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Career Track of Society of University Surgeons Resident Research Award Recipients

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Abstract

Background—Society of University Surgeons (SUS) has an ongoing competitive funding program to support research training for residents. We sought to determine the career track of award recipients.

Methods—SUS resident awardees who completed awards from 1989-2007 were included in the study. Characteristics of awardees and their academic productivity were extracted from curriculum vitae provided by awardees (n=24), or from online sources (n=7).

Results—The awardees spent an average of 2.7 years (range 1-4) of dedicated research time during residency. Awardees averaged 9.8 publications (range 1-32) with 5.4 as first author (range 1-17) with their mentor within three years of award completion, with an average maximum impact factor of 5.7. Twenty-five residents (81%) pursued fellowships. At an average follow-up of 11.4 years (range 4-22) from end of the award, and 7.2 years (0-18) from end of their clinical training, the awardees had an h-index of 14.5 (2-48). At the time of the study, 26 awardees (84%) were in

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academic surgery. Of the 23 awardees that had completed surgical training three years earlier or more, 11 (48%) received independent research funding, of which 7 (30%) received R01 or equivalent funding.

Conclusions—The SUS resident research awardees had a very productive research experience. Although our retrospective study cannot determine causation, the SUS award mechanism delivers on its promise of supporting junior surgeon-scientists that pursue academic careers and establish independent research programs. Further studies are needed to determine how rates of subsequent independent research funding can be improved.

Keywords

Career track; Research Award; H-index; SUS

Introduction

The Society of University Surgeons (SUS) was established in 1938 with a mission to encourage the pursuit of original investigations in the laboratory and in the clinic, to further the development of methodologies involved in graduate teaching of surgery to residents, and to serve as a platform where there is a free and informal exchange of ideas amongst the members.¹ Since its inception, SUS has grown in size and stature, to the point that it is now generally recognized as one of the world's premier organizations dedicated to the advancement of surgical science. SUS members have served at the highest echelons of surgery and have played crucial roles in virtually all of the critical developments within the field of modern surgery, from the most basic scientific breakthroughs to the technological advances used at the bedside and in the operating room.

The Ethicon-SUS Research Fellowship was established in 1987 with the goal of fostering, stimulating, and facilitating the training of surgeon-scientists.² From its inception, the awards have been given through a highly competitive application mechanism to surgical residents in any discipline who agree to spend one to two dedicated years of research time in the laboratory of a SUS research mentor. The applications were formally reviewed by the SUS Scholarship Committee, and finalists were invited for an interview at the Annual Meeting of the American College of Surgeons each year. The applicants were chosen based on the strength of the applicant, mentor as well as the potential of the research project. Applicants were encouraged to publish their findings in peer-reviewed journals. The Ethicon-SUS Research Fellowship also heavily emphasized establishing careers in academic surgery. In order to gain insight into the impact of providing early research opportunities to surgical trainees, we sought to determine the career track of Society of University Surgeons (SUS)/Ethicon Resident Research award recipients.

Methods

The characteristics of Ethicon-SUS Resident Research Awards, and academic outcomes were assessed for all recipients who received awards between the years of 1987-2007. Awardees' Curriculum Vitae (CV) (N=24) and online sources (N=7) were reviewed. We recorded awardee characteristics at initiation of award, residency research time productivity,

and trainee outcome. This study was approved by the MD Anderson Cancer Center Institutional Review Board.

Characteristics at initiation of award included undergraduate, medical school and residency institutions, as well as number of publications at initiation of award. Undergraduate college rankings were determined by US News & World Report (<http://www.usnews.com/rankings>) while medical schools and residency institutions rankings were determined based on National Institute of Health research funding.³

Productivity was determined from the CVs of the awardees. If CV was not provided, we used online sources e.g. PubMed. We determined journal impact factor using Journal Citation Reports (Thomson Reuters, New York, NY). We determined the Hirsch index (h-index) based on Web of Knowledge (Thomson Reuters, New York, NY). The h-index attempts to summarize an author's productivity and impact in a single measure. The h-index is defined to be the number of publications (h) with a least h number of citations. For example, to achieve an h-index of 5, an awardee would have to publish at least 5 papers each of which was cited at least 5 times.⁴

Descriptive statistics were compiled using frequency distributions for all nominal variables. Summary data were generated and presented as average, range or percentages as appropriate.

