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Survey of Surgical Oncology Fellowship Graduates 2005–2016: Insight into Initial Practice

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ABSTRACT

Background. Despite burgeoning interest in Complex General Surgical Oncology (CGSO) fellowship training, little is reported about postgraduate employment. The goal of this study was to characterize CGSO graduates' first employment and to identify factors that influenced this decision.

Methods. The National Cancer Institute (NCI) and Society of Surgical Oncology developed and distributed an electronic survey to CGSO fellows who graduated from 2005 to 2016.

Results. The survey response rate was 47% (237/509). Fifty-seven percent of respondents were first employed as faculty surgeons at a university-based/affiliated hospital, with 15% returning to their residency institution. The distribution of respondents' current employment across the United States mirrored the locations of their hometowns. Eighty-five percent of respondents care for patients across at least three disease types, most commonly hepatopancreatobiliary (81%), esophagus/gastric (75%), and sarcoma (74%). Twenty-seven percent of respondents spend the majority of their time in one area of surgical oncology; melanoma, breast, and head/neck were the most common. Two-thirds of respondents (67%) reported that they performed either clinical or basic science research as part of their current position. Multiple factors influenced the decision of first faculty position.

Conclusions. Most CGSO graduates are employed at academic medical centers across the country in proximity to NCI-designated centers, treat a variety of disease types, and spend a percentage of their time dedicated to clinical research.

In the past decade, Complex General Surgical Oncology (CGSO) has become a recognized subspecialty by the Accreditation Council for Graduate Medical Education (ACGME), and a new certificate in CGSO was created by the American Board of Surgery.[1] Each year, more than 50 CGSO graduates enter the workforce. Aside from a previously published, single-institution study, geographic and practice choices of recent CGSO graduates have not been characterized.[2] Based on an electronic survey of surgical oncology fellows and fellowship candidates during the 2014 interview season, most responded that the CGSO certificate would be helpful in meeting career goals.[3] In addition, 64% of those surveyed wanted to work in an academic center, 36% wanted to work in a university-affiliated hospital, and none of the respondents wanted to work solely in private practice.

Academic centers are often concentrated in urban areas. There are 69 National Cancer Institute (NCI) designated cancer centers in the United States, which leaves large areas of the country without access to specialized cancer care and often results in patients traveling long distances for treatment[4]. It is recognized, therefore, that most patients are being treated by general surgeons. Delivery of high-

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quality cancer care remains a dilemma due to the shortage of physicians and training programs specific to cancer, increasing costs of cancer care, and increasing cancer incidence.[5,6] For some cancers (e.g., metastatic colorectal cancer, urologic cancer, esophageal cancer), inequalities in access to care often are based on socioeconomic status and location.[7-9]

Based on the above data, this study hypothesized that CGSO graduates are not evenly distributed geographically or by practice, which may affect access to quality surgical oncology care for the growing United States population. Therefore, the NCI and Society of Surgical Oncology (SSO) undertook a joint study with two goals: (1) to characterize CGSO graduates' first surgical practices, and (2) to determine the factors that influenced the CGSO graduates' choice of first employment.

METHODS

National Cancer Institute investigators initiated the study and partnered with SSO leadership. A survey was developed, reviewed, and approved by the Office of Human Subjects Research Protections at the National Institutes of Health and by the SSO Executive Committee. The survey consisted of 31 multiple choice, rank order, and fill-in-the-blank questions (see appendix with survey). The survey was divided into three sections: demographics, post-fellowship career/first job characteristics, and geographic data. Part of the survey was designed to determine whether any common factors affected how graduating fellows chose their first job. Survey participants were given 12 options and asked to rank their top 5 reasons for choosing their first job. These 12 options included: type of practice, personal factors, professional development, geographic location, expected case load, clinical research opportunities, salary, call responsibilities, basic science research opportunities, conducting clinical trials, loan repayment, and global surgery. To understand what types of disease the respondents were treating in their practice, they were asked to assign a percentage to each of 11 different practice areas that totaled 100%. These practice areas included general surgery, esophagus/gastric, colorectal, hepatopancreatobiliary (HPB), breast, thoracic, head/neck, melanoma, sarcoma, basic science research, and clinical research. Respondents also were asked for the zip codes of their hometown, undergraduate school, medical school, residency, research facility (if applicable), fellowship, first job, and current job.

