer not to say	1	33%
	3	

Table 7. Table showing the marital status of participants choosing this specialty. The second column shows the number of participants (n=3) and the final column expresses the results as a percentage.

Ethnicity:

Ethnicity	Number of participants	Percentage of total number of participants (%)
White	2	67%
Prefer not to say	1	33%
	3	

Table 8. Table showing the ethnicity of participants choosing this specialty. The second column shows the number of participants (n=3) and the final column expresses the results as a percentage.

Median results for GIR, Deterrents, Motivators, Interventions:

GIR: 1

Deterrents		Motivators		Interventions	
Career structure	2	Professional support	2	Mentoring schemes	3
Male dominance	4	Social support	4	Flexible working hours	1
Lack of equal opportunities	4	Organisational culture	4	Financial support	4

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Discrimination from other HCPs	3	Early exposure	2	Increased exposure	4
Work life balance	1	Income	6	Destigmatising non-full time working	2
		Career progression	2		

Table 9. Table showing the median results of participants for deterrents, motivators and interventions. For deterrents and interventions, each choice is given a result from 1=most influential and 5=least influential. For motivators, each choice is given a result from 1=most influential and 6=least influential.

Participants considering Oral and Maxillofacial surgery ranked the impact of their gender on opportunities available to them as 1, close to no impact. Deterrents were ranked in the following order, from most to least influential: work life balance, career structure, discrimination from other HCPs, with male dominance and lack of equal opportunities ranking equally as least influential. Interventions were ranked in the following order, from most to least influential: flexible working hours, destigmatising non-full time working, mentoring schemes, with financial support and increased exposure ranking equally as least influential. Income was ranked the least influential factor in motivating them to choose this specialty.

Specialty choice: Academic

Total number: 6

Marital status:

Marital status	Number of participants	Percentage of total number of participants (%)
Unmarried	6	100%
	6	

Table 10. Table showing the marital status of participants choosing this specialty. The second column shows the number of participants (n=6) and the final column expresses the results as a percentage.

Ethnicity:

Ethnicity	Number of participants	Percentage of total number of participants (%)
White	3	50%
Asian	2	33%
Black	1	17%
	6	

Table 11. Table showing the ethnicity of participants choosing this specialty. The second column shows the number of participants (n=6) and the final column expresses the results as a percentage.

Median results for GIR, Deterrents, Motivators, Interventions:

GIR: 3.5

Deterrents		Motivators		Interventions	
Career structure	4	Professional support	3	Mentoring schemes	3
Male dominance	2.5	Social support	3.5	Flexible working hours	2.5
Lack of equal opportunities	3	Organisational culture	3.5	Financial support	4.5
Discrimination from other HCPs	1	Early exposure	1.5	Increased exposure	3.5

Work life balance	3.5	Income	6	Destigmatising non-full time working	2
		Career progression	4.5		

Table 12. Table showing the median results of participants for deterrents, motivators and interventions. For deterrents and interventions, each choice is given a result from 1=most influential and 5=least influential. For motivators, each choice is given a result from 1=most influential and 6=least influential.

Participants considering an Academic pathway ranked discrimination from other HCPs as the most influential deterrent. Income was ranked the least influential factor in motivating them to choose this specialty. All participants considering Academics were "Unmarried/ Divorced/ Widowed".

Specialty choice: Trauma and orthopaedic

Total number: 16

Marital status:

Marital status	Number of participants	Percentage of total number of participants (%)
Unmarried	16	100%
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Table 13. Table showing the marital status of participants choosing this specialty. The second column shows the number of participants (n=16) and the final column expresses the results as a percentage.

Ethnicity:

Ethnicity	Number of participants	Percentage of total number of participants (%)
White	10	63%
Asian	3	19%
Mixed	3	19%
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Table 14. Table showing the ethnicity of participants choosing this specialty. The second column shows the number of participants (n=16) and the final column expresses the results as a percentage.

