

# The impact of The Royal College of Surgeons of England research fellowship scheme

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## ABSTRACT

**INTRODUCTION** The research fellowship scheme for surgeons in training run by The Royal College of Surgeons of England (RCS) had its 20th anniversary in 2013. A survey was undertaken to assess outcomes of the scheme during those 20 years.

**METHODS** Fellowship recipients were invited to complete an online 20-item questionnaire about their fellowship research and research activities since its completion. The questionnaire covered type of research undertaken, higher research degree enrolment, publications resulting from the fellowship research and subsequent research career.

**RESULTS** Of the 502 RCS fellowship recipients, 361 responded (72%). Their research covered a broad array of topics, Almost two-thirds (62%) undertook laboratory-based research and most of the remainder conducted patient-based clinical research. The vast majority (96%) of respondents had enrolled for a higher degree, with a high completion rate: 91% of fellowship recipients in the first 15 years of the scheme obtained their degree. Of the fellowships from the first 15 years of the scheme, between a fifth and a third of recipients subsequently held an academic position. The median number of peer reviewed articles and presentations per recipient was 3 and 6 respectively. Almost two-thirds (60%) of respondents had obtained funding for further research, with over half of these receiving grants from national research funding bodies.

**CONCLUSIONS** The RCS research fellowship scheme has helped trainee surgeons to undertake research towards the start of their career. Most trainees used RCS fellowships as part of their funding towards a higher degree and this was regularly achieved, along with a number of peer reviewed publications. A significant proportion of fellowship recipients progressed into academic positions in surgery.

## KEYWORDS

Surgery – Royal College of Surgeons of England – Research – Fellowships – Funding

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The Royal College of Surgeons of England (RCS) research fellowship scheme was established in 1993 to give trainees an opportunity to undertake research on an aspect of surgery, initially with one-year fellowship awards.<sup>1,2</sup> Since then, between 20 and 30 one-year fellowships have been offered annually, with the inclusion of a small number of longer awards (typically 2 or 3 years) that have tended to be awarded jointly with other research funding bodies.

Since inception, awards have involved a competitive, peer reviewed process. Applications are invited from RCS fellows and members on surgical topics including basic science research, patient-based clinical projects or research related to surgical training and education. Three external reviewers assess each application; the reviewers take into consideration the quality of the work, suitability of the applicant, facilities in relation to the conduct of the work and academic supervision. As applicant numbers have risen, the highest ranked applicants (usually between 40 and 50) have been invited to a 'poster viva' session, involving six assessors. The College's Academic and Research Board makes a final selection based on the scores from this final assessment. A

research fellowship database was created at the outset. This included the specialty of the recipient from 2001.

In the UK, current surgical training consists of two years of foundation training following graduation from medical school, two years of core training and approximately six years of specialty training (dependent on surgical specialty).<sup>3</sup> There is no restriction on applicants in relation to their stage of training and successful applicants take a break in their training to take up the awards. The fellowships cover the salary of the trainee, training in research methodology and some additional support to cover the costs of related activities (such as attending conferences).

One of the aims of the RCS research fellowship scheme is to encourage more surgical trainees to view research as an important part of their training, and to identify and encourage those who wished to pursue an academic surgical career with a major ongoing commitment to research.<sup>1,2</sup> Between 2000 and 2011, there was a 40% fall in the number of clinical lecturers in surgery (academic surgeons in training) and by 2013 surgeons constituted less than 10% of the overall clinical academic workforce.<sup>4</sup>

In order to review the impact of the scheme, a survey was undertaken of surgeons who had received a fellowship in the previous 20 years. The specific endpoints that might be taken as surrogates for impact were recipients obtaining a higher degree, peer reviewed publications (and the impact factors [IFs] of the journals in which they were published), presentations, receiving subsequent research funding, securing academic clinical appointments and self-reported perceived influence of research on patient care.

## Methods

Each of the surgeons on the RCS database of research fellowship recipients was contacted by email with an invitation to complete an online questionnaire about their fellowship research and their research activities since its completion. The 20-item questionnaire asked recipients about the type of research undertaken, whether they enrolled for a higher research degree and whether this was completed, peer reviewed journal publications arising directly from the fellowship research, oral or poster presentations at national and international conferences resulting directly from their fellowship period, and their subsequent research career (Appendix 1 – available online).

