

Career choices of today's medical students: where does surgery rank?

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Abstract

Introduction The national junior doctor recruitment crisis prompts an appraisal of medical student attitudes to different career pathways. The purpose of this study was to perform a national review of surgical career intentions of Irish final year medical students.

Methods Ethical and institutional approval was obtained at each study location. A questionnaire was designed and distributed to final year students. Domains assessed included demographics, career plans and reasons associated. Anonymised responses were collated and evaluated. Categorical data were compared with Fisher's exact test.

Results Responses were obtained from 342 students in four medical schools of whom 78.6 % were undergraduates. Over half (53 %) were Irish, with Malaysia, Canada and the USA the next most common countries of origin. Only 18 % of students intended to pursue surgery, with 60 % stating they did not plan to, and 22 % undecided.

Of those who plan not to pursue surgery, 28 % were unsure about a speciality but the most common choices were medicine (39 %), general practice (16 %) and paediatrics (8 %). Reasons for not picking a career in surgery included long hours and the unstructured career path. Suggestions to improve uptake included earlier and more practical exposure to surgery, improved teaching/training and reduction in working hours.

Conclusions In this study 18 % of final year medical students identified surgery as their chosen career pathway. Although lifestyle factors are significant in many students' decision, perceived quality and duration of surgical training were also relevant and are modifiable factors which, if improved could increase interest in surgery as a career.

Keywords Surgery · Career · Education · Medical student · Surgical training · Questionnaire

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Introduction

As surgical health care provision in the current era emphasises surgeon-delivered services, it is likely that increasing numbers of surgeons will be required to meet the demands [1, 2]. This pressure is compounded by expanding population-based requirements [3], as well as a requirement to train surgeons in fewer hours. Against these pressures, evidence indicates that the number of medical school graduates applying for surgical training is decreasing.

Applications to basic surgical training in Ireland decreased from 263 in 2007 to 129 applicants in 2011 (i.e., more than 50 %) [4]. As a result, many designated surgical training posts remain unfilled. In the United States unfilled general surgery training posts have been noted as far back

as 1997 [5]. Similar trends have occurred in Canada where only 21.7 % of medical school graduates identified surgery as a career choice in 2006 [6]. In other countries the proportion of medical students who apply for surgical residency ranges from 7 to 33 % [7–9]. Factors which may influence these trends include lifestyle and personal factors and increasing proportions of females in medical schools [10–12].

The current situation is compounded by additional developments. Attrition rates continue to increase in surgical residency programs [13, 14]. In Ireland, the first cohort of post-graduate medical students graduated in 2010. These graduates have a different profile to direct entry undergraduate students and they may be less inclined to choose prolonged career paths [15]. Other influences may also be important [16]. Two recent Irish studies [17, 18] which looked at surgical career influences of doctors and medical students found that career prospects (both academic/research [17] and employment prospects [18]) were major determinants in career choices.

In determining future manpower strategies it is crucial that one first determines baseline availabilities. At present it is not known whether Irish medical students have decided on career paths at final medical year stage, nor is it known how many may enter surgical training programs. A national survey of final year medical students' career intentions and influences is thus timely given recent recruitment crises and attrition rates as well as the changing profile of medical students in Ireland.

Methods

Ethical approval was obtained prior to the commencement of the study. A detailed questionnaire was designed to collect data regarding demographics, career choice, and opinions about surgery as a career. Questions were structured using a combination of dichotomous responses, Likert-scales [19] and free text. Recent surveys of medical doctors and students using postal/email canvassing [20] and online surveys [18] have yielded low response rates. Given this, a directly administered paper-based survey was employed (rather than an on-line survey) to maximise response rates [21]. The questionnaire was distributed to final year medical students in four medical schools in Ireland during the month of April 2011. This was coordinated by tutors within each institute and overseen by the Chair of each Department. One school was exclusively for graduate entry students whilst the others provided both direct and graduate entry programmes. The questionnaire was distributed when the students were assembled for teaching sessions. Students were given a brief explanation of the survey and assured that their responses would remain

anonymous. Questionnaires were collected after completion. All data were transferred onto an Excel[®] spreadsheet. Statistical analysis was carried out using SPSS version 16. Categorical data were compared with Fisher's exact test.