Results

Characteristics of Awardees

Overall, the awardee characteristics at initiation of the Ethicon-SUS award are listed in Table 1. Of the 31 awardees 13 (42%) were female. The awardees were highly qualified based on their educational background. Most graduated from a college that was in the top 25 US colleges, based on US News and World Report ranking and many attended medical schools that were in the top 25 by NIH funding. Most awardees were in residency programs affiliated with institutions that were in the top 25 by NIH funding.

The awardees spent 2.7 years (range 1-4 years) of research during their residency. Of the 31 awardees, 18 received one year of SUS support and 13 received two years of SUS support. Most awardees initiated their research training in their postgraduate year 3 (PGY3). Six of the awardees received a PhD during residency.

Awardee Productivity

Although the trainees had an average of two publications at the initiation of their award, by the end of their residency the trainees had published an average of 15.8 papers (range 2-63). Overall, the awardees published an average of 9.8 papers with their mentor (range 1-32), with 5.4 first author publications with their mentor (range 1-17). We assessed the maximum impact factor of the journal in which the awardees published; for this we assessed only manuscripts, published by the awardee as first author, with their mentor. The average of maximum journal impact factor for these publications was 5.8 (up to 15).

Trainee Outcome

The average follow-up from the end of the awards was 11.4 years (range 4-22). This translated to follow-up of 7.2 years from the end of all of the trainee's clinical training (range 0-18). Most awardees pursued a clinical fellowship at the conclusion of their general surgery residency (Table 3). At the time of the data freeze for this study, the awardees had an average of 42.5 publications (range 2-186).

The average h-index at time of this study, was 14.5 (range 2-48). Of the awardees, one was still a clinical fellow in an academic program, 15 were Assistant Professors, four were Associate Professors, and six were Professors. Only five awardees were in non-academic positions. Overall, 84% of the awardees held academic positions and several had achieved leadership positions within academic institutions including positions as Deans, Chairs and Division Heads.

Nineteen (61%) of the awardees subsequently pursued research in the same area as their originally funded projects. Limiting the analysis to the SUS awardees that have been out of training at least three years (N=23), 11 (48%) had received peer-reviewed funding after their SUS award. Of these, seven (30%) had received a R01 or equivalent. Nine awardees (39%) had active funding at the time of assessment and nine had already become SUS members.

Discussion

We found that SUS resident research awardees had a very productive research experience. Although our retrospective study cannot determine causation, it is notable that most of the awardees subsequently pursued academic careers and many established independent research programs, delivering on the promise of developing leaders in surgery and science.

As would be expected with such a competitive mechanism, the awardees had very strong educational backgrounds upon entry into the program. Most awardees graduated from top-ranked colleges and attended medical schools and residency programs that were highly ranked based on their NIH funding. Thus, awardees were already successful, and were already in research-oriented environments.

Notably, 42% of the awardees were women despite the fact that women were in the minority in surgery for much of period of study and still occupy only 33% of surgery residency positions in recent US studies⁵. Currently, only 7.8% of SUS of members are women (Latisha Moore, SUS, personal communication). The SUS and its leadership has played an important role in dispelling the perception that the SUS is an "old boys' club" and has strived to ensure women's active participation and elevation into leadership roles in the society, actively exploring approaches for continued advancement of women in academic surgery^{6,7}. This may in part reflect the high percentage of female awardees.

