



Analysis of Early Job Market Experiences and Perceptions Among Bariatric Surgery Fellowship Graduates and Bariatric Surgery Program Directors

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Abstract

Purpose Over the past decade, an increasing number of bariatric surgeons are trained in fellowships annually despite only a modest increase in nationwide bariatric surgery volume. The study surveys the bariatric surgery job market trend in order to inform better career-choice decisions for trainees interested in this field.

Materials and Methods A national retrospective cohort survey over an 11-year period was conducted. Bariatric surgery fellowship graduates from 2008 to 2019 and program directors (PDs) were surveyed electronically. Univariate analysis was performed comparing responses between earlier (2008–2016) and recent graduates (2017–2019).

Results We identified a total of 996 graduates and 143 PDs. Response rates were 9% and 20% respectively ($n = 88, 29$). Sixty-eight percent of graduates felt there are not enough bariatric jobs for new graduates. Seventy-nine percent of PDs felt that it is more difficult to find a bariatric job for their fellows now than 5–10 years ago. Forty-eight percent of PDs felt that we are training too many bariatric fellows. Seventy-seven percent of all graduates want the majority of their practice to be comprised bariatric cases; however, only 42% of them reported achieving this. In the univariate analysis, recent graduates were less likely to be currently employed as a bariatric surgeon (64% vs. 86%, $p = 0.02$) and were less satisfied with their current case volume (42% vs. 66%, $p = 0.01$).

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Conclusions The temporal increase in bariatric fellowship graduates over the past decade has resulted in a significant decline in the likelihood of employment in a full-time bariatric surgical practice and a decline in surgeons' bariatric case volumes.

Keywords Bariatric · Training · Job market analysis · Job market · Fellow · Surgery

Introduction

General surgery training has changed significantly over the past few decades. More than 80% of general surgery residency graduates pursued subspecialty fellowship training in recent years. [1, 2] While a workforce shortage has been predicted for general surgeons [3], some highly specialized surgeons may face an over-supply because of the significant increase in the number of subspecialty training programs and applicants seeking post-graduate training. This has prompted examinations in the workforces, job markets, and practice patterns of many surgical subspecialties in the USA and Canada [4–9]. A national survey of endocrine surgery fellowship graduates showed that recent graduates reported fewer overall job offers and academic job opportunities [4, 5]. Similarly, a large study of transplant surgeons reported that a significant percentage (12%) of graduating fellows were unsuccessful in finding transplant jobs [6]. In contrast, a survey of vascular surgery fellows and integrated residents found that nearly all graduates reported positive experiences in their job searches after training [7]. These reports can play a key role in guiding general surgery trainees in their career decisions and forecasting early job expectations, but currently there is a lack of robust data on this topic for most surgical specialties including bariatric surgery.

With the steady rise in prevalence of obesity during the past few decades, there was a significant increase in bariatric surgery volume from 1998 to 2006 [10]. The number of bariatric/minimally invasive fellowships also increased steadily over the past decade [11, 12]. Currently there are 116 “official” bariatric and/or minimally invasive surgery fellowships in the USA according to the Fellowship Council, and many more unofficial fellowship programs [13]. While more bariatric fellows graduate each year, the growth of bariatric surgery volume has been relatively modest over the past decade [14, 15]. Anecdotally many recent bariatric surgery fellows, fellowship program directors, and even practicing bariatric surgeons feel that there are fewer available bariatric surgery positions each year and significantly greater competition for those limited spots. Given the recent trends and perceptions, there is an important and urgent need to understand how new bariatric fellowship graduates fare in their current employment in order to inform career-choice decisions for trainees interested in this field.

The American Society for Metabolic and Bariatric Surgery (ASMBS) Bariatric Surgery Training Committee formed a

working group to study the job market for graduates of bariatric fellowships. The working group hypothesized that recent graduates might have a more difficult time with their job search due to fewer available opportunities. A national survey of bariatric fellowship graduates and program directors was then conducted to provide useful quantitative data about the bariatric job market to share with residents, current and prospective fellows, faculty, program directors, and the surgery community at large. The primary objectives of this study were to characterize the employment patterns and opinions among bariatric fellowship graduates over the past decade, and to also characterize the experiences and opinions of bariatric fellowship program directors nationwide.