Results

In total, 342 responses were obtained from students in the four medical schools. The overall response rate was 66.4 % and ranged from 69.6 % in the Royal College of Surgeons in Ireland (RCSI) to 59.6 % in the National University of Ireland, Galway (NUIG) (Fig. 1a). The lowest contribution to the overall response was 6 % from the Graduate Entry Medical School in University of Limerick (explained by there being 32 students in the class in question).

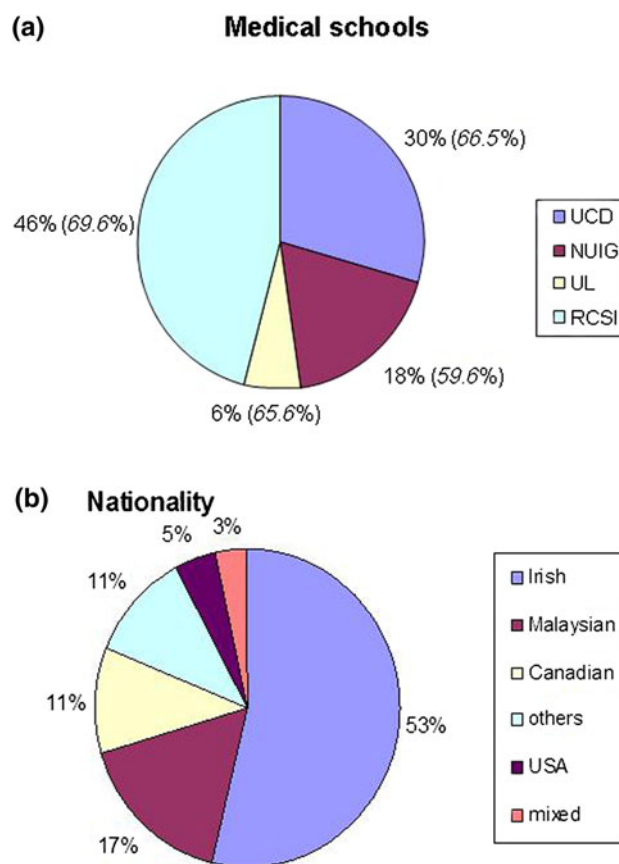


Fig. 1 **a** Medical schools included in survey. Percentage in *black* font is the contribution of the institutional response to the overall response. Percentage in *italics* font is the response rate for each medical school. The medical schools are University College Dublin (UCD), National University of Ireland (NUIG), University of Limerick (UL), Royal College of Surgeons in Ireland (RCSI). **b** Nationalities of the surveyed students. The majority of students were Irish and 47 % of the respondents were from overseas

Demographics

The mean age of the students was 26.3 years (median 24 years) and 60.2 % of the students were female. With regard to nationality, 176 of the students (55 %) were Irish; other countries represented included Malaysia, Canada and the USA (Fig. 1b). All students were in final year. The majority of the students (72.2 %) were single and 4.4 % were married. The remaining 23.4 % said they were in a relationship. Nine students (2.6 %) had children. Undergraduate students made up 76.9 % of the total. Post-graduate entry level students had previously obtained a degree as had some direct entry students; in this cohort, the most common degrees obtained were in science (46.7 %), arts (8.7 %) and engineering (7.6 %). Almost 20 % of students had a degree in healthcare-related topics including physiotherapy, nursing and pharmacy.

Career choices

When asked about a career in surgery, 18 % of the students intended to pursue surgery as a career, 60 % intended not to and the remaining 22 % were undecided. Of those not intending to pursue a surgical career, almost a quarter were undecided about career choice. Of those who had decided, medicine was the most frequent choice, followed by general practice and paediatrics (Fig. 2a).

Timing of career choice decision and choice in relation to country of employment

Overall, the majority of students (51 %) made a career decision in their final year of medical school. Where students had decided, 13 % had done so following a particular clinical rotation or attachment. When the students who made a career decision during medical school were analysed separately, 71 % did so in final year compared to 7 % in first or second year. When asked in which country they planned to work, 62 % of students intended to stay in their country of origin and 13 % planned to emigrate. With regard to the Irish students, 67 % of the overall cohort, and 70 % of those intending to do surgery, planned to stay in Ireland.

Evaluation of responses in students intending to pursue surgery

The factors that influenced a choice to pursue surgery as career were assessed. Significantly more male students than female students intended to pursue surgery [25.2 vs.

