Communication from the ASGE Research Committee

GUIDELINE

Impact and outcomes of research sponsored by the American Society for Gastrointestinal Endoscopy

Prepared by: ASGE RESEARCH COMMITTEE

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This document was reviewed and approved by the Governing Board of the American Society for Gastrointestinal Endoscopy (ASGE).

Background and Aims: Since 1985, the American Society for Gastrointestinal Endoscopy (ASGE) has awarded grants for endoscopic-related research. The goals of this study were to examine trends in ASGE grant funding and to assess productivity of previous recipients of the ASGE grant awards.

Methods: This was a retrospective cohort analysis of all research grants awarded by the ASGE through 2009. Measures of academic productivity and self-assessment of the ASGE awards' impact on the recipients' careers were defined by using publicly available resources (eg, National Library of Medicine–PubMed) and administration of an electronic survey to award recipients.

Results: The ASGE awarded 304 grants totaling $12.5 million to 214 unique awardees. Funding increased 7.5-fold between 1985 and 1989 (mean $102,000/year) and between 2005 and 2009 (mean $771,000/year). The majority of awardees were men (83%), were at or below the level of assistant professor (82%), with a median of 3 years of postfellowship experience at the time of the award, and derived from a broad spectrum of institutions as measured by National Institutes of Health funding rank (median 26, interquartile range [IQR] 12-64). Nineteen percent had a master's degree in a research-related field. Awardees' median publications per year increased from 3.5 (IQR 1.2-9.0) before funding to 5.7 (IQR 1.8-9.5) since funding; $P = .04$, and median h-index scores increased from 3 (IQR 1-8) to 17 (IQR 8-26); $P < .001$. Multivariate analysis found that the presence of a second advanced degree (eg, masters or doctorate) was independently predictive of high productivity (odds ratio [OR] 2.92; 95% confidence interval [CI], 1.09-7.81). Among 212 unique grant recipients, 82 (40%) completed the online survey. Of the respondents, median peer-reviewed publications per year increased from 3.4 (IQR 1.9-5.5) to 4.5 (IQR 2.0-9.5); $P = .17$. Ninety-one percent reported that the ASGE grant had a positive or very positive impact on their careers, and 85% of respondents are currently practicing in an academic environment. Most of the grants resulted in at least 1 peer-reviewed publication (67% per Internet-based search and 81% per survey).

Conclusions: The ASGE research program has grown considerably since 1985, with the majority of grants resulting in at least 1 grant-related publication. Overall academic productivity increased after the award, and the majority of awardees report a positive or very positive impact of the award on their careers. Medical professional societies are an important sponsor of clinical research. (Gastrointest Endosc 2016;84:385-91.)

For the past 30 years, the American Society for Gastrointestinal Endoscopy (ASGE) has sponsored grants to conduct GI research. During this period, the ASGE issued annual requests for applications to conduct studies related to endoscopy ranging from bench, translational, and clinical research themes. In addition to these open calls

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for grant submissions, there have been several targeted ASGE grants devoted to early and mid-career development and requests for applications evaluating specific technologies (eg, radiofrequency ablation and video capsule endoscopy). The overall objectives of this program are 2-fold: (1) to produce research that has a direct impact on patient care while optimizing the application of endoscopy in clinical practice, and (2) to support scholarly activities for scientists with an interest in endoscopy. For young investigators, the grants are intended to serve as a springboard to further extramural funding.

The awards are distributed annually through a competitive process based on the novelty, significance, methodologic rigor, and feasibility of the proposal. Details about the ASGE grants program are available online (http://www.asge.org/research/). Since its inception, the grants program has been managed by the ASGE Research Committee with oversight from the Governing Board. The objectives of this publication, developed by ASGE Research Committee members, are to assess the association between these awards and subsequent scientific publications and the career trajectories of the awardees.

METHODS

Subjects and variables

The ASGE database was used to identify all grant recipients from 1985 to 2009. The database contained information about the award amount, the year of the original grant, and the title of the grant proposal as well as the academic rank of the recipients. Publicly available resources (ie, National Library of Medicine [PubMed]), Web of Science, Research Portfolio Online Reporting Tools, and Google) were used to collect and verify publication data related to the original award, number of publications since the award, current academic appointment, and relevant leadership positions. For awardees with a common surname, the middle initial or full name was used in an effort to accurately associate publications with the appropriate grant recipient. Finally, the ASGE grant recipients were invited to complete an online survey requesting information on the outcome of their grants, notable grant-related products, and self-perceived impact of being an ASGE grant recipient. These invitations were sent at least 5 times to each awardee. For those not responding to the invitation e-mail, an attempt was made to reach each awardee by sending at least 2 additional personal e-mails from one of the Research Committee members.