Methods

The study investigators are members of the ASBMS Bariatric Surgery Training Committee. We identified the contact information of minimally invasive surgery and bariatric surgery fellowship graduates through the Fellowship Council. A comprehensive 32-question electronic survey was created using Qualtrics, an online survey tool. The survey items were developed by the study investigators based on a literature review of similar instruments used by other surgical specialties in performing job market analysis research [4–9]. In March 2020, the survey was independently distributed via email by the Fellowship Council to bariatric surgery fellowship graduates from 2008 to 2019 (Appendix A). A separate 10-question online survey was emailed to all bariatric surgery program directors (Appendix B). To maximize response rate, we requested the survey to be sent to recipients a second time, 1 week following the initial email. Participation was voluntary and responses were kept anonymous.

Descriptive statistics were used to summarize the data and overall characteristics and opinions of the respondents. Univariate analysis was performed with R studio 1.2.1335 using Pearson chi-squared test, Fisher's exact test, and student's *t* test where appropriate for categorical and continuous variables. For the purposes of analyzing changes over time, all fellowship graduate respondents were dichotomized by the year of their completing fellowship. Fellows graduating between 2008 and 2016 were characterized as “earlier,” and respondents graduating between 2017 and 2019 were grouped as “recent”. A *p* value of 0.05 or less was considered to be

significant. Local institutional review board approval was obtained for this study.

Results

Fellowship Graduates

Demographics

We identified 996 fellowship graduates from 2008 to 2019. The overall response rate was 9% ($n = 88$). Of respondents, 36 were categorized as earlier graduates (2008–2016) and 52 were recent graduates (2017–2019). The median age of respondents was 36. The cohort was 69% male, 30% female, and 1% preferred not to state. Fellowship programs from different regions across the country and abroad were well represented in the survey: 29% Northeast, 24% Southeast, 20% Midwest, 16% West, 6% Southwest, and 6% International graduates (Table 1). The distribution of survey participants was well-aligned with the current list of fellowship programs according to the Fellowship Council, which were geographically distributed as follows: 23% Northeast, 19% Southeast, 27% Midwest, 15% West, 7% Southwest, and 9% International [13].

Practice Setting

Most graduates reported currently working at a different institution than their residency program (86%) and fellowship program (83%). A majority reported finding a job in their preferred practice setting (76%). Of those who did not find a job in their preferred practice setting, 33% wanted to work in a different geographic area, 33% reported suboptimal bariatric case mix and practice volume, 4% stated inadequate salary, and 7% answered “other,” which included reasons such as inadequate partners or lack of administrative support. Approximately 46% of graduates preferred an academic job and 40% ended up with an academic position. In terms of expectations towards taking general surgery call, 84% expected to have general surgery, acute care, and/or trauma call responsibilities. Similarly, 77% ended up in jobs that had general surgery call requirements (Table 1).

Case Volume

While 77% of graduates prefer the majority of their practice to be comprised bariatric cases, only 42% reported achieving this in their current practice. This mismatch in expected vs. actual clinical case volume is demonstrated in Fig. 1. Furthermore, only half of graduates (52%) reported being satisfied with their current bariatric volume, while 74% reported being satisfied with their case complexity.

Salary and Debt

When asked about the starting salary at their current job, approximately 59% reported greater than \$300,000 and 41% reported less than \$300,000 in annual earnings. In terms of student debt, half reported greater than \$100,000 and the other half reported less than \$100,000 in debt at the start of bariatric fellowship (Table 1).

Job Market Perceptions and Job Search

When asked if they had a difficult time securing a job after fellowship, 43% of graduates reported “probably yes” or “definitely yes”. Approximately 68% of graduates felt there were not enough bariatric jobs for new graduates and 50% of graduates felt that they did not have an accurate global view of the current bariatric job market. The average number of bariatric job applications submitted by each fellow was 6.3 ± 0.7 and average number of eventual job offers per fellow was 2.1 ± 0.2 . Approximately 13% of respondents received their job offer before fellowship, 6% during the first half of fellowship, 62% during the second half of fellowship, and 19% after graduation (Table 1).