In May 2017, an electronic survey was sent to surgical oncologists who graduated from 2005 to 2016 from an accredited CGSO fellowship program (509 individuals). This did not include breast or colorectal fellowship programs. The survey took approximately 11 min to complete. Participation in the survey was voluntary and anonymous. No financial incentives were offered. This study evaluated whether race, gender, relationship status at time of graduation, number of years dedicated to research during residency, debt at fellowship graduation, number of publications, and type of general surgery residency program influenced what factors respondents ranked in the top five reasons for choosing their first employment. Continuous parameters (number of publications) were compared between those with and without top five selection for a given factor using a Wilcoxon rank-sum test. Dichotomous parameters were compared between groups using Fisher's exact test, whereas unordered categorical parameters were compared between groups using Mehta's modification to Fisher's exact test. Ordered categorical parameters were compared between groups using a Cochran–Armitage test for trend. Following this initial evaluation, parameters that resulted in a difference with $p < 0.10$ were considered for inclusion in a multiple logistic regression model to determine the joint ability of the parameters to predict whether a factor would be in the top five or not. The final model was chosen using backward selection, and the model was translated into a classification rule, which was then applied to the data on which it was developed to indicate the potential degree of correct classification based on the results of the model.

Statistical analysis of descriptive data was performed using IBM SPSS Statistics 25. Analysis of factors associated with ranking of reasons for choosing first employment were performed using SAS Version 9.3 (SAS Institute, Inc., Cary, NC).

RESULTS

Demographics

Overall response rate to the survey was 47% (237/509). Respondents were 68% ($N = 161$) male and 64% ($N = 151$) Caucasian. At the time of graduation, 52% ($N = 124$) of respondents were age 31–35 years, 79% ($N = 188$) were married, and 59% ($N = 140$) had educational debt (Table 1). Seventy-one percent ($N = 168$) of respondents completed general surgery residency at an academic, university-based program. One, two and three years of dedicated research years during residency were undertaken by 12%, 40%, and 11% respectively. Of the 33% ($N = 79$) of respondents eligible for CGSO board certification at time of graduation, 79% ($N = 70$) were board certified at the time of this survey.

TABLE 1 Demographics of respondents

Variable	*N* (%)[a]
Gender	
Male	161 (68)
Female	74 (31)
Prefer not to answer	2 (1)
Age at completion of fellowship	
25–30	1 (1)
31–35	124 (52)
36–40	98 (41)
41–45	14 (6)
Type of general surgery residency	
Academic—University hospital based	168 (71)
Academic—Community based, University affiliated	36 (15)
Private	13 (5)
Did not answer	11(5)
Military	9(4)
International	0
Race	
Caucasian	151 (64)
Asian	57 (24)
Hispanic	7 (3)
African American	5 (2)
Prefer not to answer	9 (4)
Other	8 (3)
Relationship status at the end of fellowship	
Married	188 (79)
Single	35 (15)
Committed relationship	13 (6)
Divorced	1 (< 1)
Widowed	0
Other	0
Educational Debt at the end of fellowship	
None	81 (34)
< $100,000	44 (19)
$100,000 – $199,999	68 (28)
$200,000 – $300,000	24 (10)
> $300,000	4 (2)
Prefer not to answer	5 (2)
Did not answer	11 (5)
Year graduated	
2005	15 (6)
2006	12 (5)
2007	20 (8)
2008	17 (7)
2009	16 (7)
2010	24 (10)
2011	22 (9)
2012	28 (12)
2013	21 (9)
2014	8 (3)
2015	24 (10)
2016	29 (12)
Dedicated research during residency	
None	76 (32)
1 year	28 (12)
2 years	97 (40)
3 or more	25 (11)
Did not answer	11 (5)
Number of publications Dunne residency	
0	19 (8)
1–10	144 (61)
11–20	61 (26)
> 20	13 (5)

