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Time Out of General Surgery Specialty Training in the UK: A National Database Study

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OBJECTIVE: General surgery specialty training in the United Kingdom takes 6 years and allows trainees to take time out of training. Studies from the United States have highlighted an increasing trend for taking time out of surgical training for research. This study aimed to evaluate trends in time out of training and the impact on the duration of UK general surgical specialty training.

DESIGN, SETTING, AND PARTICIPANTS: A cohort study using routinely collected surgical training data from the Intercollegiate Surgical Curriculum Program database for General surgery trainees registered from August 1, 2007. Trainees were classified as Completed Training or In-Training. Out of training periods were identified and time in training calculated (both unadjusted and adjusted for out of training periods) with a predicted time in training for those In-Training.

RESULTS: Of the trainees still In-Training (n = 994), a greater proportion had taken time out of training compared with those who had completed training (n = 360; 54.5% vs 45.9%, $p < 0.01$). A greater proportion of the In-Training group had undertaken a formal research period compared with the Completed Training group (35.1% vs 6.1%, $p < 0.01$). Total unadjusted training time in the Completed Training group was a median 6.0 (interquartile range 6.0-7.0) years compared with a predicted unadjusted training time in the In-Training group, with an out of training period recorded, of a median 8.0 (interquartile range 7.0-9.0) years.

CONCLUSIONS: Trainees are increasingly taking time out of surgical training, particularly for research, with a subsequent increase in total time of training. This should be considered when redesigning surgical training programs and planning the future surgical workforce. (J Surg Ed 76:55–64. © 2018 The Authors. Published by Elsevier Inc. on behalf of Association of Program Directors in Surgery. This is an open access article under the CC BY-NC-ND license. (http://creativecommons.org/licenses/by-nc-nd/4.0/))

KEY WORDS: Program design, Fellowships, Research, Academic training, Surgical workforce, Residency

COMPETENCIES: Systems-Based Practice, Professionalism, Medical Knowledge

INTRODUCTION

Surgical training worldwide varies dramatically.[1] Many countries have curricula that are designed to include, alongside the essential clinical skills training, a period of research. The United States has no single standardized requirement for research during general surgery residency training with individual training programs setting academic requirements.[2] Typically, US medical school graduates choosing to pursue a career in general surgery will spend 5 years in general surgery training with the option of taking additional time for research and subspecialty training in the form of fellowship periods. Ellis et al. reported a rise in the number of general surgery trainees taking time out for research in the United States with an increase in the proportion of trainees undertaking more than 1 year for research from 9.8% between 1990 and 1999 to 22.4% between 2000 and 2009.[3] In addition, Robertson et al.'s 2006 survey of USA general surgery program directors reported a mean research fellowship duration of 1.7 years (in those residents who had undertaken research) with 52% of residents spending 2 years

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on a research fellowship.[2] These changes have resulted in an extension to training, meaning many trainees do not become independent practitioners until a decade after graduation.[2]

In contrast, general surgery training in the United Kingdom is divided into 3 training phases with competitive application via a national selection process for entry to each phase. New UK medical school graduates undertake 2 years of generic training, termed "Foundation Training."[4] This is followed by 2 years of early surgical training, termed "Core Surgical Training" prior to commencing 6 years of General Surgery Specialty Training.

General surgery training in the United Kingdom is a single program of training, with work-based assessments, exams, and additional requirements to be met prior to completion of training.[5,6] Trainees may choose to take time out of training for research, training in another area or for parental leave.[7] Taking time out of training for research in the United Kingdom would usually be for a minimum of a 2-year period.[7] Time out of training in the United Kingdom can be taken at any time after completion of the first year of specialty training and can be considered akin to US mid-training fellowship periods.