Comparison Between Earlier and Recent Graduates

In the univariate analysis, we compared expectations, practice patterns, and opinions of earlier graduates to recent graduates (Fig. 2). Despite the same mean number of job applications (6.3 in 2008–2016, 6.3 in 2017–2019, $p = 1$), there was a slight decrease in the mean number of bariatric job offers to new graduates (1.9 vs. 2.3, $p = 0.2$). A smaller percentage of recent graduates reported currently being employed as bariatric surgeons (64% vs. 86%, $p = 0.02$) and being satisfied with their bariatric case volume and case complexity (42% vs. 66%, $p = 0.01$; 69% vs. 82% 0.07). A larger percentage of recent graduates reported having a difficult time finding a job (55% vs. 36%, $p = 0.09$). In addition, there were some notable differences between the two cohorts. Earlier graduates were predominantly male (82% vs. 59%, $p = 0.04$), reported less overall student debt at the start of fellowship (64% vs. 40% reported less than \$100,000, $p = 0.01$), and reported a lower starting salary at the time of graduation (44% vs. 70% reported more than \$300,000 in annual starting salary, $p = 0.04$). The two groups were not significantly different in geographic distribution and academic affiliation ($p = 0.2, 1$).

Attitudes Towards Fellowship Training

Despite challenges in finding a bariatric job after graduation, the vast majority of graduates (91%) felt adequately trained to

Table 1 Descriptive summary of survey responses from fellowship graduates 2008–2019

Number of total respondents, <i>n</i>	88
Age, median	36
Sex*, <i>n</i> (%)	
Female	25 (69)
Male	57 (30)
Preferred not to state	1 (1)
Residency region, <i>n</i> (%)	
Northeast	30 (34)
Southeast	13 (15)
Midwest	17 (19)
Southwest	4 (5)
West	16 (18)
International	8 (9)
Fellowship region, <i>n</i> (%)	
Northeast	25 (29)
Southeast	21 (24)
Midwest	18 (20)
Southwest	5 (6)
West	14 (16)
International	5 (6)
Current practice region, <i>n</i> (%)	
Northeast	22 (25)
Southeast	19 (22)
Midwest	19 (22)
Southwest	4 (5)
West	15 (17)
International	9 (10)
Description of fellowship, <i>n</i> (%)	
Bariatric surgery	21 (24)
Minimally invasive surgery (MIS)	1 (1)
Bariatric/MIS	64 (73)
Advanced gastrointestinal/MIS	2 (2)
Most important reason for pursuing bariatric fellowship, <i>n</i> (%)	
To build a specialized niche/practice	48 (55)
To gain additional surgical skills	35 (40)
To be competitive for the job I want	2 (2)
Did not feel ready to practice independently	0 (0)
Other	3 (3)
Current institution same as residency ^y , <i>n</i> (%)	12 (14)
Current institution same as fellowship ^y , <i>n</i> (%)	15 (17)
Current institution has academic affiliation ^y , <i>n</i> (%)	34 (40)
Amount of student debt, <i>n</i> (%)	
< \$50,000	31 (35)
\$50,000-100,000	13 (15)
\$100,000-200,000	15 (17)
> \$200,000	29 (33)
Annual starting salary ^y , <i>n</i> (%)	
< \$200,000	5 (6)
\$200,000-250,000	13 (15)
\$250,000-300,000	17 (20)

Table 1 (continued)