[a]Rounded to nearest percent

First Employment

Fifty-seven percent ($N = 135$) of respondents were first employed as faculty surgeons at a university-based or university-affiliated hospital, with 15% ($N = 36$) returning to the same institution where they completed general surgery training (Table 2). Fifty percent ($N = 118$) of respondents were first employed at the same *type* of institution (e.g., academic university-based, academic community-based/university-affiliated, private, or military) as their general surgery residency program. This study captured the geographical distribution of 153 (65%) respondents, with zip code data depicted in Fig. 1 for respondents that provided all six time points. The distribution of respondents' current employment across the United States mirrored the locations of their hometowns. One-third of respondents ($N = 47$, 31%) returned to their home state for employment.

Ninety-one percent ($N = 216$) of respondents described how their time was spent in their practice. Most respondents' first practice involved treating a variety of malignancies, with a distinct minority (27%, $N = 58$) of respondents spending 60% or more of their time in one area of surgical oncology. Melanoma was the most common disease that respondents reported dedicating 60% or more of their time (21%, $N = 12$), followed by breast cancer (16%, $N = 9$), and head/neck cancer (16%, $N = 9$). For respondents who did not focus 60% or more of their time in one disease area ($N = 158$), the most common clinical areas that respondents reported dedicating time to were hepatopancreatobiliary (81%, $N = 128$), esophagus/gastric (75%, $N = 119$), and sarcoma (74%, $N = 117$). Very few of

TABLE 2 Characteristics of first faculty employment

Variable	*N* (%)[a]
Describe your first position	
Faculty at University based hospital	110 (46)
Faculty at University affiliated practice	25 (11)
Private practice	26 (11)
Hospital employee	24 (10)
Did not answer	21 (9)
Military	14 (5)
Faculty at free standing cancer center	9 (4)
Other	7 (3)
International	1 (< 1)
Was your first position at the same institution as your…	
General surgery residency	36 (15)
Did not answer	21 (9)
Surgical Oncology Fellowship	19 (8)
Med school and residency	7 (3)
Medical school	2 (1)
Other affiliation (ex: research fellowship)	3 (1)
Surgical residency and fellowship	2 (1)
None of the above	147 (62)
Are you still at your first job?	
Yes	164 (69)
No	52 (22)
Did not answer	21 (9)
If No—how many jobs have you had since fellowship?	
2	39 (76)
3	10 (20)
4+	2 (4)

[a]Rounded to nearest percent

total respondents (5%, $N = 10$) dedicate time to treating thoracic malignancies in their current practice. Eighty-five percent ($N = 183$) of respondents care for patients across at least three disease types. The percent time respondents' reported as dedicated to different malignancies did not vary among CGSO graduation years.

In addition to the nine clinical areas, respondents were asked to assign a percentage of their time to basic research, clinical research, or both. Two-thirds of respondents (67%, $N = 145$) reported that a percentage of their time is dedicated to clinical research and/or basic research. Seventy-three percent ($N = 106$) of those respondents dedicate a median of 10% (range: 1–90%) of their time to clinical research, 10% ($N = 14$) dedicate a median of 50% (range: 9–75%) of their time to basic research, and 17% ($N = 25$) dedicate a median of 30% (range: 5–100%) of their time to both clinical and basic science research.

Factors Influencing First Employment

Survey respondents were given 12 categories (described in *Methods*) that may have influenced their choice of first job. Respondents were asked to rank their top five reasons for choosing a job, and this study explored how often a factor was ranked in the top five. The most cited factors influencing the decision for a first position were type of practice (ranked by 80%, $N = 172$), personal factors (ranked by 69%, $N = 150$), professional advancement opportunities (ranked by 67%, $N = 145$), geographic location (ranked by 62%, $N = 133$), and expected case load (ranked by 59%, $N = 128$; Fig. 2a).