Search criteria

Each awardee's current employment setting (eg, academic [including faculty rank], private practice, or industry), demographics, academic degrees, and any leadership positions were identified by using an Internet Google search (www.google.com). Academic productivity was measured by 3 benchmarks: (1) publishing at least 1 grant-related manuscript, (2) total number of citations, including citations per year since grant award, and (3) current h-index score[13]–this is a metric that quantifies an individual author's productivity by factoring publication numbers and citations referencing the author's work. To assess the number of publications before the award year, a PubMed search of the MEDLINE indexed literature (www.PubMed.com) was performed for each awardee, assessing all publications extending to the antecedent year of the grant award. To assess the number of publications since the award, a PubMed search of the MEDLINE indexed literature was performed for each awardee, by using the last name and the first initial, from the year of award to October 2013, which was the time during which these data were procured. Any related publications between the award year and October 2013 were assessed and evaluated by 2 independent committee members. A second PubMed search with keywords from the grant title also was performed for each investigator to determine whether or not they had published work based on their grant. The number of citations, citations per publication, and h-index for each ASGE grant recipient were obtained by using Google scholar (http://scholar.google.com) and Web of Science (http://wokinfo.com). Awardees were then categorized into low and high productivity based on the number of citations per year (dichotomized by the median for the cohort with high productivity defined as >5.7 PubMed citations per year since receiving the ASGE grant).

Survey content and administration

The survey instrument was developed and refined by members of the ASGE Research Committee. The survey was pilot tested by members of the ASGE Governing Board and Research Committee to assess content and construct validity. Awardees were surveyed about their current institutions, current practice settings, leadership positions, number of peer-reviewed research publications before and since the ASGE award, whether or not the awardee received other grant funding since the ASGE award, and impact of the grant on collaborations and on their careers overall. Respondents were then asked to provide any feedback or take-home message regarding their ASGE awards (the complete survey is available online, https://www.surveymonkey.com/r/?sm=YxEfDSejmhtsgNONF9F3Bg%3d%3d).

Data synthesis and statistical analysis

Data were entered into an Excel spreadsheet (Microsoft Corporation, Redmond, Wash) and imported for analysis with SAS software (SAS Institute, Cary, NC). Descriptive statistics were used to report the main findings. Continuous variables were reported as mean ± standard deviation, and categoric variables were reported as percentages and CIs. Parametric (eg, 2-sided *t* test) and nonparametric (eg, Wilcoxon rank sums) tests were used