Median results for GIR, Deterrents, Motivators, Interventions:
GIR: 2.5

Deterrents		Motivators		Interventions	
Career structure	3	Professional support	2	Mentoring schemes	2
Male dominance	3	Social support	4	Flexible working hours	2.5
Lack of equal opportunities	4	Organisational culture	4	Financial support	4.5
Discrimination from other HCPs	3	Early exposure	2	Increased exposure	2.5

Work life balance	2	Income	6	Destigmatising non-full time working	3
		Career progression	3.5		

Table 15. Table showing the median results of participants for deterrents, motivators and interventions. For deterrents and interventions, each choice is given a result from 1=most influential and 5=least influential. For motivators, each choice is given a result from 1=most influential and 6=least influential.

Income was ranked the least influential factor in motivating them to choose this specialty. All participants considering Trauma and Orthopaedic surgery were "Unmarried/ Divorced/ Widowed".

Specialty choice: Paediatric

Total number: 6

Marital status:

Marital status	Number of participants	Percentage of total number of participants (%)
Unmarried	5	83%
Prefer not to say	1	17%
	6	

Table 16. Table showing the marital status of participants choosing this specialty. The second column shows the number of participants (n=6) and the final column expresses the results as a percentage.

Ethnicity:

Ethnicity	Number of participants	Percentage of total number of participants (%)
White	2	33%
Asian	3	50%
Prefer not to say	1	17%
	6	

Table 17. Table showing the ethnicity of participants choosing this specialty. The second column shows the number of participants (n=6) and the final column expresses the results as a percentage.

Median results for GIR, Deterrents, Motivators, Interventions:

GIR: 3

Deterrents		Motivators		Interventions	
Career structure	2	Professional support	2	Mentoring schemes	2.5
Male dominance	4	Social support	4	Flexible working hours	2
Lack of equal opportunities	4	Organisational culture	3.5	Financial support	4.5

Discrimination from other HCPs	4.5	Early exposure	2	Increased exposure	3.5
Work life balance	1	Income	6	Destigmatising non-full time working	3.5
		Career progression	3		

Table 18. Table showing the median results of participants for deterrents, motivators and interventions. For deterrents and interventions, each choice is given a result from 1=most influential and 5=least influential. For motivators, each choice is given a result from 1=most influential and 6=least influential.

Participants considering Paediatric surgery were in disagreement for all interventions, however work life balance was ranked as the most influential deterrent. Income was ranked the least influential factor in motivating them to choose this specialty.

Specialty choice: Otolaryngology (ENT)

Total number: 15

Marital status:

Marital status	Number of participants	Percentage of total number of participants (%)
Unmarried	13	87%
Married	2	13%
Total	15	

Table 19. Table showing the marital status of participants choosing this specialty. The second column shows the number of participants (n=15) and the final column expresses the results as a percentage.

Ethnicity:

Ethnicity	Number of participants	Percentage of total number of participants (%)
White	9	60%
Asian	3	20%
Arab	1	7%
Black	2	13%
Total	15	

Table 20. Table showing the ethnicity of participants choosing this specialty. The second column shows the number of participants (n=15) and the final column expresses the results as a percentage.

Median results for GIR, Deterrents, Motivators, Interventions:

GIR: 3

Deterrents	Motivators	Interventions

Career structure	2	Professional support	3	Mentoring schemes	2
Male dominance	3	Social support	4	Flexible working hours	2
Lack of equal opportunities	3	Organisational culture	4	Financial support	5
Discrimination from other HCPs	3	Early exposure	2	Increased exposure	4
Work life balance	2	Income	6	Destigmatising non-full time working	2
		Career progression	5		

Table 21. Table showing the median results of participants for deterrents, motivators and interventions. For deterrents and interventions, each choice is given a result from 1=most influential and 5=least influential. For motivators, each choice is given a result from 1=most influential and 6=least influential.

Participants considering Otolaryngology (ENT) surgery ranked financial support as their least influential intervention followed by increased exposure. Career progression was ranked as second least influential motivator. Income was ranked the least influential factor in motivating them to choose this specialty.

Specialty choice: Vascular

Total number: 4

Marital status:

Marital status	Number of participants	Percentage of total number of participants (%)
Unmarried	3	75%
Married	1	25%
Total	4	

Table 22. Table showing the marital status of participants choosing this specialty. The second column shows the number of participants (n=4) and the final column expresses the results as a percentage.