We evaluated whether race, gender, relationship status at time of graduation, number of years dedicated to research during residency, debt at fellowship graduation, number of publications, and type of general surgery residency program influenced what factors respondents ranked in the top five reasons for choosing their first employment. The most significant findings were in regard to what was associated with respondents ranking basic or clinical research opportunities. The number of publications (odds ratio [OR] 1.062; 95% confidence interval [CI]: 1.013–1.113; $p = 0.0121$), academic/university based versus other categories of general surgery residency (OR 13.801; 95% CI: 1.824–104.397; $p = 0.011$), and 3 or more versus 0–2 years of research during residency (OR 3.35; 95% CI: 1.336–8.401; $p = 0.010$) were associated with selecting basic science research opportunities as one of the top five reasons for choosing the first post-fellowship position. The respondents' race (Caucasian vs. other, OR 2.804; 95% CI: 1.512–5.200; $p = 0.0011$) and number of dedicated research years during residency (2 or more vs. 0–1 years, OR 2.374; 95% CI: 1.336–4.218; $p = 0.0032$) were associated with selecting clinical research opportunities as one of the top five reasons for choosing first employment.

Changing Employment

Respondents were asked to use the same 12 reasons they were given for choosing a first job to rank their top five reasons for leaving a first job. Twenty-two percent of respondents ($N = 51$) reported leaving their first job since fellowship. The most common reasons ranked were professional advancement (ranked by 84%), type of practice (ranked by 73%), personal factors (ranked by 73%), salary (ranked by 65%), and clinical research opportunities (ranked by 53%; Fig. 2b). Of the 22% ($N = 52$) of respondents who had already left their first job, 76% ($N = 39$) held two jobs since fellowship, 20% ($N = 10$) held three jobs since fellowship, and 4% ($N = 2$) held four or more jobs since fellowship (Table 2).

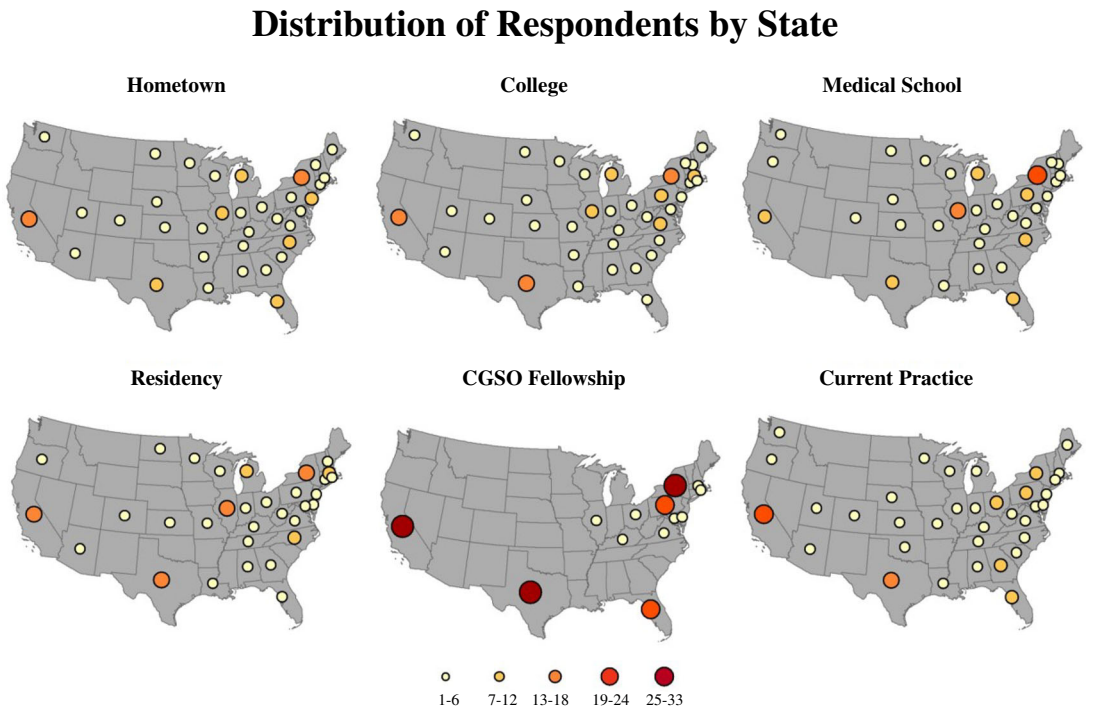

FIG. 1 Distribution of respondents by state throughout training. *Legend numbers indicate individual respondents