\$300,000-350,000	22 (26)
> \$350,000	29 (34)
Mean bariatric job applications [*] , <i>n</i> ± SE	6.3 ± 0.7
Mean bariatric job interviews [*] , <i>n</i> ± SE	2.9 ± 0.2
Mean bariatric job offers ^x , <i>n</i> ± SE	2.1 ± 0.2
When did you receive your first job offer? ^y <i>n</i> (%)	
Before fellowship	11 (13)
During first half of fellowship	5 (6)
During second half of fellowship	53 (62)
After graduation from fellowship	16 (19)
Have not received an offer yet	1 (1)
How did you find your current job? ^y <i>n</i> (%)	
Direct mentor contacts	35 (41)
Networking events	6 (7)
Self-directed searches	45 (52)
Found a job in your preferred practice setting ^y , <i>n</i> (%)	65 (76)
Currently employed as bariatric surgeon ^y , <i>n</i> (%)	58 (70)
Agree with following statements ^z , <i>n</i> (%)	
Had a difficult time finding a bariatric job	37 (43)
Expected general surgery call responsibility	72 (84)
Actual general surgery call responsibility	66 (77)
Content with decision to pursue fellowship	78 (95)
Feel adequately trained to practice independently after fellowship	74 (91)
There are not enough bariatric job opportunities for new graduates	56 (68)
Satisfied with case volume	42 (52)
Satisfied with case complexity	61 (74)
Satisfied with work-life balance	59 (72)

*Information not available for 5 respondents

^x Information not available for 7 respondents

^y Information not available for 2 respondents

^z Information not available for 6 respondents

practice bariatric surgery independently at the completion of their clinical fellowship. Furthermore, 95% felt content with their decision to pursue a bariatric fellowship, 72% felt satisfied with their current work-life balance, and 84% chose to market themselves as bariatric surgeons (Table 1).

Bariatric Program Directors

The survey was sent to 143 minimally invasive and bariatric fellowship program directors in the USA. The response rate was 20% (*n* = 29). Different geographic regions across the

Fig. 1 Comparison between ideal vs. actual percentage of bariatric case volume in current practice

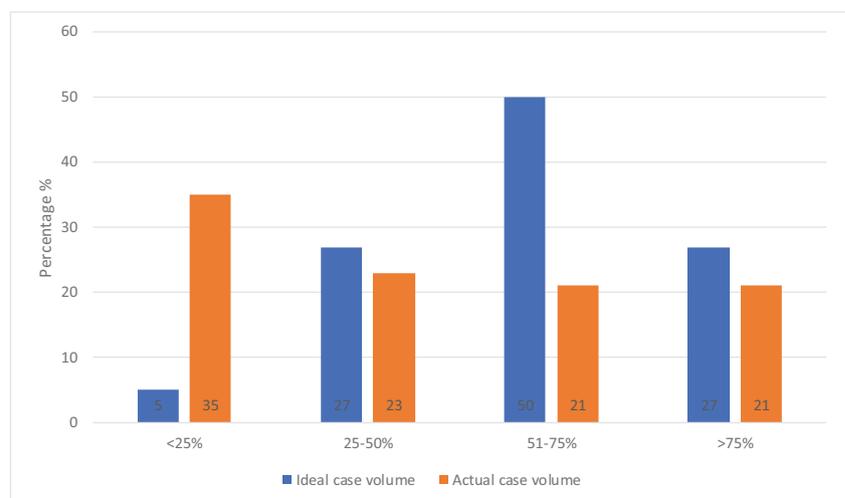
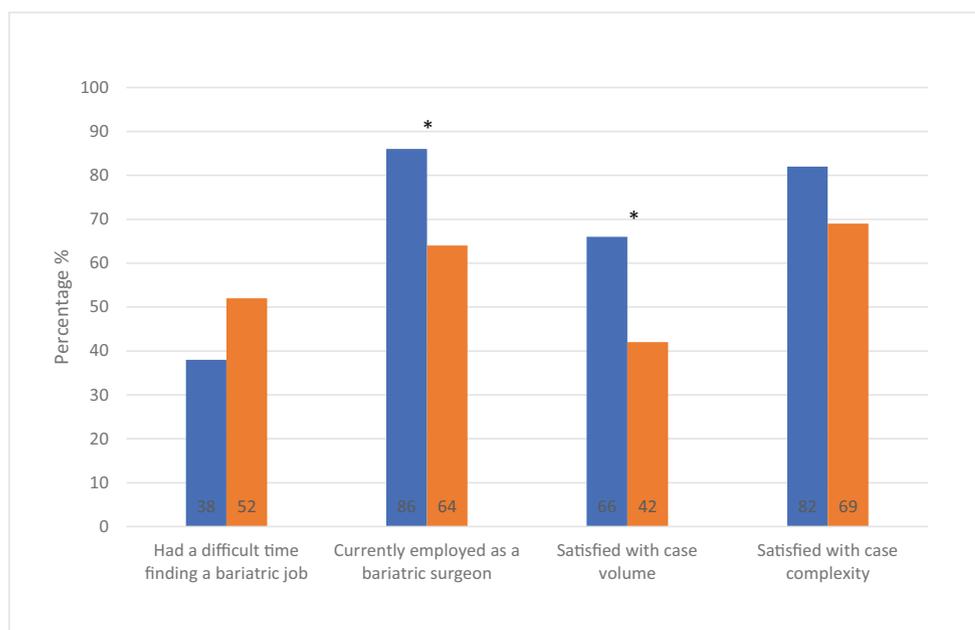