We found that awardees were remarkably productive in their research time. The awardees spent 2.7 years of dedicated research time during their residency, and on average published 15.8 papers with 5.4 papers as first author during residency. This compares very favorably with results from a study by Stewart et al, that showed that only half of surgical residents in New England programs published one paper per year of research with only 17% having

three publications or more.⁸ Furthermore, most SUS research awards led to publications in journals with a substantial impact factor. The average maximum impact factor of the publications was 5.8, highlighting the caliber of the research performed, and perceived scientific impact. The awardees had an average h-index of 14.5 and a maximum h-index 48. The h-index is increasingly recognized as an objective measure of success, and is being assessed by some institutions for allocation of research resources such as laboratory space as well as promotion and tenure decisions. The h-index has been reported to better predict future achievement than three other indicators—number of citations, number of papers, and mean citations per paper— achievement being defined by either the indicator itself or the total citation count.⁴ The h-index has been associated with academic rank in studies conducted in several specialties,⁹⁻¹¹ and average h-index has been reported to be higher among faculty who have obtained at least one National Institute of health (NIH) grant.¹² However, as h-index reflects the number h of papers a researcher has published with at least h number of citations, it is inherently biased towards senior investigators.¹³ Since our study had an 11.4 year follow-up with only 7.2 years (range 0-18) years of follow-up from completion of training, it is likely that the awardees' h-index will continue to rise.

Several studies of effectiveness of biomedical research training programs were conducted in the 1980s and 1990s; all used three basic criteria for assessment of outcomes; subsequent research funding, career progress and publications (numbers and citation)¹⁴. Similar studies have been published for other specialties such as Anesthesia, and Emergency Medicine, Radiation Oncology¹⁵¹⁶ as well as on outcome of Thoracic Surgery Foundation Awardees.¹⁷ These studies found that awardees of Society Scholarships went on to successful careers as demonstrated by retention in academia, subsequent publications, rise in academic rank, and subsequent grant funding. We found that 84% of the Ethicon-SUS Research Fellowship awardees remained in academia; demonstrating that surgical trainees that receive competitive grants from specialty societies are likely to have successful academic careers. Of the SUS awardees that have been out of training at least three years, nearly half had received peer-reviewed funding after their SUS award, and 30% had received an R01 or equivalent. This compares favorably with a report from an academic surgical residency program that showed that 35% of residents who did dedicate research training subsequently achieved independent funding as faculty and 20% received NIH funding.¹⁸ Although our data suggests that many SUS awardees were able to secure peer reviewed funding, there is room for improvement in this outcome measure, possibly through initiation of long-term mentorship programs, and specific training in grant-writing.

Several aspects of our methodology deserve further consideration. We chose not to use a survey of recipients, so as to avoid responder bias. Instead, we contacted the awardees individually and extracted characteristics of academic productivity from the CV provided by the awardees (N=24) or from online sources if the CV could not be obtained (N=7). Past studies demonstrated the limitations of surveys in this setting, with similar studies using surveys reporting response rates ranging from 42- 70%.^{15, 16, 19} With our approach we had data on all awardees. However, it is possible that our online search and publication assignment criteria were flawed, leading to some inaccuracies in the number of publications for the awardees in whom the CVs could not be obtained. Similarly, it is possible that CVs contained errors.

A limitation of this study was that there are no records of applicants who did not receive SUS funding and thus no ability to compare the relative success of funded versus unfunded applicants. Likewise, there are no similar data on the research funding, faculty rank or publications of residents that did not apply for SUS research awards. Further, we can only report on career outcomes, and cannot determine causality for these outcomes. The success of SUS grant recipients may reflect (1) the ability of the SUS Scholarship Committee peer-review process to select applicants who are likely to be successful in academic surgery or (2) the contributions of seed money to early career development and continuing research endeavors. It is likely that both explanations are correct. Clearly, the individual awardees are the ones primarily responsible for the achievements evident in this study. However, it is likely that their success is enhanced by a strong mentorship environment and provision of successful academic role models.

There is unprecedented opportunity in translational science. However, there is also increasing pressure on surgeons for greater clinical productivity. In this regard, surgeons are at a disadvantage compared to other clinician-scientists. Relatively high reimbursement for procedures and correspondingly high salaries incentivize institutions to keep surgeons in the operating room, rather than the research lab. Therefore, academic surgery is in danger. Because of the evolving complexity of both translational research and clinical surgery, compounded by dropping funding lines at the NIH and other funding agencies, dedicated resources are needed to train and maintain our pipeline of young surgeon-scientists. Surgeon-scientists need training not only to deliver state of the art clinical care, but also to ask innovative questions, and design experiments to test hypotheses. Maintaining our pipeline of surgeon-scientists requires substantial and sustained commitment of effort and resources. Most importantly, institutions must provide time away from clinical responsibility as well as resources to allow junior surgeons to succeed in academics. Since resources are limited, honest assessment of return on investment is required.