Choices for those not doing surgery. (N=211, 53 undecided)

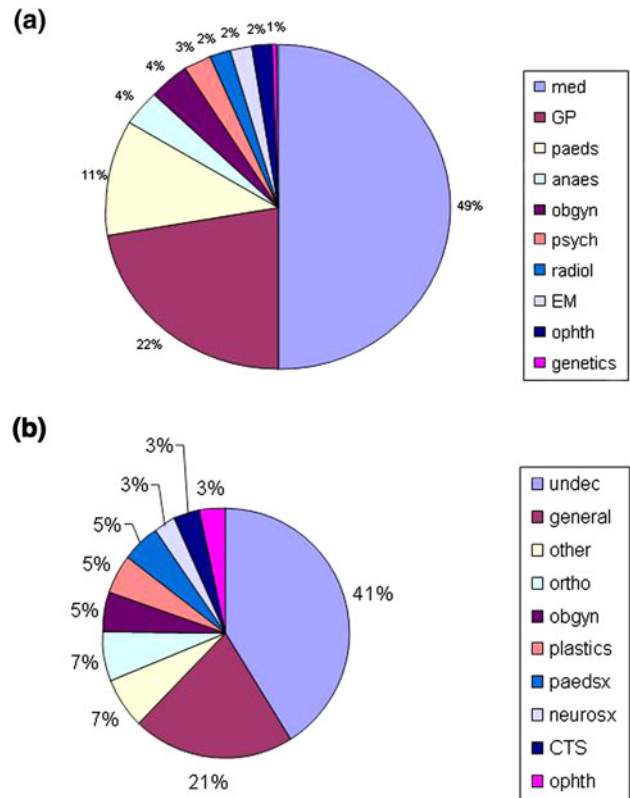


Fig. 2 **a** Career intentions of students intending not to do surgery. From the sample $N = 211$, 53 students were undecided. Of the remaining 158 students, medicine was the most popular choice. **b** Surgical subspecialty choice. Many subspecialties were represented but general surgery was the most popular choice. *med* medicine, *GP* general practice, *paeds* paediatrics, *anaes* anaesthetics, *obgyn* obstetrics and gynaecology, *psych* psychiatry, *radiol* radiology, *EM* emergency medicine, *ophth* ophthalmology, *undec* undecided, *ortho* orthopaedic surgery, *sx* surgery, *CTS* cardiothoracic surgery

12.6 %, $p < 0.01$ (Table 1)]. Students intending to pursue surgery were more likely to have completed an elective rotation in surgery (33 vs. 7.1 %, $p < 0.01$). While a greater proportion of these students had a family member or friend who was also doing surgery, the difference was not significant. Of the 18 % of the overall cohort who had a family member or friend in surgery, 78 % were male relatives. When direct and graduate entry students were compared a greater percentage of the latter did not intend to pursue surgery, but the difference was not significant (59 vs. 65 %, $p = 0.43$). Although more overseas than Irish students intended to pursue surgery, the difference was again not significant (22 vs. 14 %, $p = 0.064$).

Of the 60 students who intended to pursue surgery as a career, 59 % had also already decided on a surgical subspecialty (Fig. 2b). All specialties were represented across the entire student cohort. However, general surgery was the subspecialty chosen most frequently.

Table 1 The percentage of students who intended to pursue surgery across various subgroups

Factor	Percentage of students who intended to pursue surgery	Significance (Fischer's exact test)
Gender (%)		
Male (39.8)	24.8	$P < 0.01$
Female (60.2)	13.1	
Previous surgical elective (%)		
Yes (37.3)	33.9	$P < 0.01$
No (62.7)	7.1	
Family member in surgery (%)		
Yes (18)	20	$P = \text{NS}$
No (82)	16.6	
Medical school course (%)		
Undergraduate (77)	17.5	$P = \text{NS}$
Graduate (23)	18.2	
Nationality (%)		
Irish (53)	13.9	$P = \text{NS}$
Non-Irish (47)	21.9	

Male students and students who had undertaken an elective rotation were the only subgroups where significantly more students intended to pursue surgery

Evaluation of responses in students not intending to pursue surgery

The factors influencing those students who did not intend to pursue surgery as a career were also examined. When students were asked to give reasons why they did not plan to do surgery, the most common reasons given were long hours, lifestyle factors and prolonged duration of training. Of this cohort, 3 % had made decisions based on the perception that surgical training was “female unfriendly.” Other reasons are summarised in Fig. 3.