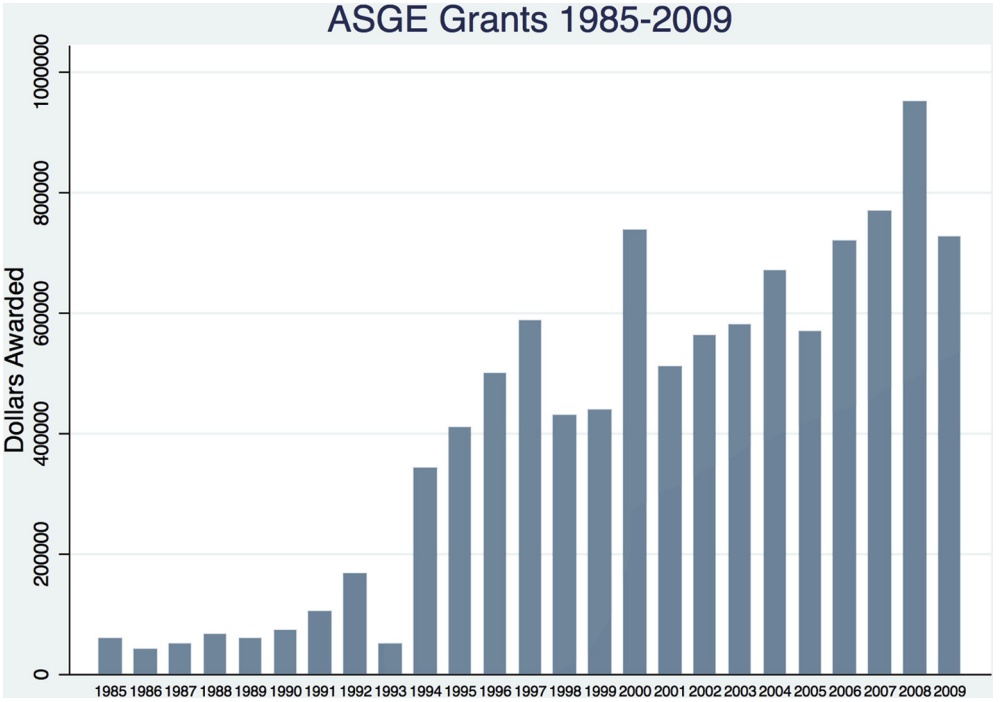

Figure 1. ASGE Grants, 1985-2009.

to compare distributions between groups, as appropriate. The chi-square test was used to compare categoric variables. Multivariate logistic regression at the grant level was used to identify factors independently associated with a highly productive awardee, defined as >5.7 PubMed citations per year since receiving the ASGE grant. Variables having a P value < .10 on univariate analysis were included in this model. Standard errors were adjusted with clustering by the awardee. Awardees with common surnames were excluded from this component of the analysis. A Pearson correlation was used to explore the correlation between variables. A P value of < .05 was considered statistically significant.

RESULTS

From 1985 to 2009, there were a total of 304 grants for a total of ($12.5 million) issued to 212 unique awardees, with a mean value of $35,972 (range $2960 to $150,000). The majority of the awards (68%) were for an endoscopic research award, whereas 15% were career development awards, and 17% were other mechanisms. The program has grown in terms of both grants awarded and funds dispersed, with a 7.5-fold increase in dollars awarded between 1985 and 1989 (mean $102,000 per year) and 2005 and 2009 (mean $771,000 per year) (Fig. 1). There has been significant diversity in the topics of ASGE-supported research: the most commonly funded areas of research were pancreatobiliary (29%, including ERCP, pancreas, biliary diseases, and EUS), upper GI (20%, including gastroesophageal reflux disease, Barrett's esophagus, esophageal cancer, and gastric cancer), and colonoscopy (12%, including colonic polyps, colon cancer, and bowel preparation) (Supplemental Fig. 1, available online at www.giejournal.org). Women accounted for 18% of awardees, although the proportion of women applicants was not available. The majority of awardees had a Doctor of Medicine degree (98%) and were at or below the level of assistant professor (82%), with a median of 3 years' postfellowship experience at the time of the award. Nineteen percent had a master's degree in a research-related field. A substantial number of recipients had a prior ASGE grant (31%).

Internet-based search results

Recipients derived from a broad spectrum of institutions as measured by National Institutes of Health [NIH] funding rank (median 26, interquartile range (IQR) 12-64) (Table 1). Most grants (67%) resulted in at least 1 related publication. Awardees median publications per year increased from 3.5 (IQR 1.2-9.0) before funding to 5.7 (IQR 1.8-9.5) since funding; $P = .04$. Total lifetime PubMed citations also increased from 6 (IQR 1-15) to 64 (IQR 24-130); $P < .001$, and median h-index scores increased from 3 (IQR 1-8) to 17 (IQR 8-26); $P < .001$ (Table 2). Compared to awardees with lower productivity since the award (<5.7 PubMed citations per year), those with higher productivity were more likely to be further from fellowship training, have an advanced research degree, be a recipient of multiple ASGE grants, have

TABLE 1. Grant recipient characteristics at time of grant receipt

Age, median (IQR)	36 (32-40)
Years from fellowship to grant	3 (1-6)
Years since grant award	15 (9-18)
Female sex, no. (%)	51 (17.5)
Advanced degree in research, no. (%)	50 (18.9)
Academic rank at the time of award, no. (%)	
Trainee	32 (29.1)
Instructor	10 (9.1)
Assistant professor	48 (43.6)
Associate professor	16 (14.6)
Professor	4 (3.6)
Institutional NIH rank at the time of ASGE award, median (IQR)	26 (12-64)
Extramural funding before the ASGE grant, no. (%)	106 (79.1)
NIH funding before the ASGE grant, no. (%)	28 (28.9)
Prior ASGE grant recipient, no. (%)	87 (31.4)
PubMed citations at the time of grant award, median (IQR)	6 (1-15)
h-index at the time of grant award, median (IQR)	3 (1-8)
PubMed citations per year at time of grant, median (IQR)	3.5 (1.2-9.0)