Within UK general surgical training, trainees are expected to meet minimum academic standards which include publishing 3 peer-reviewed publications and presenting at 3 international meetings by completion of training.[6] These academic requirements are likely to remain in some form in any new curricula.[8-10] Trainee involvement in surgical research collaboratives [11-15] has increased interest in surgical research amongst trainees.[16-18] Furthermore, there is support for the inclusion of clinical trial involvement within surgical training.[19-22] Thus far, there has been no formal assessment of these drivers on time out of training for research in UK surgical training and its impact on training duration.

Study Aims

This study aimed to quantify the number of UK general surgery trainees taking time out of training, the types of out of training periods (e.g., research, additional training, or parental leave), the duration of such time periods, and to assess the impact of out of training periods on the time taken to complete general surgery specialty training.

METHODS

Data Sources and Management

This study used routinely collected data from 2 UK national surgical training databases—the Intercollegiate Surgical Curriculum Program (ISCP) and the Joint Committee on Surgical Training (JCST) Surgeons Information Management System (SIMS) database. These databases are mandatory for all surgical trainees and hold complete training records for all trainees registered for specialty training in the United Kingdom.

ISCP database

The ISCP is an online surgical training management system that was launched in 2007 as a personal record for surgeons in training.[5] Demographic information relating to both the trainee and their placements for training is inputted by trainees and validated by the trainee's Training Program Director.

JCST SIMS database

The JCST holds records for trainees, which include a start of training date, any type of absence from training with start and end date of the absence period, a categorized reason for absence (e.g., research, parental leave), and a predicted completion of training date. Upon entry to the training program, a predicted completion of training date is created based on a standard 6 years of training and is updated if a trainee has a period of absence from training or trains less than full time.

The data from the two databases were linked using the unique identifier General Medical Council number and then anonymized by the ISCP data manager. All data management and analysis were performed using Stata 14 (Statacorp, Texas).

Study Population

This consisted of all General Surgery trainees registered for specialty training from August 1, 2007 in the United Kingdom until June 1, 2016. The start date of training was defined from data in both the JCST SIMS (registered start of specialty training date) and ISCP (start of ST3 placement date) databases. Training start dates were assessed for accuracy and corrected to reflect the start of specialty training in erroneous cases. The end of follow-up was defined as the date a trainee was recommended for certificate of completion of training in the JCST SIMS database or the end date of the trainee's last completed whole stage of training before or on June 1, 2016 in the ISCP database for those still in training.

Trainees were excluded if it was not possible to calculate an accurate start of training date; those who left training; and any trainees who had completed less than 0.9 years of training (i.e., had not completed a single full stage of training).

Statistical Analysis

Two groups were defined; those who had completed training (Completed Training) and those still in training

(In-Training). Basic demographics were quantified for both groups using summary statistics.

Analysis of time spent out of training

The proportion of trainees taking time out of training, type of out of training period, and time taken out of training were quantified and compared between the Completed Training and In-Training groups. Sick leave, exceptional leave, and career break categories were grouped together to prevent the reporting of data below the level of 5 individuals. Variation by gender and region of training was assessed. Proportions were compared using chi-squared, Mann-Whitney U test, and Z test where appropriate and statistical significance taken at $p < 0.05$.

A standardized comparison between the In-Training and Completed Training groups was made by analyzing the proportion of trainees taking time for research in the first 3 years of training only for both groups. The first 3 years of data were used following the observation during analysis that the majority of research periods were taken within the first 3 years of specialty training and to enable a standardized time comparison between the two groups.

Analysis of total time spent in training

An unadjusted total time in training was calculated as the time from the start of training date to either the date the trainee completed training or the end date of the last completed placement for the Completed Training or In-Training groups, respectively. Following definition of periods out of training which did not count toward training time (all periods except those categorized as for additional training), an adjusted time in training was calculated for the Completed Training group by excluding these time periods from total training time. Variation in adjusted and unadjusted total training time was assessed by gender and region.

A predicted unadjusted total time in training was calculated for the In-Training group as time from the start of training date to the JCST predicted date for completion of training and included all out of training periods undertaken to date. Total unadjusted time in training in the Completed Training group was compared with the predicted unadjusted total time in training in the In-Training group.