Ethnicity:

Ethnicity	Number of participants	Percentage of total number of participants (%)
White	3	75%
Asian	1	25%
Total	4	

Table 23. Table showing the ethnicity of participants choosing this specialty. The second column shows the number of participants (n=4) and the final column expresses the results as a percentage.

Median results for GIR, Deterrents, Motivators, Interventions:

GIR: 2

Deterrents		Motivators		Interventions	
Career structure	2.5	Professional support	2	Mentoring schemes	3
Male dominance	3.5	Social support	3	Flexible working hours	2
Lack of equal opportunities	3	Organisational culture	4.5	Financial support	4

Discrimination from other HCPs	4.5	Early exposure	1	Increased exposure	2
Work life balance	2	Income	6	Destigmatising non-full time working	3.5
		Career progression	4		

Table 24. Table showing the median results of participants for deterrents, motivators and interventions. For deterrents and interventions, each choice is given a result from 1=most influential and 5=least influential. For motivators, each choice is given a result from 1=most influential and 6=least influential.

Participants considering Vascular surgery ranked early exposure as the most influential factor in motivating them to choose this specialty. Income was ranked the least influential factor in motivating them to choose this specialty.

Specialty choice: General

Total number of participants: 42

Marital status:

Marital status	Number of participants	Percentage of total number of participants (%)
Unmarried	34	81%
Married	5	12%
Prefer not to say	3	7%
Total	42	

Table 25. Table showing the marital status of participants choosing this specialty. The second column shows the number of participants (n=42) and the final column expresses the results as a percentage.

Ethnicity:

Ethnicity	Number of participants	Percentage of total number of participants choosing specialty (%)
White	18	43
Asian	17	40
Arab	2	5
Black	3	7
Prefer not to say	2	5
Total	42	

Table 26. Table showing the ethnicity of participants choosing this specialty. The second column shows the number of participants (n=42) and the final column expresses the results as a percentage.

Median results for GIR, Deterrents, motivators, interventions:

GIR: 2

Deterrents		Motivators		Interventions	
Career structure	3	Professional support	2.5	Mentoring schemes	2
Male dominance	3	Social support	3	Flexible working hours	3
Lack of equal opportunities	3	Organisational culture	4	Financial support	5
Discrimination from other HCPs	4	Early exposure	2	Increased exposure	3
Work life balance	1.5	Income	6	Destigmatising non-full time working	3
		Career progression	4		

Table 27. Table showing the median results of participants for deterrents, motivators and interventions. For deterrents and interventions, each choice is given a result from 1=most influential and 5=least influential. For motivators, each choice is given a result from 1=most influential and 6=least influential.

Participants considering General surgery ranked income as the least influential factor in motivating them to choose this specialty. Financial support was ranked as the least influential intervention, with mixed responses for deterrents and motivators.

Specialty choice: Urology

Total number: 13

Marital status:

Marital status	Number of participants	Percentage of total number of participants (%)
Unmarried	8	62%
Married	5	38%
Total	13	

Table 28. Table showing the marital status of participants choosing this specialty. The second column shows the number of participants (n=13) and the final column expresses the results as a percentage.

Ethnicity:

Ethnicity	Number of participants	Percentage of total number of participants (%)
White	5	38%
Asian	7	54%
Arab	1	8%
Total	13	

Table 29. Table showing the ethnicity of participants choosing this specialty. The second column shows the number of participants (n=13) and the final column expresses the results as a percentage.

Median results for GIR, Deterrents, Motivators, Interventions:

GIR: 2

Deterrents		Motivators		Interventions	
Career structure	3	Professional support	2	Mentoring schemes	2
Male dominance	3	Social support	3	Flexible working hours	3

Lack of equal opportunities	3	Organisational culture	4	Financial support	4
Discrimination from other HCPs	3	Early exposure	2	Increased exposure	1
Work life balance	2	Income	6	Destigmatising non-full time working	3
		Career progression	5		

Table 30. Table showing the median results of participants for deterrents, motivators and interventions. For deterrents and interventions, each choice is given a result from 1=most influential and 5=least influential. For motivators, each choice is given a result from 1=most influential and 6=least influential.