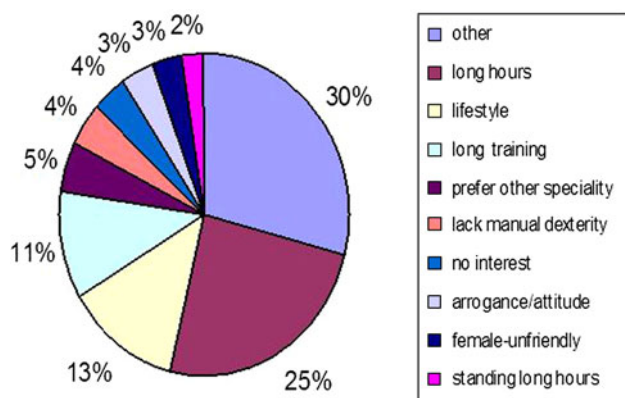


Fig. 3 Reasons given for not pursuing surgery. In the “other” category, students felt that surgery was too competitive, too difficult, too stressful, excessively hierarchial, lacked patient contact, etc

Table 2 The factors rated most highly in the Leikert scale section by students intending to pursue surgery, and the ratings by the students intending not to pursue surgery

Factor	Students intending to pursue surgery (%)	Students intending not to pursue surgery (%)	Significance (Fischer's exact test)
Enjoyment of surgery	94.7	62.9	$P < 0.001$
Procedural-driven nature	88	39	$P < 0.001$
Mix of elective and emergency	82	50	$P < 0.001$
Clinical rotation	78.9	44.3	$P < 0.001$

The percentages represent the amount of students who scored each factor with either a “5” (strong positive influence) or a “4” (mild positive influence)

In the Likert scale section of the questionnaire, students who did not plan to do surgery rated long hours and length of training as the strongest negative influences. Of note, the rating of these factors was weighted more negatively than the corresponding weighting given by students intending to pursue a surgical career (68 vs. 44 %, $p < 0.01$, 51 vs. 40 %, $p = \text{NS}$). Of those who planned to do surgery, the highest-scoring positive influences included enjoyment of surgery, mixture of elective and emergency work, the practical nature of surgery, and previous clinical rotation. These aspects were rated higher by students who planned to do surgery compared to those who did not (Table 2). “Prestige” and “having a family member” in surgery influenced students least (this held for both groups of students).

Suggestions as to how to improve the proportion of students intending to enter a surgical career

Students were invited to contribute free-text suggestions as to how to increase the number intending to pursue a surgical career. The majority of respondents (42 %) suggested better training, both at medical student and surgical trainee level. Almost a quarter (23 %) suggested improvements in career structure, including the provision of increased number of consultant posts, more career guidance and reducing the relative importance of research. Improvements in the area of working hours and lifestyle-related factors were suggested by 21 %. The single most common suggestion made (18 % of all suggestions) was to increase practical exposure for students, i.e., to allow medical students to scrub in theatre and become more involved.

Discussion

The issue of fewer trainees entering surgical training has become increasingly topical due to recruitment difficulties, attrition rates, changing profiles of medical students and resultant manpower shortages in many hospitals. This Irish study of medical students' career intentions is the first since the introduction of graduate entry medical students and is the only one to focus on the decisions of final year medical students (i.e., when career intentions may more accurately reflect ultimate career choices). An understanding of the number of students intending to pursue surgery at this point provides an important baseline measurement. Although our study was conducted at medical schools in Ireland, the cohort had a diverse international background. Thus, the findings have an international relevance as many of the students also intended to work overseas.

This study demonstrated that 18 % of final year medical students intended to pursue a career in surgery. The students surveyed were all in final year and thus most likely to have given career choice definitive consideration. In keeping with this, we found that 71 % of students who made a career choice during medical school did so in the final medical year. This highlights the importance of the medical school experience on career decisions. Although timing of the surgical rotation is not standardised it frequently happens in the final year of medical school.

Similar levels of students intending to enter surgical careers have been identified internationally. Glynn et al. [17] surveyed both medical students and non-consultant hospital doctors in Ireland in 2008/2009 and found that overall only 13.2 % intended to pursue surgery. Studies conducted in France [9] and Israel [7] show that 33 % and 22 % of students, respectively, intended to pursue surgery. In Canada 21.7 % of medical school graduates identified surgery as a career choice in 2006 [2]. A 2010 report about the career intentions of Canadian students studying abroad revealed that only 13.9 % intended to pursue surgery and only 6.4 % general surgery [22]. Thus, it appears that the issue with recruitment into surgery is not particular to Ireland.