Study Approvals

This study was performed as part of a wider research study and had ethical approval from the University of Nottingham research ethics committee (J08122015 SoM EPH) and permission from the ISCP data group.

RESULTS

Cohort Definition and Demographics

There were 1603 trainees with data available following linkage of the datasets. A total of 249 trainees (15.5%) were excluded from the analysis with 74 trainees (4.6%) with no defined start of training. A further 131 trainees (8.2%) were excluded who had completed less than a single year of surgical training (Fig. 1).

Of the 1354 trainees in the final cohort, 360 trainees (26.6%) had completed training and 994 trainees (73.4%) remained in training. In total, 434 trainees were female (32.1%) and 920 (67.9%) were male (Table 1). The median age at start of specialty training was 30.8 years (interquartile range [IQR] 29.4-33.1 years) in the Completed Training group compared with 30.3 years in the In-Training group (30.3, IQR 28.8-32.5 years; $p < 0.01$).

Out of Program Periods

There were 961 out of program episodes taken by a total of 708 trainees (52.3%). Of the trainees who had completed training, 165 (45.8%) had taken at least 1 out of training period. Comparatively, more of the In-Training group (n = 543, 54.6%) had taken at least 1 out of training period ($p < 0.01$; Table 1). The total time taken out of training in the Completed Training group, for those who had undertaken a period out of training, was a median of 1.0 year (IQR 0.6-1.2 years). The total time taken out of training in the In-Training group, for those who had undertaken a period out of training, was a median of 2.0 years (IQR 1.2-3.0 years, $p < 0.01$; Table 2). A greater proportion of female trainees had undertaken any period out of training than male trainees in both the Completed Training and In-Training groups (64.9% of females vs 40.6% of males in Completed Training group, $p < 0.01$; 61.9% of females vs 50.6% of males in In-Training group, $p = 0.01$). This was due to female trainees taking parental leave in addition to other out of training periods whereas fewer than 5 male trainees had a period of formal parental leave recorded. Parental leave had been taken by fewer trainees who had completed training (5.8%) compared with the In-Training group (11.7%, $p < 0.01$). The median total time spent out of program for parental leave was 0.8 (IQR 0.6-1.1) years in the Completed Training group compared with a median 1.0 (IQR 0.8-1.7) years in the In-Training group ($p < 0.01$).

Of those who had completed training, 31.1% had taken time away from training for a further period of formal training with 96.4% of the additional training episodes occurring during the last 3 years of training (Table 2). The median time taken for additional training periods in the Completed Training group was 0.8 years (IQR 0.5-1.0 years). There was no difference in the proportion of male