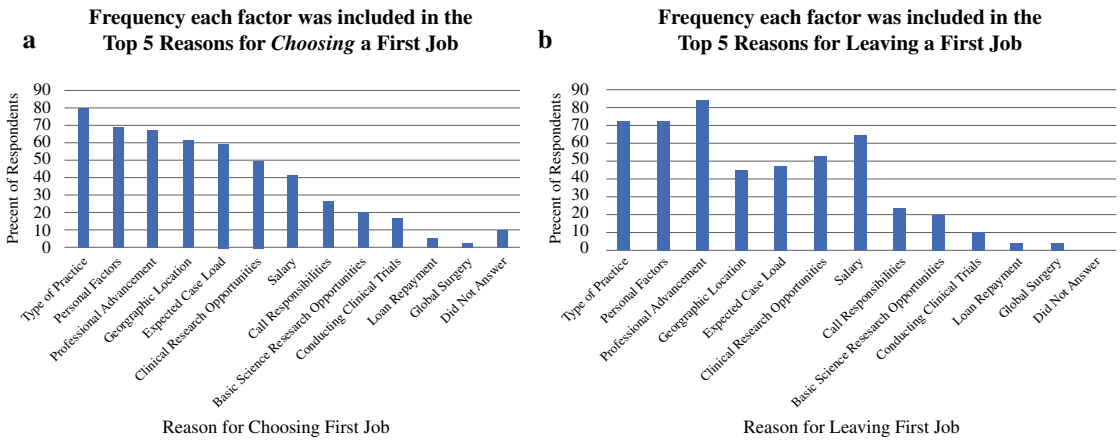

FIG. 2 Frequency each factor was included in top five reasons for a respondent choosing a first job (**a**) and leaving a first job (**b**)

DISCUSSION

Despite recent growth and interest in the field of surgical oncology, the first practice choices of CGSO graduates has gone unreported. This study describes the employment of recent CGSO graduates and the factors that influenced their choice of first employment. The primary purpose of the study was to characterize distribution of practice type of CGSO fellowship graduates. More than half of respondents obtained their first job as a faculty member at a university-based or university-affiliated hospital. This finding is in line with previous observations by the American College of Surgeons and SSO, which found that 59.5% and 72% of respondents, respectively, were in academic practice.[10,11] The resources of large academic centers, including sub-specialty staff (e.g., gastroenterologists, oncologists, interventional radiologists), specialized intensive care units, etc., provide the infrastructure required for complex patient care needs. Additionally, these large academic centers are a conducive environment for research.

CGSO graduates appear to spread out after graduation in a similar geographic distribution to their hometown and early training. While California, Texas, New York, Pennsylvania, and Florida still have the highest concentration of

respondents in this cohort, many have taken jobs throughout the country often at or near NCI-designated cancer centers. This brings up two important items. First, it supports this study's finding that most respondents work in large academic centers. These five states contain the highest number of CGSO fellowship programs. Second, even though respondents may practice outside of the major cities where they trained, there are still large areas of the country where very few or no respondents have settled. As a result, there are large areas of the country not represented and not covered by recent CGSO graduates. This has the potential to create a shortage of subspecialty surgeons in parts of the country and for patients who live in rural areas and must travel to reach a major cancer center. By identifying these areas of the country, program directors can encourage CGSO graduates to practice in these regions. It also may be beneficial to create nonacademic or community track surgical oncology training programs for surgeons who desire to practice in these areas. In addition, training programs can form relationships with smaller, acute-care hospitals in underserved regions. This could allow specialty societies, such as the SSO, to design educational and practical training programs geared toward general surgeons in regions where CGSO trained specialists do not have a strong presence. It is unclear based on this survey, however, what the concentration is of more senior surgical oncologists (those who graduated before 2005) in these same areas.