Respondents were asked to give up to three citations relating to their highest IF peer reviewed journal articles. This information was cross-referenced with the 2014 journal IFs (rather than the IFs at the year of publication) as a proxy measure of the importance and originality of the research.

The type of research was categorised as laboratory-based, research on new surgical techniques, research improving quality of care or clinical audit, research on understanding disease incidence and progression, developing a subspecialty interest or 'other' (such as engineering). Subsequent funding sources were categorised as from the UK Medical Research Council, the UK National Institute for Health Research, the Wellcome Trust, another UK national funding body, a local funding body or 'other' (including industry).

Questionnaire responses were collected using a web-based survey tool (<http://www.surveymonkey.com/>). Non-respondents were followed up with two email reminders. Data were analysed using Stata<sup>®</sup> version 11 (StataCorp, College Station, TX, US) using parametric and non-parametric methods and descriptors as appropriate.

## Results

A total of 502 eligible surgeons who had received awards between 1995 and 2013 were contacted, of whom 6 had received 2 fellowships. Questionnaires were completed by 361 individuals (72% response rate) although not all respondents answered all of the questions. Dividing the 20-year period into four 5-year intervals, the response rates from the successive intervals were 68%, 72%, 65% and 83% respectively.

Among the 502 first RCS fellowships, 450 awards (89%) had been for 1 year, 38 (8%) for 2 years and 11 (2%) for 3 years. Just over three-quarters of these awards had been to

men and the ratio of men to women did not change over time (1995–1997: 80%, 2008–2012: 78%).

Among the 326 first fellowship awards since 2001, the largest proportion (39%) went to trainees in general surgery. The distribution of awards by specialty is shown in Table 1. The distributions of fellowship durations and specialties among the 361 survey respondents were similar to those of the whole cohort of recipients (Table 1). The median age of respondents at the start of their fellowship was 30 years (interquartile range [IQR]: 29–32 years), and this was the same for men and women. The majority (82%) of those aged under 30 years had not started specialty training when they began their fellowship. Conversely, 81% of respondents aged 32 years or over at the time of award were in specialty training. Overall, 58% began their fellowship before the start of specialty training.

### Research activity during the fellowship

Almost two-thirds (62%) of the respondents undertook laboratory-based basic research while 17% described their research as being on new surgical techniques or practice that directly involved patients. Research focused on epidemiology and improving quality of care formed a minority of projects, accounting for 5% and 4% of fellowship awards respectively.

**Table 1** Distribution of fellowships among recipients and survey respondents

	All recipients	Respondents
<i>Total fellowships awarded</i>	502	361
Men	390 (78%)	275 (76%)
Women	112 (22%)	86 (24%)
<i>Duration of first award</i>		
1 year	450 (90%)	323 (89%)
2 years	38 (8%)	32 (9%)
Other	14 (3%)	6 (2%)
<i>Specialty*</i>	(n=326)	(n=240)
General surgery	128 (39%)	93 (39%)
Urology	43 (13%)	32 (13%)
Plastic surgery	36 (11%)	22 (9%)
Trauma and orthopaedics	35 (11%)	25 (10%)
Otolaryngology	32 (10%)	28 (12%)
Paediatric surgery	17 (5%)	14 (6%)
Neurosurgery	16 (5%)	12 (5%)
Cardiothoracic surgery	12 (4%)	9 (4%)
Oral and maxillofacial surgery	7 (2%)	5 (2%)
*Known for awards after 2000		

The remaining 12% of projects covered a broad array of topics.

Almost all respondents (96%) enrolled for a higher degree around the same time as their fellowship. Over the 20-year period, enrolment for a higher degree increased, as did the proportion of trainees choosing to undertake a PhD. This has now become the most common degree for which fellowship recipients enrol (Table 2). The higher degree completion rate has been very high. For those awarded a fellowship in the first 15 years of the scheme, 91% of respondents had obtained their degree. Among respondents who received their

fellowship after 2007, 37% had completed a degree and 61% were still enrolled (Table 2).