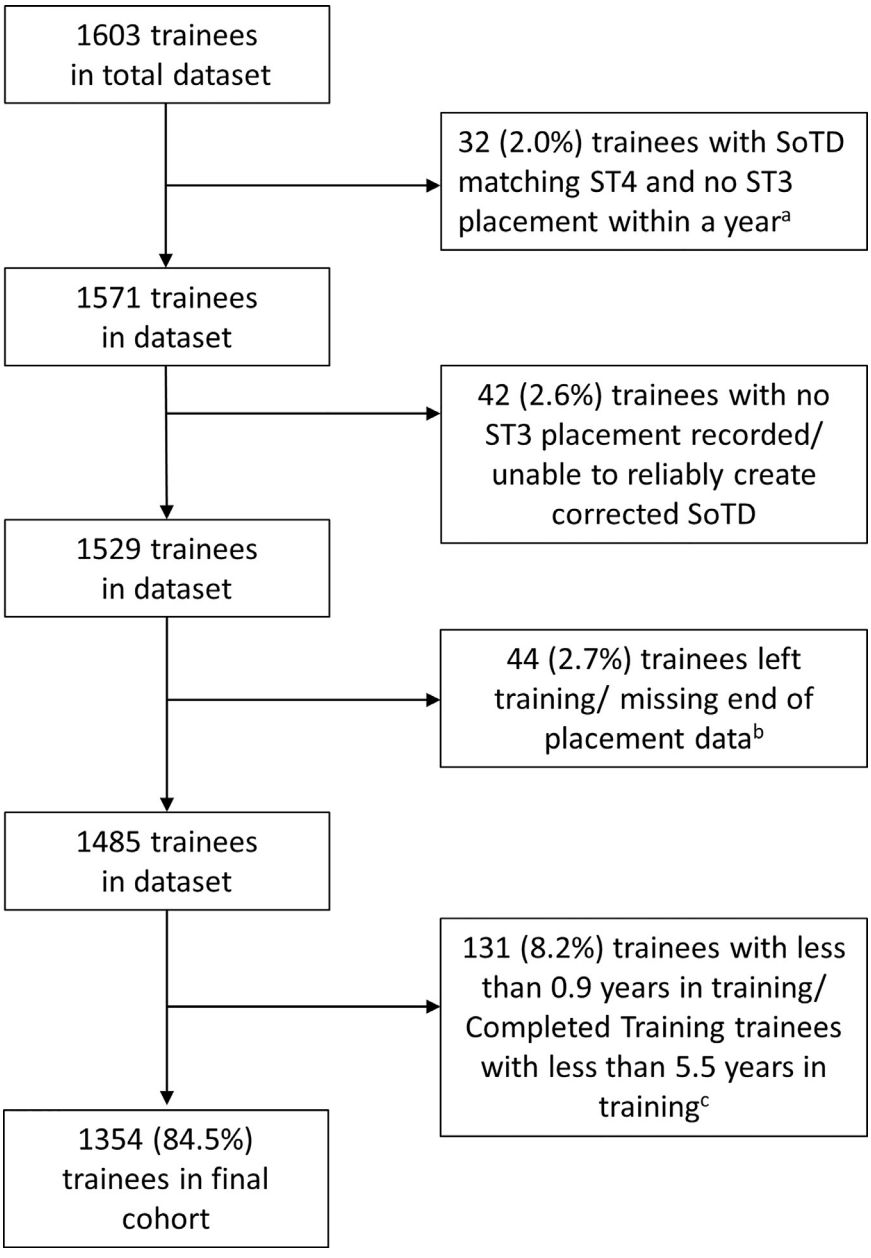

FIGURE 1. Flow diagram for exclusion of trainees from the dataset Abbreviations: SoTD = start of training date. % = % of original dataset. (a) Not possible to accurately set a corrected start of training date reflective of ST3 start date. (b) Unable to set an end of cohort date with missing end of placement data, (n < 5). (c) CCT trainees appear to be Calman trainees transferred in to ISCP system but without complete training records for duration of specialty training and less than 5.5 years unadjusted training time, (n < 5).

and female trainees undertaking additional periods of training in those who had completed training ($p = 0.5$).

The proportion of trainees taking time out of training ranged widely between regions from 29.6% in the Kent, Surrey, and Sussex deanery to 65.1% in the Thames Valley deanery ($p < 0.01$; Fig. 2).

Out of program research

A greater proportion of trainees in the In-Training group had taken time out of training for research compared with the trainees in the Completed Training group (35.1% vs. 6.4 %, $p < 0.01$). The duration of time taken out of training for research was unimodal in the Completed Training group with 13 trainees (59.1%) taking 2 years for research. The duration of time taken out of training for research was bimodal in the In-Training group with 146 trainees (41.8%) taking 2 years and 119 trainees (34.1%) taking 3 years.