Fig. 2 Comparison of responses towards bariatric job search and current job satisfaction among earlier (2008–2016) and recent graduates (2017–2019). *Asterisk indicates $p < 0.05$ in univariate analysis



country were represented; 34% Northeast, 17% Southeast, 31% Midwest, 10% West, and 6.9% Southwest. The average number of fellows per year was 1.5 ± 0.6 . The median age of fellowship programs was 15 years. On average, PDs reported 235 total bariatric cases, 93 gastric bypass cases, and 46 revisional cases performed by each fellow annually (Table 2).

Over the past 5 years, the majority of PDs (86%) reported that over half of their graduates found bariatric jobs after graduation. Interestingly, 79% of PDs agreed that it is more difficult to find a bariatric surgery job for a fellow now than compared to 5–10 years ago. About half of the PDs (48%) agreed with the statement that we are currently training too many bariatric fellows.

Discussion

In this study, we completed an initial job market analysis of bariatric fellowship graduates that provides current information about early employment opportunities and experiences in the evolving subspecialty of bariatric surgery. With respect to our original hypothesis, we found that while the majority of graduates found bariatric jobs after completing fellowship, a substantial percentage reported having a difficult time during their initial job search. Furthermore, recent graduates from 2017 to 2019 seemed to have a more difficult time finding a job than their earlier counterparts from 2008 to 2016, suggesting that there were fewer available bariatric job opportunities relative to the number of graduating fellows in recent years. Unfortunately, there are limited published data specific to the bariatric job market to directly support or refute this claim. A

general surgery job market analysis performed in 2013 estimated that 34% of available positions in general surgery required fellowship training and approximately 7% required completion of Minimally Invasive Surgery fellowship in order to apply [3]. According to recent estimates, there have been only modest increases in the number of bariatric cases each year [14, 15]. For the past decade, we have been training a larger number of trainees every year and it is reasonable to speculate that the bariatric surgery job market is reaching saturation. However, some predict that as utilization and acceptance of bariatric surgery increase based on the health and preventive benefits of the procedures, a greater work force may eventually be needed to ensure access to care for a greater percentage of patients with obesity.

In our survey of program directors, a majority of PDs found it difficult to find jobs for their recent trainees than compared to 5–10 years ago. Surprisingly, almost half believed that we are currently training too many bariatric surgeons. Although this is the case, we feel that more investigation is needed to inform policy decisions towards modifying the number of bariatric fellowship positions. There is also a strong argument for advocating more bariatric surgeries be performed rather than limiting the number of bariatric trainees. Multiple previous studies have clearly demonstrated that only a small fraction of patients who meet criteria for bariatric surgery are receiving surgical intervention [16–18], despite the well-documented body of literature on the numerous positive health benefits in this population [19–21]. One obvious solution to the worsening issues we have identified in terms of job prospects would be to improve access to bariatric surgery among those who medically qualify. This would entail

