

## Original Article

# Is endocrine surgery research dying?

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**Abstract:** Surgeon-scientists are uniquely positioned to make improvements in patient care. With stagnant NIH funding and increased grant applications, government-sponsored endocrine surgery research may be declining, thus compromising the training of future surgical investigators. We evaluated if NIH-sponsored endocrine surgery research has decreased. Grant funding of all United States active and senior members of the American Association of Endocrine Surgeons (AAES) in 1998 and 2008 was obtained from the NIH Computer Retrieval of Information on Scientific Projects (CRISP) database. All NIH grants between 1996-1998 and 2006-2008 were abstracted. There were 210 and 260 eligible members in 1998 and 2008, respectively. From 2006-2008, fewer members (8% vs. 13%,  $P = 0.05$ ) had NIH funding for all research, and fewer members (3% vs. 6%,  $P = 0.05$ ) were funded for endocrine surgery research. Grants per funded member did not decrease for all research ( $1.3 \pm 0.1$  vs.  $1.3 \pm 0.1$ ,  $P = 0.99$ ) or endocrine surgery research ( $1.2 \pm 0.1$  vs.  $1.1 \pm 0.1$ ,  $P = 0.95$ ). Of 24 members who had funding from 1996-1998, 8 (33%) maintained funding, while 4 of 12 (33%) maintained funding for endocrine surgery research. We conclude that fewer AAES members have funding after a ten-year period. Two-thirds of investigators no longer have funding, but the average number of grants per funded member is the same. This suggests that investigators are able to obtain and maintain funding once established, but fewer investigators are able to achieve this funding. Endocrine surgery training programs must continue to emphasize the development of future surgeon-scientists.

**Keywords:** Endocrine surgery, research funding, surgeon-scientist, surgical research, endocrine surgery research, education

### Introduction

Without a doubt, research is integral to both current and future patient care. Unfortunately, the demands of clinical productivity, academic research, and teaching can be taxing upon a busy surgeon-scientist. Couple this with a largely stagnant National Institutes of Health (NIH) research budget, and it is no wonder the future is tenuous [1]. The surgeon-scientist is a demanding career paradigm, requiring funding, training, and support [2, 3]. It is daunting even in the most academically oriented surgery departments because of time commitments [4]. Perhaps the challenge of successfully conducting research as a surgeon-scientist is summarized best by Dr. Francis Moore: "Those at one end of the bridge say he is not a very good scientist, and those at the other end say he does not spend enough time in the operating room. If only he is willing to live with this abuse, he can continue to do his job effectively" [5]. Research

is a challenging and critical component of academic surgery.

It is difficult to conduct research without funding. Obtaining and maintaining funding is not a new challenge: there has been commentary in the surgical literature for decades [6, 7]. One of the perennial challenges of surgical research has been that funding has not always been on par with non-surgical researchers [8]. It has been shown that surgical grant proposals were less likely to be funded and had smaller grant awards [9], moreover, funding has declined relative to nonsurgical colleagues [10]. This problem may continue to worsen [11]. Fortunately, some have noted an increase in productivity despite static grant support [12]. Industry, private foundations, and institutional funds may alleviate funding challenges, but concerns remain about conflicts of interest [4, 13, 14]. In short, obtaining and maintaining funding presents a problem.

## Endocrine surgery research funding

The American Association of Endocrine Surgeons (AAES) is dedicated to advancing the science and art of endocrine surgery while maintaining high standards of practice. Its membership consists of both academic and non-academic endocrine surgeons. The AAES has recently expressed concern about research funding. It is conceivable that the smaller surgical specialties may suffer in times of tight funding, which in turn affects training opportunities for future researchers. Therefore, we analyzed the amount of NIH funding held by AAES members as a marker of endocrine surgery research over the past decade to answer this question: is endocrine surgery research dying?

### Methods

#### *Membership description*

The AAES is the only national association of endocrine surgeons in the United States. To make this study an accurate representation of members who would be performing NIH-funded research, the study subjects were limited to active and senior members who practice in the United States. Active membership is defined as “surgeons who are Fellows of the American College of Surgeons (ACS) or its international equivalent and of good professional standing, who have a major interest and devote significant portions of their practice or research to endocrine surgery, who are certified by the American Board of Surgery (ABS) or its equivalent in Canada (FRCSC), Central America, Mexico and South America” (membership category descriptions are available at <http://www.endocrinesurgery.org/members/members.htm>). Senior membership is a category for active members over the age of 65 or who no longer have an active practice; those without active practices were excluded from the present study. Also excluded were the corresponding members who are not from the countries mentioned earlier, allied health specialists, the young candidate members, and the resident/fellow members. In the end, this captures the members who have had a chance to secure NIH funding if research is part of his or her career goals.