There was no difference between the proportion of male and female trainees taking time out of training for

TABLE 1. Demographics and Training Region of the Trainees Who had Completed Training, Trainees Remaining in Training and Total Dataset

	Completed training group (n = 360)	In-Training group (n = 994)	Total dataset (n = 1354)
Males n (%)	283 (78.6)*	637 (64.1)†	920 (67.9)‡
Females n (%)	77 (21.4)*	357 (35.9)†	434 (32.1)‡
Age at start of training, years Median (IQR)§	30.8 (29.4-33.1)§	30.3 (28.8-32.5)	30.4 (28.9-32.6)§
Total adjusted time in training, years Median (IQR)	6.0 (6.0-6.5)	3.0 (2.0-4.3)	4.0 (2.0-6.0)
Total unadjusted time in training, years Median (IQR)	6.0 (6.0-7.0)	7.0 (6.0-8.5)‖	-
Number of out of training periods taken			
0 (n (%))	195 (54.2)*	451 (45.4)†	646 (47.7)‡
1 (n (%))	121 (33.6)*	398 (40.0)†	519 (38.3)‡
2 or more (n (%))	44 (12.2)*	145 (14.6)†	189 (139.6)‡
Region			
Health Education East Midlands n (%)	22 (6.1)*	68 (6.8)†	90 (6.6)‡
Health Education East of England n (%)	13 (3.6)*	43 (4.3)†	56 (4.1)‡
Health Education Kent, Surrey and Sussex n (%)	0	44 (4.4)†	44 (3.2)‡
Health Education London (combined) n (%)	66 (18.3)*	212 (21.3)†	277 (20.5)‡
Health Education North East n (%)	36 (10.0)*	47 (4.7)†	83 (6.1)‡
Health Education North West n (%)	30 (8.3)*	112 (11.2)†	142 (10.5)‡
Health Education South West n (%)	29 (8.1)*	70 (7.0)†	99 (7.3)‡
Health Education Thames Valley n (%)	11 (3.1)*	32 (3.2)†	43 (3.2)‡
Health Education Wessex n (%)	12 (3.3)*	51 (5.1)†	62 (4.6)‡
Health Education West Midlands n (%)	17 (4.7)*	76 (7.6)†	93 (6.9)‡
Health Education Yorkshire and the Humber n (%)	43 (11.9)*	69 (6.9)†	112 (8.3)‡
NHS Education for Scotland (combined) n (%)	46 (12.8)*	114 (11.5)†	160 (11.8)‡
Northern Ireland Medical and Dental Training n (%)	19 (5.3)*	19 (1.9)†	38 (2.8)‡
Wales n (%)	16 (4.4)*	39 (3.9)†	55 (4.1)‡

IQR = interquartile range.
n = 47 had missing data.
* =% of Completed Training group.
† = % of In-Training group.
‡ = % of total cohort.
§ = only trainees with valid date of birth data included in analysis.
‖ = predicted total unadjusted time in training.

research in those who had completed training (p = 0.7). However, in the In-Training group, a higher proportion of males (38.3%) had undertaken research out of training compared with female trainees (29.7%, p < 0.01; Table 2). The proportion of trainees taking time out of training for research varied widely from 13.2% in Northern Ireland to 41.9% in the West Midlands (p < 0.01; Fig. 2).

When the total time in training was standardized to the first 3 years of training for both groups, the difference in proportion of trainees taking time out of training for research was accentuated with 3.6% of those who had completed training undertaking research periods compared with 24.3% of the In-Training group (p < 0.01).

Time in Training

Completed training group

The unadjusted total time in training for those who had completed training was a median of 6.0 years (IQR 6.0-7.0; range 5.7-9.3 years). The unadjusted total time in training was higher for females in this group with a median of 6.5 (IQR 6.0-7.3) years compared with a median of 6.0 (IQR 6.0-6.9) years for the male trainees who had completed training (p = 0.01).

The adjusted total time in training for the Completed Training group remained a median of 6.0 (IQR 6.0-6.5) years following exclusion of appropriate out of training periods (Table 1). When out of training periods had been excluded, there was no difference between male and female trainees or by region in the total time spent in training (p = 0.9 and p = 0.3, respectively).