Unfortunately, the absolute number entering and remaining in surgical training is likely to be lower than the above indicated figures. Applicants to the basic surgical training scheme in Ireland fell by 50 % between 2006 and 2011. A longitudinal study from Dallas for example [23] demonstrated that during the interval from 2004 to 2007 between 5.3 and 10 % of all medical students involved in the study actually entered surgical training. A UK study found that only 63 % of basic surgical trainees intended to remain in surgical training [24]. US studies found attrition rates in general surgical residencies varied between 17 and

20 % [13, 25, 26] with suggestions that this rate may even be increasing [14].

When asked to suggest factors that discouraged students from pursuing surgery, long hours and lifestyle factors were mentioned most frequently, in keeping with international trends [9, 16, 27, 28]. When asked to give specific reasons for not pursuing surgery, length and quality of training schemes were frequently cited. When asked to propose mechanisms for increasing interest in a surgical career, the single most commonly made free-text suggestion was to increase practical exposure for medical students (i.e., allow them to scrub in theatre) and also for basic surgical trainees. Of note, positive aspects in relation to a surgical career (e.g., its procedure-driven nature) were rated more highly by students intending to pursue surgery. This group weighted negative aspects as less important in general. Thus, lifestyle-related deterrents were less important for those who are interested in surgery, as observed in previous studies [17]. In keeping with this, a survey of 2011 applicants to US surgical training programmes revealed that factors such as educational and training quality of the programme and academic reputation were rated more highly than factors such as work-life balance and salary [29].

Students frequently commented on the lack of operative experience for trainees in designated training positions at senior house officer (SHO) level, a trend previously identified [30]. A recent survey of SHO operating activity mirrors international trends with 43.2 and 63.6 % of surgical SHOs not having performed an OGD or colonoscopy. Almost 40 % have never performed an appendicectomy [31]. This problem is not particular to Ireland and has been observed in the UK [32] and the US [33]. The data in this study indicate that students rotating through surgical clerkships are observing and noting the practical exposure obtained by junior surgical trainees and it is feasible that this is having a negative effect.

The factors associated with a choice in favour of surgery as a career were assessed. Students who had completed an elective surgical rotation were significantly more likely to pursue surgery. This relationship is not clear-cut however as it is likely that students motivated to conduct surgical electives are biased towards surgical disciplines to begin with. Those who want to pursue surgery rated enjoyment of a clinical rotation as a strong motivating factor; therefore, earlier medical school exposure to surgery may inspire a student, and encourage them to select a further elective rotation in surgery, which may continue to increase their interest. These trends observed in our study support data from the surgical literature showing students are more likely to be interested in a surgical career following their surgical rotation [34–37]. Those students who are

interested in surgery to begin with may be more inclined to focus on the positive aspects of a clinical attachment.

Interestingly, similar proportions of direct and graduate entry medical students intended pursuing a career in surgery. There were 77 graduate entry medical students in this study. Post-graduate entry medical courses were recently introduced in Ireland and are expected to reach a steady state in terms of entrants within the coming year. This could have health service provision implications in specialties with longer training schemes [15] (i.e., surgery) although the present findings do not support this suggestion.

In this study, significantly more males intended pursuing surgery (in keeping with established international trends) [12]. The reasons for this are complex; lifestyle issues may represent a stronger deterrent for women [38] and there may be a lack of female role models making females feel they are less likely to succeed in surgery even though this may not be the case [39–41]. Of note however, a similar observation was made in a study focussing on pre-college students [42]. This suggests that career choices are, in some cases, strongly influenced earlier than previously thought. The effects of having a relative or friend involved in surgery could thus become important [32]. A recent study showed that having a family member or close friend in surgery was a positive predictor of surgery as a career choice [1]. In our study, a family member or friend in surgery was not associated with increased rates of intent to enter a surgical career. As only 18 % of our cohort had a family member or friend in surgery it is possible that the cohort is too small to detect such a trend.

Of the Irish students who intended to pursue surgery, 70 % indicated they intended to remain and work in Ireland. This observation may have further implications for service provision in general. This issue was not particular to surgery however as 62 % of the entire cohort of respondents intended to remain in their native country.