#### *Identification of NIH grant funding*

At the time this study was conducted, the CRISP (Computer Retrieval of Information on Scientific Projects, formerly available at [\[nih.gov\]\(http://crisp.nih.gov\)\) database was queried for all active and senior members of the AAES with practices in the United States. This has since been replaced by RePORT \(Research Portfolio Online Reporting Tool, publically available at <http://projectreporter.nih.gov/reporter.cfm>\). The database was searched for all members in both 1998 and 2008. All grants were noted for the two years prior and inclusive of the queried year such that the study periods were from 1996-1998 and 2006-2008. As long as a grant received funding within those time periods, even if not for the entire time period, it was counted.](http://crisp.</a></p></div><div data-bbox=)

Projects were defined as “all research”, which included any type of research funding, “endocrine surgery research”, which excluded breast, exocrine pancreas, and GI physiology research. For the purposes of the study, the following grants were included: R01, R21, R25, R29, K07, K23, and T32. Project grants and other umbrella funding from sources such as R13, R33, M01, P01, P50, and U01 were excluded because they are not funding mechanisms designed for primary research, project grants, conference grants, or were not offered during both time periods studied.

#### *Statistical analysis*

As appropriate to presented data, Fisher’s exact test and the independent samples *T* test were performed using SPSS (Version 11; SPSS, Inc., Chicago, IL). A *P* value of < 0.05 was considered to be significant. When *P* values are presented with data, it is important to recognize that they are considering the time periods as samples in the overall trend. When discussing the time periods as a direct comparison over the decade, *P* values are irrelevant: the numbers are either different or they are not different because all data have been gathered, obviating the need for statistical analysis.

### Results

#### *The number of NIH-funded AAES members decreased over time*

In total, there were 210 active and senior members of the AAES who practiced in the United States in 1998, while there were 260 members in 2008 (**Table 1**). In terms of all research, there were 28 members funded from 1996-1998 and 22 members funded from 2006-2008. This rep-

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**Table 1.** AAES members with NIH funding. The total number of AAES active members with practices in the United States for each of the time periods is shown. Compared to 1996-1998, a smaller percentage of the membership had all types of research funded ( $P = 0.05$ , Fisher's exact test) in 2006-2008. In terms of endocrine surgery research funding, there was also a decrease between 1996-1998 and 2006-2008 ( $P = 0.05$ , Fisher's exact test).

Category	Members		
	Total	Funded	Percent funded
All Research			
1996-1998	210	28	13%
2006-2008	260	22	8%
Endocrine Surgery Research			
1996-1998	210	13	6%
2006-2008	260	7	3%

**Table 2.** Grants by funding mechanism. For all research, there were a total of 37 grants between 1996-1998 and 29 grants between 2006-2008. For endocrine surgery research, there were 15 and 8 grants for the time periods. Most commonly held grants include R01 and T32 grants.

Category	R01	R21	R25	R29	K07	K08	K23	T32
All Research								
1996-1998	16	0	2	6	0	2	0	11
2006-2008	13	5	1	1	1	1	1	6
Endocrine Surgery Research								
1996-1998	4	0	0	1	0	2	0	8
2006-2008	3	2	0	0	0	0	0	3

resented a significant decrease in the proportion of NIH-funded AAES members conducting all research (13 vs. 8%,  $P = 0.047$ , Fisher's exact test). For endocrine surgery-specific research, the 13 members with NIH funding decreased to 7 members between the two time periods. Again, this represents a significant decrease in the proportion of NIH-funded AAES members conducting endocrine surgery research (6 vs. 3%,  $P = 0.043$ ). These data demonstrate an absolute decrease in the proportion

of funded members between the two time periods as well as a statistically significant decrease when viewing the time periods as two independent samples reflective of a larger trend.