Table 2 Descriptive summary of survey responses from program directors

Number of total respondents, <i>n</i>	29
Fellowship region, <i>n</i> (%)	
Northeast	10 (34)
Southeast	5 (17)
Midwest	9 (31)
Southwest	2 (7)
West	3 (10)
International	0 (0)
Description of fellowship, <i>n</i> (%)	
Bariatric surgery	9 (31)
Minimally invasive surgery (MIS)	0 (0)
Bariatric/MIS	20 (69)
Advanced gastrointestinal/MIS	0 (0)
Number of fellows per year, <i>n</i> ± SE	1.5 ± 0.6
When was the fellowship established? Median year	2005
Annual average of total bariatric cases performed by fellow, <i>n</i> ± SE	235 ± 22
Annual average of gastric bypass cases performed by fellow*, <i>n</i> ± SE	93 ± 7.7
Annual average of revisional bariatric cases performed by fellow, <i>n</i> ± SE	46 ± 7.3
Over the past 5 years, what percentage of your graduates found bariatric jobs? <i>n</i> (%)	
< 25%	3 (10)
26–50%	1 (3)
51–75%	5 (17)
> 75%	20 (69)
What are the reasons your fellows are pursuing fellowship? <i>n</i> (%)	
Passion for bariatric surgery	5 (17)
Need more training for advanced laparoscopy	3 (10)
All of the above	20 (69)
Other	1 (3)
Agree with following statements, <i>n</i> (%)	
More difficult to find a bariatric job for your fellow now than compared to 5–10 years ago	23 (79)
We are currently training too many bariatric fellows	14 (48)
The new fellows are well trained for their bariatric practice	28 (97)

*Information not available for 1 respondent

improving insurance coverage and the approval processes, increasing primary care provider awareness and ease of referrals for their patients who meet criteria, and ensuring continued participation and compliance with bariatric-accredited center participation and certification [22, 23].

In addition to difficulty with job searches, another key finding is that graduates reported doing fewer bariatric cases than they ideally want. While most graduates (75%) prefer the majority of their practice to be comprised bariatric cases, fewer than half (42%) reported a bariatric majority practice. Furthermore, just over half of all respondents reported satisfaction with their current bariatric volume, which suggests that there is a significant portion of fellowship-trained surgeons who want to perform more bariatric cases but are unable to do so. Taken together, the survey data strongly suggest that

there is a discrepancy between the number of available bariatric cases and number of cases bariatric surgeons are able to perform. When this mismatch happens, the need for more bariatric surgeons diminishes, especially in the large metropolitan areas where there are more practicing surgeons. Anecdotally, many recent bariatric surgery fellowship graduates have reported only finding bariatric jobs in rural or under-served areas. This is a complex issue that unfortunately has no easy solutions, as it involves not only available bariatric case volumes but also the saturation of a given market, the case mix and coverage needs for non-bariatric surgery at each institution, and the requirement to meet targeted metrics such as relative value units (RVUs). Lastly, our data showed that a smaller percentage of recent graduates achieved their desired percentage of bariatric cases than

compared to earlier graduates. Although tempting to attribute this particular finding to a diminishing ratio of bariatric volume per available surgeon, it is likely to be confounded by the fact that it takes a long time for new graduates to build a strong referral base and develop a high-volume bariatric practice. Future studies on this topic could match cohorts with equivalent interval between graduation and timing of survey in order to better understand the temporal relationship of bariatric case volume and case mix experiences.

On a positive note, despite difficulty with job searches and case volumes, most graduates reported high job satisfaction, confidence in being adequately trained, and satisfaction about their decision to pursue bariatric surgery. This finding is in line with survey results of other subspecialty-trained surgeons [4, 5]. Some general surgery graduates may choose to pursue fellowship training because they lack confidence towards their surgical skills. Our study data clearly showed that for the vast majority of trainees, bariatric/minimally invasive surgery fellowships improved their confidence to practice independently. However, we also realize the significant limitations of self-reported data, particularly for assessing surgical ability, competency, and quality. Future studies on this topic could harness the power of large nationwide databases such as the Metabolic and Bariatric Surgery Accreditation and Quality Improvement Program (MBSAQIP) that contain objective quality and outcome metrics, which could be linked to changes in average case volumes and experience among recent fellowship graduates.