IQR, Interquartile range; *NIH,* National Institutes of Health; *ASGE,* American Society for Gastrointestinal Endoscopy.

a greater number of publications, and higher h-index scores at the time of the award (Table 3). The multivariate analysis found that only the presence of an advanced research degree was independently predictive of high productivity (OR, 2.92; 95% CI, 1.09-7.81).

Survey results

Among 212 unique grant recipients, 82 (40%) completed the survey instrument. At the time of grant receipt, 71% had experience in obtaining research grants before their ASGE award. However, only 29% had formal training in research methodology. Median peer-reviewed publications before receipt of the ASGE grant were 11 (IQR 4-30) (Table 4). The majority remain in an academic position (85%), with 40% of their current professional effort devoted to the clinical practice of endoscopy, and a median of 15% effort (IQR 10%-40%) for research. In addition, approximately half of all recipients have had a leadership role in their careers and have received federal research funding (Table 5). The median number of peer-reviewed publications after receipt of the ASGE grant was 45 (IQR 20-85). Median peer reviewed publications per year increased from 3.4 (IQR 1.9-5.5) before the award to 4.5 (IQR 2.0-9.5) after receipt of the ASGE grant; $P = .17$. Ninety-one percent reported that the ASGE grant had a positive or very positive impact on their careers (Table 5).

TABLE 2. Publication and productivity of awardee based on Internet-based search

Grant resulted in at least 1 related publication, no. (%)	180 (66.7)
PubMed citations since receiving the ASGE award, median (IQR)	64 (24-130)
Total PubMed citations since receiving the ASGE award, median (IQR)	81 (31-149)
PubMed citations per year since receiving the ASGE award, median (IQR)	5.7 (1.8-9.5)
Current h-index, median (IQR)	17 (8-26)

ASGE, American Society for Gastrointestinal Endoscopy; *IQR,* interquartile range.

Comparing survey responders versus nonresponders with regard to demographics, education, productivity, h-index at the time of the grant and currently showed no statistical differences between the 2 groups (Supplemental Table 1, available online at www.giejournal.org).

In determining whether an ASGE grant resulted in at least 1 peer-reviewed publication, there was poor agreement between the Committee's assessment by using Internet-based tools and survey respondents (Supplemental Table 2, available online at www.giejournal.org, kappa = 0.02). The frequency of publications was higher according to survey responders, with only 60 of 73 (82%) self-reported grant-related publications identified by the Internet-based search.

DISCUSSION

Research is important for guiding and improving health-care and developing innovation in care delivery. Assessing the outcome of funded research is important for both the researcher and the research sponsor. Outcomes of these awards generally can be assessed by several measures: knowledge gained (eg, publications and presentations), clinical implications (eg, change in practice, contribution to clinical guidelines, or health policy), and individual achievement (career development and subsequent research funding).[1] One of the most important outcome measures is the return on the investment of the research to the funding organization.[2] Before attempting to secure additional research resources, it is important for any funding organization to evaluate the products of their research-related investment.

Funding has declined from the NIH, and it is almost certain that it will remain flat or even decrease in the near future.[3] This will pose a major threat to both clinical and basic science investigators, particularly young investigators, who are considered to be the most vulnerable to this trend.[4] This may directly or indirectly impact breakthrough innovations and discoveries, dissemination of evidence-based practice, and, as a consequence, patient care.[5-7] The ASGE has been in the vanguard of endoscopic research for more than half a century. Research funded by the ASGE leads to the development of

TABLE 3. Comparison of awardee characteristics with high- and low-publication volumes since ASGE award