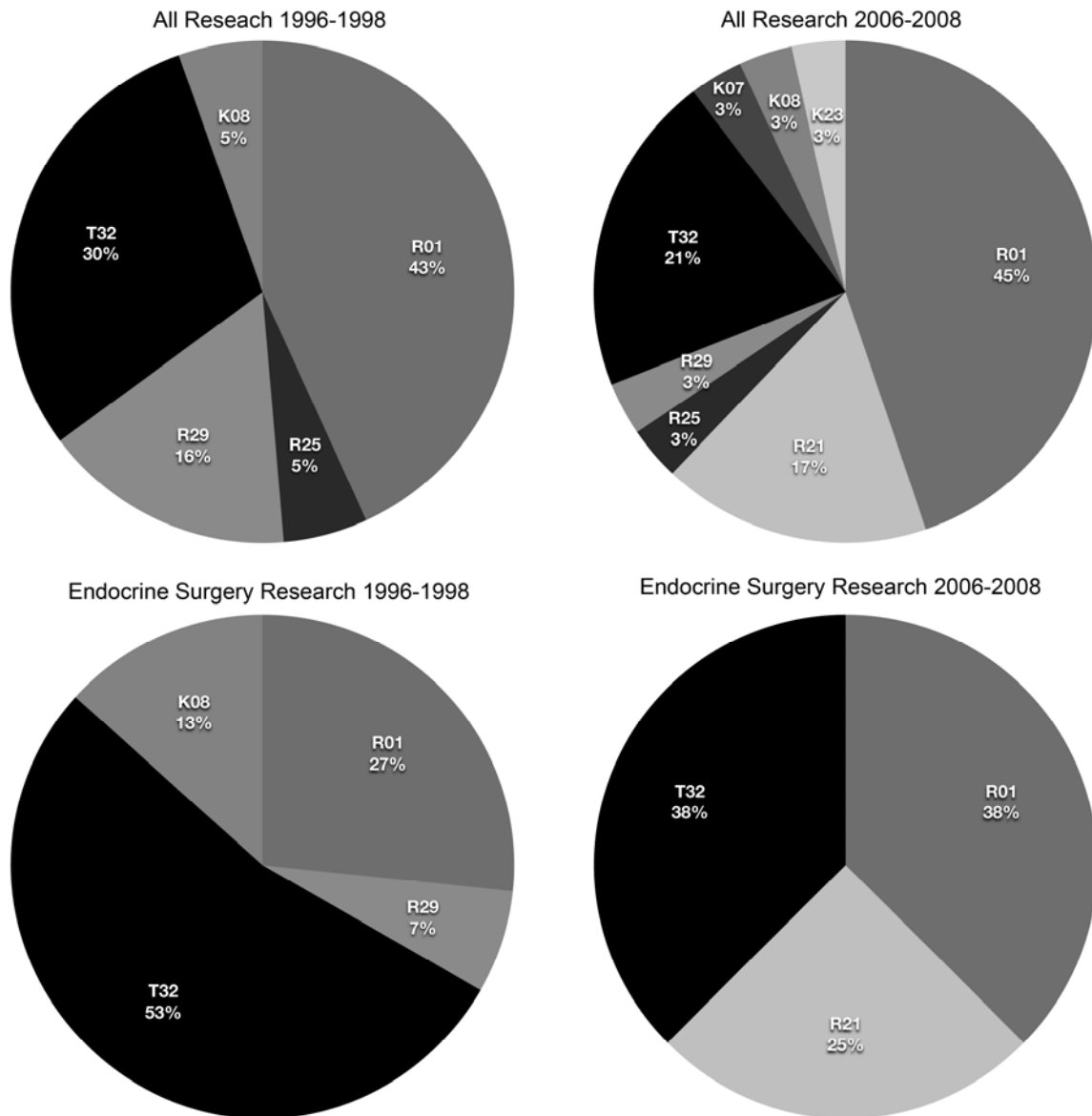
*NIH research funding is mainly from R01 and T32 grants*

We analyzed different funding sources by grant mechanism and type over time (**Table 2** and **Figure 1**). For all research, there were a total of

**Table 3.** AAES grants per member. The total number of grants in each time period is shown. The number of grants per member did not show a significant decrease between the two time periods ( $P = 0.12$  for all research and 0.07 for endocrine surgery research), and the average number of grants per funded member did not decrease for all research or endocrine surgery research ( $P = 0.99$  and 0.95, respectively). Data points are mean±standard error of mean.

Category	Grants		
	Total	Per member	Per funded member
All Research			
1996-1998	37	0.18±0.04	1.32±0.1
2006-2008	29	0.11±0.02	1.32±0.1
Endocrine Surgery Research			
1996-1998	15	0.07±0.02	1.15±0.1
2006-2008	8	0.03±0.01	1.14±0.1

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**Figure 1.** Grants by funding mechanism. The breakdown of grants by funding mechanism are demonstrated graphically. Most commonly held grants include R01 and T32 grants, with a disappearance of K grants for endocrine-surgery specific research over time. Notably, the proportion of R21 grants is higher for all research and endocrine surgery-specific research.

37 grants between 1996-1998 and 29 grants between 2006-2008. For endocrine surgery research, there were 15 and 8 grants for the time periods. The majority of the grants from either time period were either R01 or T32 grants. The makeup of funding sources changed over time: for example, K grants disappear as a source of endocrine surgery research funding between the 1996-1998 and 2006-2008 study periods, and the R21 grants become more

prominent in both time periods in both research categories.