Participants considering Urology surgery ranked income as the least influential factor in motivating them to choose this specialty. Career progression was ranked the second least influential motivator, followed by positive changes in organisational culture then social support system. They ranked increased exposure as the most influential intervention, followed secondly by mentoring schemes.

Specialty choice: Plastic

Total number: 17

Marital status:

Marital status	Number of participants	Percentage of total number of participants (%)
Unmarried	13	76%
Married	4	24%
Total	17	

Table 31. Table showing the marital status of participants choosing this specialty. The second column shows the number of participants (n=17) and the final column expresses the results as a percentage.

Ethnicity:

Ethnicity	Number of participants	Percentage of total number of participants (%)
White	8	47%
Asian	7	41%
Arab	1	6%
Black	1	6%
Total	17	

Table 32. Table showing the ethnicity of participants choosing this specialty. The second column shows the number of participants (n=17) and the final column expresses the results as a percentage.

Median results for GIR, Deterrents, Motivators, Interventions:

GIR: 3

Deterrents	Motivators	Interventions

Career structure	3	Professional support	2	Mentoring schemes	2
Male dominance	4	Social support	4	Flexible working hours	2
Lack of equal opportunities	3	Organisational culture	4	Financial support	4
Discrimination from other HCPs	4	Early exposure	1	Increased exposure	3
Work life balance	1	Income	6	Destigmatising non-full time working	3
		Career progression	4		

Table 33. Table showing the median results of participants for deterrents, motivators and interventions. For deterrents and interventions, each choice is given a result from 1=most influential and 5=least influential. For motivators, each choice is given a result from 1=most influential and 6=least influential.

Participants considering Plastic surgery ranked early exposure as the most influential factor in motivating them to choose this specialty. Income was ranked the least influential factor in motivating them. Participants considering Plastic surgery chose work-life balance as their most influential deterrent and professional support as their second most influential motivator.

Specialty choice: Cardiothoracic

Total number: 5

Marital status:

Marital status	Number of participants	Percentage of total number of participants (%)
Unmarried	3	60%
Married	1	20%
Prefer not to say	1	20%
Total	5	

Table 34. Table showing the marital status of participants choosing this specialty. The second column shows the number of participants (n=5) and the final column expresses the results as a percentage.

Ethnicity:

Ethnicity	Number of participants	Percentage of total number of participants (%)
White	2	40%
Asian	1	20%
Arab	1	20%
Prefer not to say	1	20%
Total	5	

Table 35. Table showing the ethnicity of participants choosing this specialty. The second column shows the number of participants (n=5) and the final column expresses the results as a percentage.

Median results for GIR, Deterrents, Motivators, Interventions:

GIR: 2

Deterrents		Motivators		Interventions	
Career structure	2	Professional support	2	Mentoring schemes	1
Male dominance	4	Social support	3	Flexible working hours	3
Lack of equal opportunities	3	Organisational culture	4	Financial support	5
Discrimination from other HCPs	3	Early exposure	1	Increased exposure	2
Work life balance	4	Income	5	Destigmatising non-full time working	4
		Career progression	5		

Table 36. Table showing the median results of participants for deterrents, motivators and interventions. For deterrents and interventions, each choice is given a result from 1=most influential and 5=least influential. For motivators, each choice is given a result from 1=most influential and 6=least influential.

Participants considering Cardiothoracic surgery were in agreement for the interventions and motivators. They ranked the interventions in the following order, from most to least valuable: mentoring schemes, early exposure, flexible working hours, destigmatising non-full time working and financial support. Participants ranked motivators in the following order, from most to least influential: early exposure, professional support, social support system, positive changes in organisational culture, with income and career progression being equally ranked lowest.

Specialty choice: None

Total number: 9

Marital status:

Marital status	Number of participants	Percentage of total number of participants (%)
Unmarried	7	78%
Married	2	22%
Total	9	

Table 37. Table showing the marital status of participants choosing this specialty. The second column shows the number of participants (n=9) and the final column expresses the results as a percentage.

Ethnicity:

Ethnicity	Number of participants	Percentage of total number of participants (%)
White	4	44%
Asian	4	44%
Mixed	1	11%
Total	9	

Table 38. Table showing the ethnicity of participants choosing this specialty. The second column shows the number of participants (n=9) and the final column expresses the results as a percentage.