In-Training group

The predicted unadjusted total time in training was a median of 7.0 (IQR 6.0-8.5) years for the In-Training group. When this was limited to those who had already undertaken a period out of training, the predicted unadjusted total time in training increased further to a median of 8.0 years (IQR 7.0-9.0 years). The predicted unadjusted total time in training did not vary between male

TABLE 2. Number of Trainees and Time Taken for Different Types of Out of Training Period

Completed Training group

Type of out of training period	Males (n = 283)		Females (n = 77)		Total (n = 360)	
	Number of trainees (%)	Total time taken, years (IQR)	Number of trainees (%)	Total time taken, years (IQR)	Number of trainees (%)	Total time taken, years (IQR)
Research	†	2.0 (1.0-2.1)	<5	-	22 (6.1)‡	2.0 (1.0-2.1)*
Training	86 (30.4)	0.8 (0.5-1.0)	26 (33.8)	1.0 (0.5-1.0)	112 (31.1)‡	0.8 (0.5-1.0)
Experience	26 (9.2)	0.5 (0.5-1.0)	6 (7.8)	0.7 (0.5-1.0)	36 (10.0)	0.7 (0.5-1.0)
Parental leave	<5	-	†	0.8 (0.6-1.1)	21 (5.8)‡	0.8 (0.6-1.1)*
All out of training types combined	115 (40.6)	1.0 (0.5-1.2)	50 (64.9)	1.0 (0.6-1.5)	165 (45.9)‡	1.0 (0.6-1.2)*

In-Training group

Type of out of training period	Males (n = 637)		Females (n = 357)		Total (n = 994)	
	Number of trainees (%)	Total time taken, years (IQR)	Number of trainees (%)	Total time taken, years (IQR)	Number of trainees (%)	Total time taken, years (IQR)
Research	243 (38.1)	2.4 (2.0-3.0)	106 (29.6)	2.0 (2.0-3.0)*	349 (35.1)‡	2.0 (2.0-3.0)*
Training	51 (8.0)	1.0 (0.5-1.0)	31 (8.7)	1.0 (0.5-1.0)	82 (8.2)‡	1.0 (0.5-1.0)
Experience	47 (7.4)	1.0 (1.0-1.0)	32 (9.0)	1.0 (1.0-1.0)	79 (7.9)	1.0 (1.0-1.0)
Parental leave	<5	-	†	1.0 (0.8-1.7)	117 (11.7)‡	1.0 (0.8-1.6)*
All out of training types combined	322 (50.5)	2.0 (1.5-3.0)	221 (61.9)	2.0 (1.0-3.0)	543 (54.6)‡	2.0 (1.2-3.0)*

† = not reported to protect anonymity <5 = fewer than 5 trainees.
‡ = $p < 0.01$, chi-squared test.
* = $p < 0.01$, Wilcoxon rank sum test. All statistical comparisons are between the Completed Training and In-Training groups.

and female trainees who had already undertaken a period out of training in the In-Training group.

DISCUSSION

This study has quantified the number of UK general surgery trainees taking time out of training, the types of out of training periods, and the duration of such periods. This study has demonstrated a changing trend in taking time out of UK general surgery specialty training, particularly for research. This is evidenced by the greater proportion of In-Training trainees taking time out of training for research compared with those who had completed training. Furthermore, the proportion of trainees undertaking formal research periods in the In-Training group may still be under reported in this study as some trainees in the analysis may go on to take time out of training for research in the future course of their specialty training. This research trend is further evidenced by the marked difference in the proportion of trainees taking time out of training for research when training time was standardized to the first 3 years of training in both cohorts. Not only are more trainees taking time out of training for research, but they are tending to take longer away from training, resulting in up to 2 years additional total time in specialty training for a large proportion of trainees.