Due to economic pressure and concerns regarding conflict of interest, there is declining industry support for educational initiatives such as the SUS-Ethicon Research Awards. We would like to emphasize that SUS-Ethicon Research Awards have been funded continuously since 1987 through a generous educational grant from Ethicon. The awards were initiated after Ethicon approached the SUS leadership in 1985 to find “long-term ways in which Ethicon can help the Society further its goals”.² Notably the awardee selection process was through a SUS committee, independent of any Ethicon influence, with project selection based on best science rather than study topic. This has led to research projects spanning a variety of fields and ultimately surgeon-scientists in several different specialties. The SUS-Ethicon Research Awards have been the backbone of SUS's research training initiatives, and the success of the research award mechanism highlights the long-term impact of this academic-industry partnership.

At a time where federal dollars are shrinking, and more and more scientific innovation is taking place in industry, collaboration with industry will be increasingly necessary. Collaboration with industry can help to secure funding for trainees, as well as to rapidly translate new discoveries from industry to the clinic. Simultaneously, philanthropy and other

funding sources must be pursued to ensure that we continue to train highly qualified surgeon-scientists who can conduct original investigations in the laboratory and in the clinic.

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Table 1

Awardee Characteristics at Initiation of Award

Factor	# Resident Awardees (n=31; %)
Gender	
Male	18 (58%)
Female	13 (42%)
Undergraduate US World News ranking	
Top 25	20(65%)
>25	5 (16%)
NA ¹	6 (19%)
Medical school NIH funding	
Top 25	11 (35%)
>25	16 (52%)
NA ²	4 (13%)
Residency institution NIH funding	
Top 25	21 (68%)
>25	6 (19%)
NA ³	4 (13%)
Publications at initiation of award	2 (0-7)

¹ Four non-US colleges, two not available

² Four non-US medical schools

³ Three non-US residencies, one not available

Table 2

Residency Research Time Productivity

Factor	# Resident Awardees (n=31, %)
Number of years of award	
1 year	18 (58%)
2 years	13 (42%)
Start time of research period	
Initiated in PGY3	16 (52%)
Initiated in PGY4	11 (35%)
NA	4 (13%)
Years of research in residency, average, range	2.7 (1-4)
Obtained PhD during residency	6
# Pubs by end of residency; average, range	15.8 (2-63)
# Pubs with mentor, average, range ¹	9.8 (1-32)
# Pubs first author with mentor, average, range ¹	5.35 (1-17)
Maximum impact factor of journal for first author publication with mentor, average, range ¹	5.75(-0-14.77)

Abbreviations: PGY= Post Graduate Year; NA=Not available; Pubs=publications

¹ within 3 years end of award

Table 3**Trainee Outcome**

Factor	# Resident Awardees (n=31, %)
Follow-up from end of award, years (range)	11.4 (4-22)
Follow-up from end of all clinical training, years (range)	7.2 (0-18)
Pursued fellowship	
Yes	25(81%)
No	6 (19%)
Type of fellowship	
Pediatric surgery	7
Transplant surgery	5
Surgical oncology	4
Hepatobiliary surgery	2
Vascular surgery	2
Breast surgery	1
Colorectal surgery	1
Minimally invasive surgery	1
Combined plastic surgery track	1
Gynecologic oncology	1
Current # pubs, average, range	42.5 (2-186)
Current average H index, average, range	14.5 (2-48)
Current Position	
Professor	6 (19%)
Associate Professor	4 (13%)
Assistant Professor	15 (48%)
Clinical Fellow	1 (3%)
Non-academic	5 (16%)
SUS awardees out of training 3 years or longer	(N=23)
Peer reviewed funding after award	
Yes	11 (48%)
No	12 (52%)
R01 or equivalent	
Yes	7 (30%)
No	16 (76%)
Current active funding	
Yes	9 (39%)
No	14 (61%)
SUS member	
Yes	9 (39%)
No	14 (61%)