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Review

Recent trends in National Institutes of Health funding for surgery: 2003 to 2013

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Abstract

BACKGROUND: The purpose of this study is to compare the compositions of federally funded surgical research between 2003 and 2013, and to assess differences in funding trends between surgery and other medical specialties.

DATA SOURCES: The National Institutes of Health (NIH) Research Portfolio Online Reporting Tool database was queried for grants within core surgical disciplines during 2003 and 2013. Funding was categorized by award type, methodology, and discipline. Application success rates for surgery and 5 nonsurgical departments were trended over time.

CONCLUSIONS: Inflation-adjusted NIH funding for surgical research decreased 19% from $270M in 2003 to $219M in 2013, with a shift from R-awards to U-awards. Proportional funding to outcomes research almost tripled, while translational research diminished. Nonsurgical departments have increased NIH application volume over the last 10 years; however, surgery's application volume has been stagnant. To preserve surgery's role in innovative research, new efforts are needed to incentivize an increase in application volume.

Scholarly contributions to research are important measures of success in academic surgery, and the ability to obtain funding for such efforts is frequently considered for recruitment and promotion.[1–4] As the largest public funding source for medical research worldwide, the National Institutes of Health (NIH) is universally recognized for its scientific rigor and role in academic advancement.[5] The overall NIH budget increased dramatically from 1999 to 2003; however, it has not kept pace with inflation since that time. As a result, funding success rates have steadily decreased, such that only the top 10% of applications were awarded in 2013.[6,7]

Historically, surgeon scientists have lagged behind counterparts in other medical departments with regards to NIH funding, due in part to increasing clinical responsibilities.[8,9] As a result, the proportion of surgeons with NIH awards is only one quarter that of nonsurgeon physicians, and surgeons are under-represented in NIH study sections.[10,11] To expand surgery's role in medical research, it would be sensible to examine how other medical specialties have compensated for the NIH's budgetary decline. Furthermore, the impact of the depreciating NIH budget on individual surgical disciplines is uncertain, and

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contributions from growing fields such as health outcomes research are unclear. To take advantage of shifting trends, an assessment of the current landscape of funded surgical research is indicated.

The purpose of this study was 2-fold. First, we assessed trends in NIH applications and success rates across major medical school departments to test the hypothesis that surgery has been affected disproportionately by the decrease in the NIH budget. Second, we examined the distribution of surgery research subjects and methodologies in 2003 and in 2013 to determine key areas of growth. Through these analyses, we hoped to propose strategies to promote future surgical research.

Patients and Methods

The NIH Research Portfolio Online Reporting Tool database (available at http://report.nih.gov) was queried for all research project grants within the United States and territories during the fiscal years 2003 and 2013. Grants allocated to departments of surgery were selected through the "Department" search field. F- and T-awards were excluded as these represent resident and student training grants. Because the purpose of the study was to depict the landscape of surgery-related research, grants were included regardless of the advanced degree of the principal investigator (M.D., Ph.D., etc). The exported data included summary descriptions of research, total costs, and information regarding principal investigators and research institutions. For comparative purposes, this identical process was used to query NIH support for the 4 best-funded clinical departments: internal medicine, psychiatry, pathology, and pediatrics, and the best-funded basic science department: microbiology. Additionally, application success rates for surgery and comparison departments were collected via the NIH database.[12]

Research summary descriptions for surgery grants were reviewed by one of the 2 study investigators (Y.H., B.E.). Each investigator reviewed grants from both datasets (2003 and 2013). Based on summary descriptions, each grant was categorized by surgical discipline. Departments of surgery in the United States vary in their inclusion of certain surgical specialties (neurosurgery, urology, obstetrics and gynecology, otolaryngology, ophthalmology). To be consistent across the study, only grants focusing on core surgical disciplines were included for analysis. For summary descriptions, which were too broad for categorization, the principal investigator's listed academic division was used as the surgical discipline. The surgical oncology discipline included cancer-related studies in any organ system. Research in undergraduate or graduate education and non-cancer research in the gastroenterology, endocrine, or hepatobiliary organ systems were included in the general surgery discipline. The research methodology for each grant was classified into the following categories: basic science, translational, clinical trial, outcomes, and operative technique. Basic science research was defined by a focus on core biological pathways, with no assessment of immediate therapeutic or diagnostic effect. Translational research included experiments aimed at addressing therapeutic or diagnostic needs for a specific human disease, including animal models of human pathology. Clinical trials were defined as hypothesis-driven human experiments targeting an existing medicine or procedure, while operative technique research was limited to novel surgical innovations. Finally, outcomes research included projects assessing institutional or multi-institutional outcomes of healthcare practices. Grant descriptions which incorporated several methodological categories were classified as translational research. To assess inter-rater agreement, 150 grants were evaluated by both reviewers. Inter-rater agreement was .85, with all differences in classification originating from the delineation between basic science and translational research.

Total costs of grants allocated in fiscal year 2003 were adjusted to 2013 equivalent dollars using an inflation adjustment factor of 1.27.[13] Summary statistics for mean and total allocations are provided by award activity and award type. Proportional contributions to total NIH surgery research funding were calculated based on research methodology and discipline. To determine trends in average funding per grant, the Wilcoxon rank-sum test was used to compare allocations between 2003 and 2013 to account for nonparametric data distributions.

Results

In total, 1,025 grants in core surgical disciplines met inclusion criteria and underwent review: 613 from 2003 and 512 from 2013. Total adjusted NIH funding to surgical research diminished by 19.1% from $270.4M in 2003 to $218.7M in 2013. Geographic distribution of NIH funding by state in 2003 and in 2013 is provided in Supplemental Materials.

Allocations to departments of surgery by research activity and award type are presented in Table 1. Funding for research projects (R-awards) underwent the largest decrease (−38%), including a 39% decrease in R01 awards ($152.2M to $92.8M). Allocations for cooperative agreements (U-awards) increased by 23%, making up 28% of total surgery research funding in 2013. K-awards—representing mentored research among young physician scientists—saw a 33% decrease, with notable drops in several major surgical disciplines (Table 2). Additional data on award activities subdivided by surgical discipline are available in the Supplemental Materials. Noncompetitive renewals (Type 5) dominated funding within both datasets, and new grants (Type 1) comprised 17% of funding for both periods. Notably, allocations to competitive renewals (Type 2) have diminished by 66%.

Comparisons between surgery and the other 5 studied departments in NIH research are provided in Fig. 1. Over the 2003 to 2013 period, surgery's relative decrease in total number of research awards was second only to pathology.