CGSO fellowship training requires a minimum number of cases for breast, endocrine, gastrointestinal, HPB, melanoma, and soft-tissue sarcoma cases.[12] This study found that very few respondents spend a majority of their time focused on one area of surgical oncology. More importantly, this study found that 85% of respondents included at least three of the nine clinical areas in their current practice. This means that most CGSO graduates enter the workforce and operate on a wide range of malignancies. These data support the current structure of CGSO fellowship and the minimum case requirements. While many CGSO fellows train in a modern environment of surgical sub-specialization for a specific disease type/histology, this study demonstrates that broad-based training is optimally preparatory.

The second purpose was to determine whether any factors influenced the graduates' choice of first employment. The most common factors ranked by respondents were type of practice, personal factors, professional advancement opportunities, geographic location, and expected case load. The least important factors were related to basic science research, conducting clinical trials, loan repayment, and global surgery. It is noteworthy that more than double the number of respondents ranked clinical research opportunities in their top five reasons for choosing a first job compared with basic science research and clinical trials. This may speak to the difficulty of being a surgeon-scientist or clinical investigator. Nearly two-thirds of respondents took 1–3 years off during residency for research, and nearly all of the respondents published at least one paper before entering fellowship. In addition, two-thirds of respondents report at least some of their time is devoted to clinical and/or basic science research in their current practice. This demonstrates that CGSO graduates maintained their research interest throughout training and practice, yet when it came to choose a first job, research opportunities were ranked lower in priority. Studies have shown that the amount of NIH funding for academic surgeons has decreased compared with the medical subspecialties.[13,14] In addition, many hospital systems place an emphasis on clinical productivity given the current nature of reimbursement, whereas research is not as heavily incentivized.[15] A previous survey of surgical oncologists found that the majority of respondents performed more than seven operations per a week, whereas only a quarter of respondents devoted more than a quarter of their time to research.[10] Throughout training, surgeons are witness to the barriers of being a surgeon scientist (e.g., funding, time). Currently, most CGSO applicants perform basic research during designated time in residency. Upon completion, most would-be applicants return to residency for 2–3 years before pursuing fellowship training. Consequently, there is an obligate 4- to 5-year hiatus from basic research, which likely impacts graduates' career choices significantly.

In this study, the most common reason ranked in the top five reasons for choosing a first job was type of practice. There was a consistency of respondents completing general surgery training in an academic center and pursuing an academic center for their first job. A recent study on factors associated with matriculation at a CGSO fellowship showed that applicants from a university based surgical residency were more likely to achieve matriculation at a CGSO fellowship.[16] This could indicate self-selection of academic training programs by residents with the intention of attending a fellowship afterwards or an inclination on behalf of the CGSO fellowship programs to accept applicants from academic programs. The current study also examined factors associated with the decision to leave a first job. Interestingly, three of the reasons respondents ranked as their top five reasons for leaving a first job were also three of the reasons ranked for choosing a first job (i.e., type of practice, personal factors, professional advancement). This suggests what graduates found important when choosing a first job also impacted their decision to leave that job.

This study has the inherent limitations of any survey. First, this study surveyed only recent graduates. For the geographical distribution of CGSO graduates, the study was only able to analyze 65% of the respondents due to absent data (i.e., no response). Second, as a survey study, there is no way to correlate responses with actual surgical practice. For example, the clinical areas that respondents assigned percentages cannot be verified against the respondents' actual practice. Third, this study provides a very general overview of the factors affecting CGSO graduates and their first jobs. As a result, the study was able to demonstrate little statistical significance regarding factors that influenced respondents' choice of first job. In addition, this study could not calculate the median time of employment for respondents who changed positions.

CONCLUSIONS

CGSO graduates are more likely to take jobs in academic centers, and their first surgical practice often incorporates a wide range of malignancies. CGSO graduates appear interested in pursuing research as part of their first job; however, most focus on clinical research rather than basic science or clinical trials. The geographic disparities between the incidence of cancer and distribution of recent CGSO graduates could be studied further. This study may prove beneficial to both the SSO and NCI by revealing areas that should be investigated to improve surgical cancer care to the growing and aging United States population. The most common reasons for choosing a new job also may be considered an opportunity for focused mentorship or counseling. This study serves as a starting point for understanding the practice patterns of recent CGSO graduates and how they may influence the growing demand for surgical oncologists, while simultaneously providing areas of interest that can be explored with future studies.

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