This is the first study to utilize linked ISCP and JCST data to form a large, representative cohort of general surgery trainees from a single country. This has allowed accurate ascertainment of training start dates and periods of time out of training. Inevitably, small errors in data entry and measurement of time may still be present. The regional variation in the number of trainees taking time out of training highlights the necessity of national data use in our study. Reporting single region data could be misleading whereas we have been able to provide a more representative view of training time in the United Kingdom. Prior studies in the United States have either focused on single region data or relied on self-reported questionnaires which may be prone to bias. This study excluded a small proportion of trainees (4.6%) from the original dataset owing to inability to define when trainees started specialty training. However, the exclusion of this small group of trainees with nonstandard training has made the findings more representative of standard

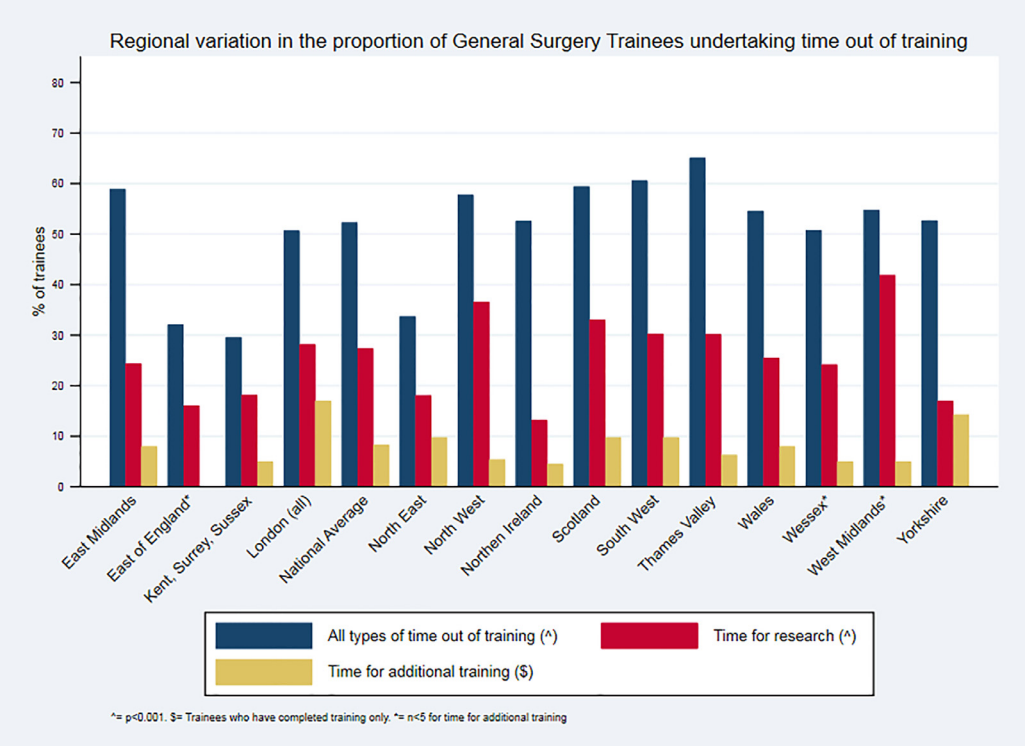

FIGURE 2. Regional variation in the proportion of General Surgery Trainees undertaking time out of training ^ = $p < 0.001$. $ = trainees who have completed training only. * = $n < 5$ for time for additional training.

UK surgical training. The authors acknowledge that trainees may have undertaken formal research periods prior to commencing specialty training rather than during the course of specialty training, thus biasing the findings of this study. National data to support this suggestion do not exist, thus it is not possible to quantify how many of the trainees in the Completed Training group had undertaken formal research prior to commencing specialty training. However, carrying out research prior to specialty training does not affect the duration of specialty training or workforce planning issues resulting from taking time out of a specialty training program.