Variable	Low productivity (n = 135)	High productivity (n = 137)	Univariate *P* value	Odds ratio (CI)	Multivariate *P* value
Years since fellowship, median (IQR)	1 (1-4)	3 (1-7)	.003	1.08 (0.96-1.21)	0.204
Female sex, no. (%)	28 (20.7)	20 (14.6)	.296		
Masters or higher degree in research, no. (%)	11 (9.2)	37 (28.7)	.001	2.92 (1.09-7.81)	0.033
Academic rank at the time of award, no. (%)			.388		
Fellow	12 (30.0)	19 (29.3)			
Instructor	5 (12.5)	4 (6.2)			
Assistant professor	18 (45.0)	28 (43.1)			
Associate professor	5 (12.5)	10 (15.4)			
Professor	0 (0.0)	4 (6.2)			
Recipient of multiple ASGE grants, no. (%)	41 (31.3)	87 (68.0)	< .001*		
Institutional rank, median (IQR)	25 (12-64)	32 (11-64)	.212		
No. of PubMed citations at time of grant award (median, IQR)*	2 (0-7)	10 (5-31)	.005	0.99 (0.95-1.05)	0.972
h-index at time of grant award (median, IQR)*	1 (0-4)	6 (3-11)	< .001	1.08 (0.92-1.26)	0.350

CI, Confidence interval; *IQR,* interquartile range.
*This variable was not included in the multivariate model because the unit of analysis for the model was each individual grant.

new techniques, devices, and applications that improve the value of endoscopic services while expanding its role in the diagnostic and therapeutic approach to a multitude of conditions. In some cases, even small studies can have a dramatic impact on the approach to important clinical situations, such as the ASGE-funded study of neostigmine for colonic pseudo-obstruction.[8]

The ASGE research grant program was highly successful in generating research dissemination via publications. More than 67% of awards resulted in at least 1 publication. We also found evidence of continued research productivity and a commitment to an academic medicine career among awardees. Both h-index and median number of publications per year increased after the receipt of an ASGE grant, with the majority of survey respondents having continued academic employment (85%). Nearly 50% of these respondents have obtained successful funding from other sources, including NIH, after their ASGE grants.

Our results are in concordance with previously published studies of society grant funding both in the field of gastroenterology and in other specialties. The American College of Gastroenterology (ACG) assessed characteristics of grant recipients over 25 years by using the ACG reports and medical literature search engines. Of 341 past awardees, 195 (62%) are currently in academic positions. In addition, publications resulted from 90% of the funded projects.[9] Miller and Wozny[10] surveyed previous recipients of the Canadian Anesthesiologist's Society's research award for the period between 1985 and 2005 and reported that the mean number of publications per recipient after award receipt was 30.1. Young[11] conducted a similar survey among past recipients of the Society for Academic Emergency Medicine's grant awards (response rate 70%) and found that all respondents remained in academics and 74% (14/19) have received subsequent federal funding. Compeau et al[1] found that 55.3% of Blind Baker awardees responded that the grant assisted in obtaining subsequent funding. Kimple and Kao[12] reported that all 21 previous recipients of the American Society for Radiation Oncology Junior Faculty Development Awards have remained in academics.

TABLE 4. Characteristics of survey respondents at the time of ASGE grant receipt

Specialty	
Gastroenterology	79 (94.1)
Surgery	4 (4.8)
Other	1 (1.2)
Funding before ASGE grant	
Institutional research grant	31 (37.4)
Institutional trainee grant	14 (16.9)
Federal grant as PI or co-PI	14 (16.9)
Other extramural grant, without federal funding	31 (37.4)
Industry grant, investigator-initiated	27 (32.5)
Industry grant, industry-initiated	16 (19.3)
None	24 (28.9)
Advanced degree (master) in research methodology or related	24 (28.9)
Advanced degree (doctorate)	5 (6.0)
Peer-reviewed publications before ASGE grant, median (IQR)	11 (4-30)
Peer-reviewed publications per year before ASGE grant, median, (IQR)	3.4 (1.9-5.5)

ASGE, American Society for Gastrointestinal Endoscopy; *PI*, principal investigator; *co-PI,* co-principal investigator; *IQR,* interquartile range.