The study has some limitations. We did not survey students in every medical school in Ireland, but four of the six medical schools were used in the survey. A directly administered questionnaire was used to increase response rates with the small risk that this may introduce bias. However, as the survey was anonymous and administered to large groups of students, we felt the bias was minimal and that students answered freely and honestly in the free-text sections. This survey is by its nature a study of intentions only and gives an indicator but not a guarantee of the career choices of final year medical students. There is no official data to track the actual career choices of medical graduates, which is compounded by issues such as the fact that many students opt to work abroad for a year before settling into a training programme. Our response rate of 66.4 % was not optimal, but not significantly worse

than rates obtained in other similar studies. (61 % [8], 69 % [9], 49 % [18], 10 % [20]).

The current observations permit the development of a focused strategy that could enhance entry into surgical health service provision. More students who did electives in surgery intended to pursue surgery as a career. This modifiable factor could be developed in medical programmes with a view to strategically increasing entry into surgical health care disciplines. The single most frequently mentioned negative factor was long hours and prolonged training. Although this is certainly modifiable (and major efforts are being made in this regard), the technical craft of surgery does not immediately lend itself to reduced hours. Students frequently cited poor quality training as negative factors in influencing their career choices. The most common free-text suggestion related to increasing student exposure to the practical interface of surgery (i.e., scrubbing up in theatre). Importantly, medical students made similar recommendations for basic surgical trainees, pointing to awareness amongst students in relation to the exposure obtained by trainees in designated training posts.

Conclusions

Only 18 % of current final year medical students intended to pursue surgery and the number who eventually apply for, and complete, surgical training schemes is likely to be lower. Although lifestyle factors are significant in many students' decision, perceived quality and duration of surgical training are also relevant and are modifiable factors which, if improved could increase interest in surgery as a career.

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Conflicts of interest None.

References

1. The Working Group on Specialist Medical Training (1993) Hospital doctors: training for the future. The report of the Working Group on Specialist Medical Training (The Calman Report). Department of Health London
2. http://www.dohc.ie/issues/european_working_time_directive/joint_statement.pdf?direct=1. Accessed 2 Dec 2012
3. Eurostat, Statistical office of the European communities http://epp.eurostat.ec.europa.eu/portal/page/portal/population/publications/population_projections
4. Figures obtained from: Department of Surgical Affairs, Royal College of Surgeons in Ireland. <http://www.rcsi.ie>
5. Erzurum VZ, Obermeyer RJ et al (2000) What influences medical students' choice of surgical careers? *Surgery* 128:253–256