The majority of respondents reported that the research undertaken during the fellowships had led to peer reviewed publications and conference presentations. Overall, the median number of peer reviewed articles per fellowship was 3 (IQR: 2–5) while the median number of oral or poster presentations at national and international conferences resulting directly from their fellowship period was 6 (IQR: 3–10). The number of publications tended to be higher among those respondents who had received their fellowship earlier

Question	Year fellowship awarded			
	1993–1997	1998–2002	2003–2007	2008–2012
<i>Have you enrolled for a higher degree? (n=358)</i>				
No	10	3	1	1
Yes	84	80	86	93
MD / DM	62%	65%	42%	30%
PhD / DPhil	21%	29%	53%	70%
MS / MChir / MPhil / MSc	17%	6%	5%	0%
<i>Have you obtained a degree? (n=361)</i>				
No, never submitted	7%	8%	0%	0%
No, ongoing	0%	3%	6%	62%
Yes	93%	90%	94%	38%
<i>Publications directly related to your fellowship research? (n=341)</i>				
No	4	2	1	16
Yes	86	73	83	76
Median number for those answering 'yes':				
Peer reviewed papers	4 (IQR: 2–6)	3 (IQR: 2–5)	3 (IQR: 2–5)	2 (IQR: 1–4)
National or international conference presentations (oral or poster)	9 (IQR: 4–12)	6 (IQR: 4–10)	5 (IQR: 3–10)	4 (IQR: 3–8)
<i>What is your current position? (n=361)</i>				
Professor / reader / senior lecturer	22%	8%	5%	1%
Consultant	74%	81%	32%	3%
Registrar	1%	7%	49%	73%
Lecturer / academic clinical fellow	0%	2%	13%	7%
Clinical research fellow	1%	0%	1%	16%
Other	1%	1%	1%	0%
<i>Do you wish to pursue a career in academic medicine? (n=337)</i>				
Yes, I already have an academic position	32%	22%	28%	16%
Yes, I hope to get an academic position	10%	20%	42%	80%
No	58%	58%	29%	4%
IQR = interquartile range				

in the scheme's history (Table 2), with 97% of those awarded a fellowship in the first 15 years having at least one publication that was directly related to their fellowship.

Respondents supplied information on 527 scientific articles (limited to a maximum of 3 citations per respondent). Among the 523 articles for which the IF could be determined, the median IF was 4.1 (IQR: 2.9–5.6). The three most common journals were the *British Journal of Surgery* (IF 5.542,  $n=38$ ), the *British Journal of Cancer* (IF 4.836,  $n=22$ ), and the *Journal of Bone and Joint Surgery (British Volume)* (IF 3.309,  $n=14$ ). A small number of articles appeared in very high ranking journals with IFs over 30: *The Lancet* (IF 45.217,  $n=5$ ), *Nature Nanotechnology* (IF 41.514,  $n=1$ ), *Nature Materials* (IF 36.503,  $n=1$ ) and *Science* (IF 33.611,  $n=1$ ).

### Subsequent career and research activity

Two-thirds (67%) of respondents obtained funding after their fellowship to continue their research (Fig 1). The funding was received from a variety of sources. Twenty per cent had obtained a grant from the Medical Research Council or National Institute for Health Research while eleven per cent had been supported by the Wellcome Trust; these grants are awarded on a competitive basis. The majority of respondents, however, obtained research funds from other national charities (eg Cancer Research UK) (26%), local funding bodies (53%) and other sources (eg pharmaceutical, medical device manufacturers) (32%).

Among those respondents who received their award in the first ten years of the fellowship scheme, 93% had become consultants (Table 2). In addition, nearly 30% of the 239 respondents from the first 15 years of the scheme are currently in academic posts, with 17 at professorial level.

Overall, about a third of respondents did not wish to pursue a career in academic surgery with a major commitment to research although this varied depending on the respondent's stage of career (Table 2). Among the 123 respondents who did not wish to pursue an academic career, common reasons were no interest in research (16%), financial

reasons (15%), geographical reasons (14%) and time constraints (18%). Three respondents reported that they were no longer working in surgery.

Half (49%) of the respondents believed that the research carried out during their fellowship had a direct impact on patient care. Respondents provided supporting evidence, citing results being incorporated into guidelines, the adoption of new clinical practices or the development of commercially available medical devices. The proportion of respondents who believed their research had been beneficial was lower among those doing laboratory research (44%) compared with other types of research (68%). The fellowship scheme was also considered by respondents to have been beneficial in other ways, with 99% believing that it gave them better personal understanding of research methods and 90% feeling more capable of applying research evidence in clinical situations.