Previous studies of surgical training have been small or restricted to nonrepresentative samples or have not quantified research training periods. For example, Thomas et al. studied 155 trainees who had completed training between November 2012 and December 2013 using trainee CVs and ISCP data.[23] They described a median total training time for their cohort of 6 years (range 5.25-11.75 years) with female trainees taking longer to train (median 7.1 years, range 5.9-11.75 years).[23] However, the authors did not describe time out of training or report adjusting for such time periods. Allum et al. studied the electronic operative logbooks and logbook consolidation sheets of 58 general surgery trainees applying for completion of training in 2010 and 2011.[24] They reported a mean total of 6 years (range 4.8-7.25 years) in general surgery training but excluded trainees who had taken time out of training. The use of JCST data, description of out of training periods, and the exclusion of out of training periods not counting toward training time have improved the reflection of time in training in our study.

Our findings show that the distribution of time spent in research is similar to that in the United States. A 2006 USA survey of general surgery residency program directors reported that 36% of general surgery residents undertook a research fellowship with a mean duration of 1.7 years. There was a modal distribution of time spent in research with 41% spending 1 year, 52% 2 years, and 27% 3 or more years.[2] In our study, trainees were most likely to undertake a minimum of 2 years of research which is in keeping with UK guidelines that time spent out of training for research should normally be for a higher degree (the minimum time required for such qualifications is 2 years).[7] In contrast to the UK curriculum, USA training programs have variable requirements for research with the Robertson et al. study reporting 126 of 199 programs requiring research time with these requirements varying in nature between full time, part time, and a single research project.[2] A USA study from a single university-based residency program looked at the changing practice of residents undertaking

research fellowships of minimum 1 year duration. It reported a doubling of the proportion of trainees undertaking research from 9.8% between 1990 and 1999 to 22.4% between 2000 and 2009.[3] The authors attributed this rise to the increased research fellowship opportunities available in the later time period. This study is of a single, large training program and may not be representative of the United States, with the proportion of trainees undertaking a research fellowship reported to be comparatively greater at 36% in Robertson et al.'s national survey of program directors.[2]

A desire for an improved work-life balance may also explain the increasing propensity for taking time out of training.[25] A 2017 systematic review investigating the prevalence and causes of attrition in general surgical training reported an attrition rate of 18% with poor lifestyle as the most commonly reported reason for leaving.[26] Formal research was reported in a USA survey to be associated with attainment of specialty training fellowships following completion of residency, which was deemed important in attaining a specialty specific permanent post.[2] This outcome was desirable for an improved work-life balance in a separate survey of general surgery residents' views on career goals.[27] It is also possible that trainees view time out of training as an opportunity to temporarily improve quality of life. Lebares et al. found a burnout prevalence of 69% in their survey of US general surgery residents.[28] Scores for stress and anxiety were significantly lower in those residents undertaking lab research rather than those in clinical training. Therefore, it may be that a desire to take a break from clinical training for work-life balance reasons or perceived improved career prospects following research periods are contributing to trainees increasingly choosing to take time out.

The findings of this study, with an increasing number of trainees taking time out of general surgery specialty training, should be considered by program directors who have responsibility for both delivering the local surgical workforce and meeting trainee needs. The tendency to taking time out of training and its subsequent increase in time in specialty training should be considered when redesigning curricula both in the United Kingdom and United States, where these trends have been identified, and also in other countries to ensure future workforce needs are met in a time of reducing surgical trainee numbers.[29-32]

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OTHER DISCLOSURES

None applicable.

DISCLAIMERS

The funders had no role in the design of the study and the collection, analysis, and interpretation of data and the writing of the article and the decision to submit it for publication. The views expressed in this publication are those of the authors and not necessarily those of the NHS, the National Institute for Health Research, Health Education England or the Department of Health.

ETHICAL APPROVAL

This study has ethical approval from the University of Nottingham research ethics committee (J08122015 SoM EPH) and permissions from the ISCP data group.

ACKNOWLEDGMENTS

This is an original article. No other persons had involvement in the study.

PREVIOUS PRESENTATIONS

None.

SUPPLEMENTARY INFORMATION

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jsurg.2018.06.011.

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