Median results for GIR, Deterrents, Motivators, Interventions:

GIR: 2

Deterrents		Motivators		Interventions	
Career structure	3	Professional support	2	Mentoring schemes	3
Male dominance	4	Social support	3	Flexible working hours	2
Lack of equal opportunities	3	Organisational culture	4	Financial support	4

Discrimination from other HCPs	4	Early exposure	4	Increased exposure	4
Work life balance	2	Income	5	Destigmatising non-full time working	2
		Career progression	3		

Table 39. Table showing the median results of participants for deterrents, motivators and interventions. For deterrents and interventions, each choice is given a result from 1=most influential and 5=least influential. For motivators, each choice is given a result from 1=most influential and 6=least influential.

Participants who are unsure of which surgical specialty to pursue ("None") had a mixed response for the influence of deterrents, motivators and interventions.

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For peer review only

COREQ (COnsolidated criteria for REporting Qualitative research) Checklist

A checklist of items that should be included in reports of qualitative research. You must report the page number in your manuscript where you consider each of the items listed in this checklist. If you have not included this information, either revise your manuscript accordingly before submitting or note N/A.

Topic	Item No.	Guide Questions/Description	Reported on Page No.
Domain 1: Research team and reflexivity			
Personal characteristics			
Interviewer/facilitator	1	Which author/s conducted the interview or focus group?	
Credentials	2	What were the researcher's credentials? E.g. PhD, MD	
Occupation	3	What was their occupation at the time of the study?	
Gender	4	Was the researcher male or female?	
Experience and training	5	What experience or training did the researcher have?	
Relationship with participants			
Relationship established	6	Was a relationship established prior to study commencement?	
Participant knowledge of the interviewer	7	What did the participants know about the researcher? e.g. personal goals, reasons for doing the research	
Interviewer characteristics	8	What characteristics were reported about the inter viewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic	
Domain 2: Study design			
Theoretical framework			
Methodological orientation and Theory	9	What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	
Participant selection			
Sampling	10	How were participants selected? e.g. purposive, convenience, consecutive, snowball	
Method of approach	11	How were participants approached? e.g. face-to-face, telephone, mail, email	
Sample size	12	How many participants were in the study?	
Non-participation	13	How many people refused to participate or dropped out? Reasons?	
Setting			
Setting of data collection	14	Where was the data collected? e.g. home, clinic, workplace	
Presence of non-participants	15	Was anyone else present besides the participants and researchers?	
Description of sample	16	What are the important characteristics of the sample? e.g. demographic data, date	
Data collection			
Interview guide	17	Were questions, prompts, guides provided by the authors? Was it pilot tested?	
Repeat interviews	18	Were repeat inter views carried out? If yes, how many?	
Audio/visual recording	19	Did the research use audio or visual recording to collect the data?	
Field notes	20	Were field notes made during and/or after the inter view or focus group?	
Duration	21	What was the duration of the inter views or focus group?	
Data saturation	22	Was data saturation discussed?	
Transcripts returned	23	Were transcripts returned to participants for comment and/or	

Topic	Item No.	Guide Questions/Description	Reported on Page No.
		correction?	
Domain 3: analysis and findings			
Data analysis			
Number of data coders	24	How many data coders coded the data?	
Description of the coding tree	25	Did authors provide a description of the coding tree?	
Derivation of themes	26	Were themes identified in advance or derived from the data?	
Software	27	What software, if applicable, was used to manage the data?	
Participant checking	28	Did participants provide feedback on the findings?	
Reporting			
Quotations presented	29	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number	
Data and findings consistent	30	Was there consistency between the data presented and the findings?	
Clarity of major themes	31	Were major themes clearly presented in the findings?	
Clarity of minor themes	32	Is there a description of diverse cases or discussion of minor themes?	

Developed from: Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*. 2007. Volume 19, Number 6: pp. 349 – 357

Once you have completed this checklist, please save a copy and upload it as part of your submission. DO NOT include this checklist as part of the main manuscript document. It must be uploaded as a separate file.