### Discussion

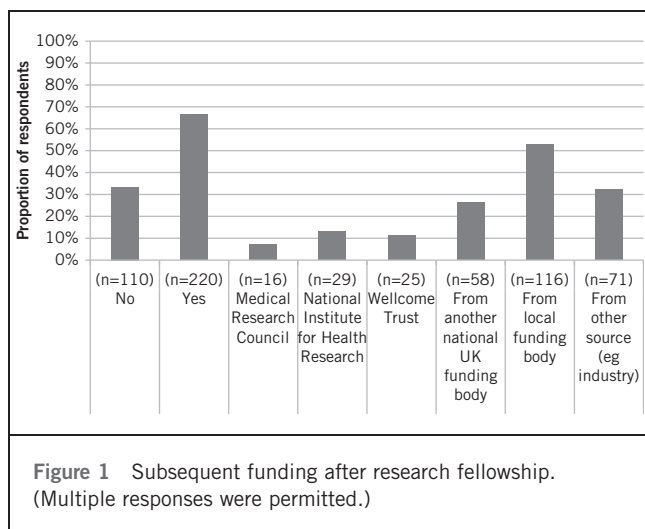
The results of this survey demonstrate that after 20 years, the research fellowship scheme has had a significant positive impact on research output and subsequent careers. A high proportion of research fellows completed higher degrees and published work in peer reviewed journals. It appears that the fellowship scheme has facilitated both clinical and academic career progression for the recipients, with 60% subsequently securing further funding for ongoing research.

A survey of research fellows after the first ten years of the scheme reported that the fellowships had created opportunities for trainee surgeons to undertake novel research that led to higher degrees and articles in high impact journals.<sup>2</sup> Recipients were also successful in obtaining research funds from national bodies. In the present survey, about two-thirds of the respondents declared an intention to pursue a career in academic surgery, compared with about half when analysed ten years previously.<sup>2</sup> Similarly, about half of the respondents in the present study felt that their work had had a direct impact on patient care, compared with about a third at the time of the scheme's tenth anniversary.<sup>2</sup>

These apparent improvements may simply be a reflection of the time that has passed, allowing the outcome of previous research to have been translated successfully for patient benefit. A further contributor could be the nature of studies that are receiving funding, with a move towards more studies directly involving patients or laboratory-based projects with high translational potential being selected and undertaken.

The positive responses from fellowship recipients need to be placed in the context of the overall level of surgical research in the UK. In the field of academic cancer surgery, the level of concern was such that a 2008 article described the UK academic cancer surgeon as 'an endangered species'.<sup>5</sup> In 2010 it was also noted that less than 2% of the UK's medical research funding is awarded to surgery-based projects.<sup>6</sup>

There has, however, been a recent upturn in the number of clinical academics in surgery. Between 2011 and 2013, the



number increased by 12.1% (compared with a 0.9% fall in clinical academics across all specialties), with a 54.8% increase in surgical clinical lecturers in this time period.<sup>4</sup> Surgical representation in clinical academia has remained stable (at less than 10%) since 2000 while hospital physicians comprise 39%.<sup>4</sup> In the UK, the integrated academic pathway<sup>7</sup> has been an assertive step forward in securing the position of academic clinical practice, with similar proposals under consideration in the US.<sup>8</sup>

While the majority of the RCS research fellowships are one year in duration, a small proportion are for two or three years, usually as joint awards with other bodies. This raises the question as to whether one year of research funding is adequate. One-year fellowships appear to act as a springboard to other funding and despite their duration, research fellows seem to derive a considerable benefit, both in terms of objective scientific output and transferable skills.

The limitations of this study include the response rate, which was 72%. The characteristics of the respondents matched the characteristics of the research fellows as a whole. This study may be subject to expectation bias. Furthermore, no information is available for surgeons who did not receive a research fellowship to compare their careers and academic outputs.

The RCS has continued to play a significant role in the funding and delivery of surgical research. Current recommendations are that funding should be directed primarily towards clinical and translational research, with fellowships awarded on a competitive basis and to named individuals

rather than to institutions. The fellowship scheme is designed to run in parallel with the RCS clinical research initiative.<sup>9</sup> While the latter involves clinical trials and the evaluation of novel technologies and devices, it is anticipated that an increasing number of surgical trainees will use these projects as vehicles for their fellowship research.

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