TABLE 5. Characteristics and impact of the ASGE grant receipt on awardees who completed the online survey

Current practice setting, no. (%)	
Private practice	11 (13.1)
Hospital employee, nonacademic	1 (1.2)
Academic setting	71 (84.5)
Industry	0
Retired or disabled	0
Other	1 (1.2)
% Effort at current practice, median (IQR)	
Endoscopic procedures	40 (25-55)
Ambulatory inpatient consultation	20 (10-30)
Research	15 (10-40)
Education	10 (5-10)
Administration	10 (6-20)
Other	9 (6-20)
Leadership positions, no. (%)	
Endoscopy unit director	34 (47.9)
Advanced endoscopy fellowship director	16 (22.5)
GI fellowship director	14 (19.7)
Section chief	22 (31.0)
Division chief	16 (22.5)
Department chair	6 (8.5)
Dean	1 (1.4)
Other leadership position	35 (49.3)
ASGE grant led to at least 1 publication, no. (%)	68 (81.0)
Peer-reviewed publications since ASGE grant, median (IQR)	45 (20-85)
Peer-reviewed publications per year since ASGE grant, median (IQR)	4.5 (2.0-9.5)
Funding since ASGE award, no. (%)	
Federal grant	39 (48.2)
Any nonindustry grant	44 (53.0)
Industry grant	44 (53.0)
ASGE grant resulted in new collaborations, no. (%)	53 (64.6)
Impact of ASGE grant on career, no. (%)	
Very positive	53 (63.9)
Modestly positive	23 (27.7)
Neutral	5 (6.0)
Negative impact	2 (2.4)
Very negative	0 (0.0)

IQR, Interquartile range; *ASGE,* American Society for Gastrointestinal Endoscopy.

There are potential limitations of our study, including misclassification of outcomes obtained through the Internet-based search strategy. In an effort to minimize misclassification, we used dual review of the search results by independent committee members. However, as evidenced by the results of the survey, respondents reported additional grant-related publications that were not identified through our initial search. Also, although the h-index is a measure of scholarly output, it is limited by its dependence on the duration of each scientist's career, the difficulty in obtaining an accurate assessment for scientists with common surnames, and finally, it does not diminish with time. Hence, it cannot detect the declining research output of a scientist.[13] Of the many performance indicators available, the h-index has become one of the most commonly used and it has recently gained prominence because it is currently being used by major citation services, such as the ISI Web of Knowledge (Thomson Reuters) (http://wokinfo.com) and Scopus (Elsevier) (http://libraryconnect.elsevier.com/lcp/0901/lcp090108.html). The study is also limited by the absence of a control group made up of ASGE members at a comparable academic rank who did not attain ASGE grant funding.

Responder bias is an inherent problem in any survey. ASGE Research Committee members made a concerted effort to try to improve the survey response rate through multiple personal e-mails. Despite these efforts and our analysis that suggested no difference between survey responders and nonresponders, systematic differences in research outcomes between the 2 groups cannot be excluded. An important strength of this analysis was the augmentation of the Internet-based search with the online survey in order to further understand and confirm the impact of the award grants on recipients.

The ASGE research program has grown considerably and awards grants covering a wide range of topics. The majority of those who have been awarded grants have successfully completed their research projects, published their results, and have remained active in academic pursuits. In addition, awardees report that these grants have had a significant positive impact on their careers. In this time of increasingly competitive federal research funding pay lines, these findings lend support to the need for ongoing efforts to maintain or increase research opportunities supported by medical professional societies.

DISCLOSURE

F. Willingham received research grants paid to the university by Xlumina, Cook Medical, MedPath, and Cancer Prevention Pharmaceuticals. A. Sethi is a consultant for Boston Scientific. J. Buscaglia is a speaker and lecturer for Abbvie Inc and Boston Scientific. S. Gurudu received a research grant from Gilead Pharmaceuticals. J. Samadder is a speaker for Cook Medical. S. Crockett received research funding from Colowrap LLC and Exact Sciences. He is a consultant for Anthem Inc. All other authors disclosed no financial relationships relevant to this publication.

Abbreviations: ACE, American College of Gastroenterology; ASGE, American Society for Gastrointestinal Endoscopy; NIH, National Institutes of Health.