Given the long length of general surgery residency, it is crucial that we provide workforce forecasting for future trainees interested in pursuing additional fellowship training. Our finding that half of fellowship graduates did not feel they have an accurate view of the bariatric job market supports the need for more of this type of market investigation. One important goal of our study was to provide quantitative reporting of the attitudes, practice patterns, and job market perceptions of bariatric fellowship graduates as there is currently a paucity of available information to guide trainees and program directors in this rapidly changing work environment.

With the recent COVID-19 pandemic and resultant economic hardships, it is possible that nationwide bariatric surgery volume and job prospects may remain stagnant or perhaps even decrease in 2021 and beyond. It is important for the current and prospective bariatric fellows to have a realistic view about the bariatric job market. The ASMBS and the Fellowship Council may need to examine options for better matching fellowship program structures and numbers of graduates to reflect the realities of the job market and practice patterns in North

America. This would include intentional and data-driven efforts to better match the number and type of graduating fellows with the current and expected needs of the healthcare system, and the development of contingency plans for future major disruptions as seen with the nationwide shutdown of elective surgeries due to COVID-19.

Limitations

Limitations of our study include responder bias, poor recall, and misinterpretation of survey questions that may affect accuracy of the data obtained. We tried to mitigate responder bias by conducting the survey independently through the Fellowship Council. In addition, participation was entirely voluntary, and responses were kept anonymous. The response rates from fellowship graduates and program directors were low, but comparable to other email survey studies using similar methodology [7]. We also had fewer respondents from earlier graduates, which is likely due to changing contact information as many no longer access their prior institutional emails. In addition, a major limitation of conducting a retrospective survey is that earlier graduates are asked to report their experience around graduation, which introduces recall bias. Finally, our questionnaire was designed to evaluate job market perceptions of trainees and program directors and did not aim to assess specific areas related to operative training.

Conclusions

The temporal increase in bariatric fellowship graduates over the past decade has resulted in a significant decline in the likelihood of employment in a full-time bariatric surgical practice, and a decline in surgeon bariatric case volumes. As a result, it has become harder for new fellowship graduates to find bariatric jobs. In addition, half of graduates felt that they did not have an accurate view of the current bariatric job market, which highlights the need for more investigation. Fortunately, the majority of recent graduates still report high job satisfaction and feel content with their decision to pursue bariatric surgery as a career.

Compliance with Ethical Standards The authors of this manuscript declared no conflict of interest. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

Appendix

Bariatric Surgery Job Market Analysis Trend over the past decade: 2008-2018

Survey I: Recent Bariatric Surgery Fellowship Graduates

Demographics

1. Gender
 - a. Male
 - b. Female
2. Age
 - a. [Blank] (years)
3. Which year did you start bariatric surgery fellowship?
 - a. [Blank]
4. Which year did you graduate bariatric surgery fellowship?
 - a. [Blank]
5. What is the best description of your fellowship:
 - a. Bariatric
 - b. Bariatric/MIS
 - c. MIS
 - d. Advanced GI/MIS
6. Your general surgery residency program is located in the following region:
 - a. Northeast
 - b. Southeast
 - c. Midwest
 - d. Southwest
 - e. West
 - f. Outside of USA
7. Your fellowship program is located in the following region:
 - a. Northeast
 - b. Southeast
 - c. Midwest
 - d. Southwest
 - e. West
 - f. Outside of USA
8. Your current practice is located in the following region:
 - a. Northeast
 - b. Southeast
 - c. Midwest
 - d. Southwest
 - e. West
 - f. Outside of USA
9. What is the most important reason for your decision to pursue bariatric fellowship training?
 - a. To build a specialized niche/practice
 - b. To gain additional surgical skills not taught in residency
 - c. To be competitive for the job I want
 - d. I do not feel ready to practice independently after residency
 - e. Other (please specify)

10. Approximately how much student debt you owed at the start of bariatric fellowship training?
 - a. <\$50 000
 - b. \$50 – 100 000
 - c. \$100 000 – 200 000
 - d. >\$200 000

