

# Impact of clinical fellowships on academic productivity in departments of surgery

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**Background.** Research and innovation are crucial to advancements in medicine and improvements in patient care. The contribution of surgical fellowships to scholarly productivity is unclear. The objective of this study was to determine the impact of subspecialty fellowships on academic output in departments of surgery.

**Methods.** This cross-sectional study examined fellowships offered at the top 50 university-based National Institutes of Health-funded and top 5 academically prolific hospital-based departments of surgery. Publications, citations, and National Institutes of Health funding history were determined for 4,015 faculty.  $\chi^2$  and *t* tests were used as appropriate.

**Results.** Cardiothoracic surgery fellowships are offered at all departments, while other surgical fellowships are offered in 52 of 55 departments (96.4%). Median department publications/citations increased with the number of fellowships offered in addition to cardiothoracic surgery: no fellowship ( $27 \pm 93/437 \pm 2,509$ ), 1–3 fellowships ( $34 \pm 90/559 \pm 3,046$ ), and 4 or more fellowships ( $40 \pm 97/716 \pm 3,200$ ,  $P < .05$ ). Significant divisional improvements in publications/citations and National Institutes of Health funding were observed for those with fellowship programs in pediatric, breast, and plastic surgery ( $P < .05$ ). No differences in departmental National Institutes of Health funding rates were observed based on number of fellowships offered.

**Conclusion.** Based on publications/citations and National Institutes of Health funding, it seems that select fellowships are associated with improved scholarly activity. Departments may wish to consider the academic benefits of offering these fellowship types. (Surgery 2016;■:■-■.)

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AFTER GENERAL SURGERY RESIDENCY, trainees can pursue various surgical fellowships for additional specialization. More than 70% of general surgery chief residents in the United States go on to fellowship training.<sup>1</sup> Although one role of fellowship training may be to further develop clinical skills not adequately acquired in residency training but necessary to function as an independent surgeon,<sup>2</sup> another major component of this training is to nurture future research and scholars within the subspecialty. Such activities are a “continuing professional responsibility” as mentioned in the

Fellowship Council’s Program Requirements for Fellowships in Surgery.<sup>3</sup>

Scholarly activity is important to facilitate advances in a particular field, especially medicine. This activity includes pursuing grant opportunities that can fund research projects and publishing research findings in order to disseminate new information that can ultimately be used to improve patient care. Prior studies in various other fields of medicine have shown that fellowship-trained physicians have higher academic productivity, as measured by indicators such as h-index and number of publications, compared with their non-fellowship-trained peers.<sup>4-9</sup> However, a few other studies have not shown such an association.<sup>10-12</sup> Perhaps, academicians who were fellowship-trained have higher baseline academic productivity prior to the start of their faculty position, and this becomes a segue for continued research and scholarship beyond the training years. Could it be that institutions offering certain fellowship programs

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promote scholarly activity and attract faculty that have been and will continue to be academically productive? For dermatologic surgeons, one study showed that those with fellowship training were more likely to become involved in academia.<sup>9</sup> This relationship, however, has not been explored in the field of general surgery and its related specialties. The question of whether surgical fellowship programs promote an environment conducive to academic productivity remains unanswered.

The aim of this study was to examine the association of various postresidency surgical fellowships with the academic metrics of the faculty in their respective surgery departments, as measured primarily by publications, citations, and National Institutes of Health (NIH) funding, and secondarily by h-index. The objective of this analysis is to understand the academic and research contribution that current surgical fellowships are providing to their respective supporting sections, divisions and departments.

## METHODS

**Data collection.** The database of 4,015 surgical faculty in the top 55 departments of surgery in the United States used in this study has been previously described.<sup>13-15</sup> Briefly, the top 50 university-based NIH-funded<sup>13,16</sup> and the 5 most academically prolific hospital-based departments of surgery determined from a Medline search and review of meetings in 2014<sup>13</sup> were identified. For each of these 55 departments of surgery, online departmental websites were accessed to identify current faculty members and surgical fellowships offered. Characteristics of each faculty member were recorded; data points collected specific to this study were specialty and division. Additional academic metrics for each faculty member were obtained from SCOPUS, NIH Research Portfolio Online Reporting Tools, and Grantome. These metrics included total publications and citations, 3-year citations, h-index, type of NIH grant, and number of NIH grants. The grant data were then categorized into 3 groups used in the analysis as follows: no current/former NIH funding, NIH R01/U01/P01 funding, and other non-R01/U01/P01 NIH funding. Data collection occurred from September 1, 2014, to January 31, 2015. The Institutional Review Board of Indiana University School of Medicine determined this study to be exempt from review.

**Statistical analysis.** Using the compiled database of surgery departments and faculty members,

analyses of academic metrics were performed based on the categorical independent variables of specialty/division and presence of a fellowship program in a specialty. Continuous dependent variables included total number of publications, total career citations, 3-year citations, and h-indices. Categorical dependent variables included type of NIH funding (ie, NIH R01/U01/P01 funding or non-R01/U01/P01 NIH funding) and presence of NIH grants (ie, no current/former NIH funding or any NIH funding). Median and standard deviations were calculated for total publications, total and 3-year citations, and h-indices. These variables were compared among surgical divisions that offered a fellowship and those that did not offer a fellowship for a particular specialty using *t* test of means for 2 groups. Proportions of faculty with or without NIH grants also were compared between these 2 groups using  $\chi^2$  test. All statistical tests were performed using SPSS for Windows (version 15.0; SPSS Inc, Chicago, IL).

## RESULTS

**Number of fellowships is associated with academic metrics.** The 55 departments of surgery were categorized into 3 groups based on the number of fellowship programs they supported as follows: none, 1–3, or 4–7 fellowships. All departments offered cardiothoracic surgery fellowships, and therefore this particular specialty was not included in the analyses. The median number of publications  $\pm$  standard deviation (SD) for faculty in departments with no fellowships was  $27 \pm 93$ ,  $34 \pm 90$  for those with 1–3 fellowships, and  $40 \pm 97$  for those with 4–7 fellowships ( $P < .05$ ). The median number of citations  $\pm$  SD for faculty revealed a similar trend, as follows:  $437 \pm 2,509$  in departments with no fellowships,  $559 \pm 3,046$  in those with 1–3 fellowships, and  $716 \pm 3,200$  in those with 4–7 fellowships ( $P < .05$ ). Research funding, however, was not significantly associated with number of fellowships in a surgery department (Table I).

**Type of fellowship is associated with academic productivity.** To examine further how having fellowship programs affects academic productivity, the publication and citation metrics of faculty from various surgical divisions were analyzed based on whether a fellowship program was offered in a particular department of surgery. Table II shows 11 surgical divisions that were studied: pediatric surgery, colorectal surgery, breast surgical oncology, bariatric and minimally invasive surgery, endocrine

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