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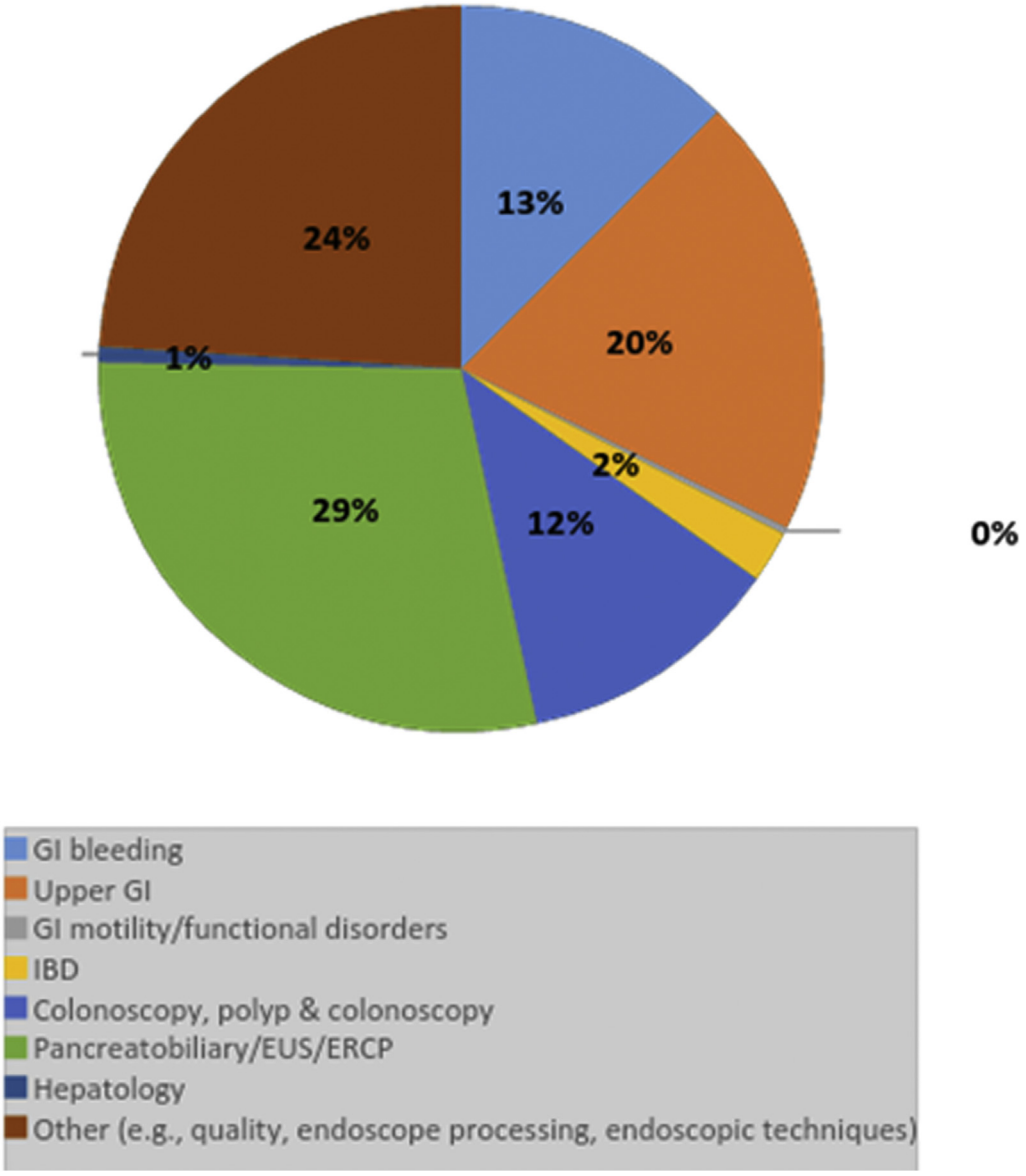

Supplemental Figure 1. Breakdown of research areas of awards awarded between 1985 and 2009. *IBD,* irritable bowel disease.

SUPPLEMENTAL TABLE 1. Characteristics of survey responders versus survey nonresponders based on committee Internet-based search

	Survey responder (n = 82)	Survey nonresponder (n = 130)	*P* value
Female sex, no. (%)	21 (16.1)	13 (15.9)	.99
Medical doctor degree, no. (%)	71 (86.6)	111 (85.4)	.57
Masters degree, no. (%)	13 (15.9)	21 (16.1)	.98
h-index (grant), mean ± SD	5.6 ± 6.1	6.3 ± 7.5	.12
h-index (current), mean ± SD	12 (14.6)	18 (13.9)	.48
High productivity, no. (%)	16.2 ± 10.4	18.9 ± 12.6	.89

SUPPLEMENTAL TABLE 2. The agreement between committee review and survey response regarding grant resulting in publication

Grant-related publication per committee review	Grant-related publication per survey response		Total
	Yes	No	
Yes	41	9	50
No	19	4	23
Total	60	13	73