6. Scott IM, Matejcek AN, Gowans MC et al (2008) Choosing a career in surgery: factors that influence Canadian medical students' interest in pursuing a surgical career. *Can J Surg* 51:371–377
7. Mazeh H, Mizrahi I, Eid A et al (2010) Medical students and general surgery—Israel's National Survey: lifestyle is not the sole issue. *J Surg Educ* 67(5):303–308
8. Are C, Stoddard HA, Huggett K et al (2009) A regional perspective on the attitudes of fourth-year medical students toward the field of general surgery. *J Surg Educ* 66(3):123–128
9. Lefèvre JH, Karila L, Kerneis S et al (2010) Motivation of French medical students to pursue surgical careers: results of national survey of 1,742 students. *J Visc Surg* 147(3):e181–e186
10. De SK, Henke PK, Ailawadi G et al (2004) Attending, house officer, and medical student perceptions about teaching in the third-year medical school general surgery clerkship. *J Am Coll Surg* 199(6):932–942
11. Riska E (2011) Gender and medical careers. *Maturitas* 68(3):264–267
12. Novielli K, Hojat M, Park PK et al (2001) Change of interest in surgery during medical school: a comparison of men and women. *Acad Med* 76(10 suppl):S58–S61
13. Yeo H, Bucholz E, Ann Sosa J et al (2010) A national study of attrition in general surgery training: which residents leave and where do they go? *Ann Surg* 252(3):529–534
14. Everett CB, Helmer SD, Osland JS et al (2007) General surgery resident attrition and the 80-hour workweek. *Am J Surg* 194:751–757
15. Goldacre MJ, Davidson JM, Lambert TW (2007) Career preferences of graduate and non-graduate entrants to medical schools in the UK. *Med Educ* 41(4):349–361
16. Scott I, Gowans M, Wright B et al (2011) Determinants of choosing a career in surgery. *Med Teach* 33(12):1011–1017
17. Glynn RW, Kerin MJ (2010) Factors influencing medical students and junior doctors in choosing a career in surgery. *Surgeon* 8:187–191
18. Corrigan MA, Shields CJ, Redmond HP (2007) Factors influencing surgical career choices and advancement in Ireland and Britain. *World J Surg* 31:1921–1929
19. Likert R (1932) A technique for the measurement of attitudes. *Arch Psychol* 140:1–55
20. Buttimer J (2006) Preparing Ireland's doctors to meet the health needs of the 21st century. Department of Health and Children (Report)
21. Grava-Gubins I, Scott S (2008) Effects of various methodologic strategies: survey response rates among Canadian physicians and physicians-in-training. *Can Fam Physician* 54(10):1424–1430
22. Canadian Students Studying Medicine Abroad (2010). <http://www.carms.ca/eng/index.shtml>. Accessed 8 Dec 2012
23. Naylor RA, Reisch JS, Valentine RJ (2010) Do student perceptions of surgeons change during medical school? A longitudinal analysis during a 4-year curriculum. *J Am Coll Surg* 210(4):527–532
24. Nor F, Plusa SM (2004) Career intentions and prospects of basic surgical trainees in the Northern Region of England. *Ann R Coll Surg Engl* 86(2):125
25. Singletary SE (2010) A fire in our hearts: passion and the art of surgery. *Ann Surg Oncol* 17(2):364–370
26. Dodson TF, Webb AL (2005) Why do residents leave general surgery? The hidden problem in today's programs. *Curr Surg* 62(1):128–131
27. Miller G, Bamboat ZM, Allen F et al (2004) Impact of mandatory resident work hour limitations on medical students' interest in surgery. *J Am Coll Surg* 199(4):615–619
28. Du J, Sathanathan J, Naden G et al (2009) A surgical career for New Zealand junior doctors? Factors influencing this choice. *N Z Med J* 122(1300):29–37
29. National Resident Matching Program, Data Release and Research Committee (2012) Results of the 2012 NRMP program director survey. National Resident Matching Program, Washington, DC
30. Lonergan PE, Mulrow J, Tanner WA et al (2011) Analysing the operative experience of basic surgical trainees in Ireland using a web-based logbook. *BMC Med Educ* 11:70
31. Sullivan KO, Byrne JS, Atie M et al (2011) A review of the basic surgical training (BST) scheme in Ireland; the need for more operative exposure. *Ir J Med Sci* 180(8):233–284 (abstract)
32. Chikwe J, de Souza AC, Pepper JR (2004) No time to train the surgeons. *BMJ* 328(7437):418–419
33. Dunnington G (2009) Uneven operative experience in surgical training: a call for action. *Ann Surg* 249(5):725–726
34. Makama JG, Ameh EA (2010) Does general surgery clerkship make a future career in surgery more appealing to medical students? *Fr Health Sci* 10(3):292–296
35. Kaderli R, Buser C, Stefanelli U et al (2011) Students' interest in becoming a general surgeon before and after a surgical clerkship in German-speaking Switzerland. *Swiss Med Wkly* 15(141):w13246
36. Al-Heiti KN, Nassar AK, Decorby K et al (2012) The effect of general surgery clerkship rotation on the attitude of medical students towards general surgery as a future career. *J Surg Educ* 69(4):544–549
37. Antiel RM, Thompson SM, Camp CL et al (2012) Attracting students to surgical careers: preclinical surgical experience. *J Surg Educ* 69(3):301–305 (Epub 2011 Nov 11)
38. Gargiulo DA, Hyman NH, Hebert JC (2006) Women in surgery—do we really understand the deterrents? *Arch Surg* 141:405–408
39. Ravindra P, Fitzgerald JE (2011) Defining surgical role models and their influence on career choice. *World J Surg* 35(4):704–709
40. Richardson HC, Redfern N (2000) Why do women reject surgical careers? *Ann R Coll Surg Eng* 82((Suppl)):290–293
41. McNally SA (2008) Competition ratios for different specialties and the effect of gender and immigration status. *J Roy Soc Med* 101:489–492
42. McHugh SM, Corrigan MA, Sheikh A et al (2011) A study of the factors influencing school-going students considering medical careers. *Surgeon* 9(4):191–194