*Grants per funded member remain stable with time*

We then examined the relationship between number of grants and the AAES membership (**Table 3**). On a per member-basis, this represents a statistically insignificant decrease from

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**Table 4.** Retention of funding by AAES members. In terms of AAES members at both time points, the members who retained funding decreased by two-thirds for both all research and endocrine surgery research. In other words, only one-third of members maintained some type of NIH funding between the two time periods studied.

	Funded Members		
	1996-1998	2006-2008	Percent
All Research	24	8	33%
Endocrine Surgery Research	12	4	33%

0.18±0.04 to 0.11±0.02 grants per member ( $P = 0.12$ , independent samples  $T$  test). In terms of endocrine surgery research, there were decrease in grants corresponded to a non-statistically significant decrease on a per member-basis from 0.07±0.02 to 0.03±0.01 grants per member ( $P = 0.07$ ). However, this is a significant decrease when considering the time points separately, rather than two points on a continuum.

We then analyzed the data based on the number of grants per funded AAES member, as this would give an indication as to how members who have retained funding are faring. The average number of grants per funded member did not decrease for all research or for endocrine surgery research over this time period (1.32±0.1 vs. 1.32±0.1,  $P = 0.99$ , and 1.15±0.1 vs. 1.14±0.1,  $P = 0.95$ , respectively). This suggests that while the overall number of grants per member has decreased, indicating that a smaller portion of the AAES membership is conducting research, those who have funding have had a similar level between the two time points.

### *AAES members are no longer funded over time*

After determining that the average number of grants per funded member had remained stable over time, we then wanted to see how many AAES members retained funding over time (**Table 4**). In terms of all research, there were 24 members with NIH funding in 1996-1998. Only 8 of these members continued to have NIH funding in the 2006-2008 time period, corresponding with a two-thirds decrease. A similar finding was demonstrated for endocrine surgery research: 12 members had NIH funding in 1996-1998, while only 4 members had funding in 2006-2008. This demonstrates that, for reasons unknown, previously funded investigators did not maintain funding over time.

## Discussion

The challenges of funding surgical research are daunting. In this study, we have attempted to determine how endocrine surgery research has changed, if at all, over the past decade. Utilizing the number of NIH-sponsored grants at two different time periods one decade apart, we elucidated trends in how much funding for endocrine surgery research exists to answer the question: is endocrine surgery research dying? The findings are certainly valuable for future planning in departments of academic surgery.

The overall number of research grants to endocrine surgeons is decreased. This is true for all research, which had a 63% decline in number of grants between the two time periods, and also of endocrine surgery-specific research. Endocrine surgery research demonstrated a 43% decline in number of grants during the same time period. It is important to note that the mechanism of funding changed over time, especially for endocrine surgery research: there is an absence of K grants in the 2006-2008 time period. This suggests that young investigators may not be achieving early career development funding from the NIH for endocrine surgery-specific research endeavors. This does not bode well for the future of endocrine surgery research, but it may be countered by the strong support from T32 grants for research.

When considering the amount of grants per member, there is a decrease over time for both general and endocrine surgery research. This is attributable to both a decrease in funding as well as an increase in membership over time. We looked at the number of grants per funded member to better understand the meaning of this, as this would give an indication as to how well-funded AAES members are. For both general and endocrine surgery research, the number of grants per funded member was effec-

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tively the same over time. This may indicate that those members with funded have a similar amount, but there are fewer of them. This is supported by the finding for both general and endocrine surgery research, as two-thirds of all investigators did not retain funding. Whether this has to do with a loss of funding, a change of career goals, or other reasons is unclear.

A study conducted in this manner is not without weaknesses. To begin, it was inclusive of only NIH-related funding. This does not address funding from industry, institutional, private foundations, or other sources. In a study such as this, records of NIH funding are the most easily accessible measure of funding. There is also a question about whether grant numbers is an appropriate measure, but we believe that it minimizes the effects of varying award sizes. We also lack data as to why the changes have occurred, notably regarding those members who did not retain funding over time. This certainly represents an area for future study, and a survey of the AAES membership to identify further barriers to research may assist in answering this question.

In conclusion, overall research funding to endocrine surgeons has decreased. Less than half of the NIH grants held by members of the AAES are directed toward endocrine surgery. Unfortunately, endocrine surgery research funding decreased. The number of grants per funded investigator has remained the same, but fewer investigators are no longer actively participating in research. It is reassuring to see that new investigators have had similar funding, but this may not be sustainable. These data may suggest that investigators are able to obtain and maintain funding once established, but fewer investigators are able to achieve this funding. Therefore, endocrine surgery training programs must continue to emphasize the development of future surgeon-scientists by providing ample resources, research opportunities, and mentorship. The question of the death of endocrine surgery research is therefore partially answered, and we must now work to understand the reason behind these changes before it is too late.

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