Job Search

11. How many **bariatric surgery** jobs did you apply for?
 - a. [Blank]
12. How many total **bariatric surgery** interviews were you offered?
 - a. [Blank]
13. How many total **bariatric surgery** interviews did you attend?
 - a. [Blank]
14. How many total **bariatric surgery** job offers did you receive?
 - a. [Blank]
15. What kind of job did you take? Eventually?
 - a. Bariatric surgery
 - b. General surgery
 - c. Bariatric/general surgery
16. When did you receive your first permanent job offer?
 - a. Before fellowship started
 - b. During the first half of fellowship
 - c. During the latter half of fellowship
 - d. After graduation from fellowship
17. Did you have a difficult time securing a job?
 - a. A. Yes B. No
18. How did you find your current job?
 - a. Direct mentor contacts
 - b. Networking events
 - c. Self-directed searches (i.e. emailing CV, societal job boards, recruiting services)

Current Employment

19. Are you currently employed as a bariatric surgeon now?
 - a. Yes
 - b. No
20. In your IDEAL practice, what percentage of your case volume would you want to be bariatric surgery?
 - a. 0%
 - b. 0-25%
 - c. 26-50%
 - d. 51-75%
 - e. 76%-100%
21. In your current practice, what percentage of your case volume is bariatric surgery?
 - a. 0%
 - b. 0-25%
 - c. 26-50%
 - d. 51-75%

- e. 76%-100%
- f.
22. What best describes your IDEAL job description?
 - a. Academic
 - b. Non-academic solo practice
 - c. Non-academic equity owner of a group practice
 - d. Non-academic employee of a group practice, hospital, or health care system
 23. What best describes your current job description?
 - a. Academic
 - b. Non-academic solo practice
 - c. Non-academic equity owner of a group practice
 - d. Non-academic employee of a group practice, hospital, or health care system
 24. Approximately how much is your starting salary when you began your current job?
 - a. <\$200 000
 - b. \$200 – 300 000
 - c. \$300 000 – 400 000
 - d. >\$400 000
 25. Do you take general surgery, acute care surgery or trauma call?
 - a. Yes
 - b. No
 26. Did you expect to have to take general surgery, acute care surgery or trauma call when you were applying for your current position?
 - a. Yes
 - b. No
 27. Is your job at the same institution that you did residency?
 - a. Yes
 - b. No
 28. Is your job at the same institution that you did fellowship?
 - a. Yes
 - b. No
 29. If you were a bariatric surgeon when you finish your fellowship, do you still do bariatric surgery as part of your practice?
 - a. Yes
 - b. No
1. Strongly Disagree, 2. Disagree, 3. Neutral, 4. Agree, 5. Strongly Agree
 32. Current practicing bariatric surgeons have an accurate view of the job market
 1. Strongly Disagree, 2. Disagree, 3. Neutral, 4. Agree, 5. Strongly Agree
 33. I want to practice ONLY bariatric surgery
 1. Strongly Disagree, 2. Disagree, 3. Neutral, 4. Agree, 5. Strongly Agree
 34. Overall I felt adequately trained to independently practice bariatric surgery at the completion of my clinical fellowship
 1. Strongly Disagree, 2. Disagree, 3. Neutral, 4. Agree, 5. Strongly Agree
 35. I had a difficult time finding a bariatric job I wanted
 1. Strongly Disagree, 2. Disagree, 3. Neutral, 4. Agree, 5. Strongly Agree
 36. I feel content with my decision about pursuing a bariatric surgery fellowship
 1. Strongly Disagree, 2. Disagree, 3. Neutral, 4. Agree, 5. Strongly Agree
 37. I am satisfied with my current case volume
 1. Strongly Disagree, 2. Disagree, 3. Neutral, 4. Agree, 5. Strongly Agree
 38. I am satisfied with the complexity of my case volume
 1. Strongly Disagree, 2. Disagree, 3. Neutral, 4. Agree, 5. Strongly Agree
 39. I am satisfied with my current work-life balance
 1. Strongly Disagree, 2. Disagree, 3. Neutral, 4. Agree, 5. Strongly Agree
 40. I choose to market myself as a bariatric surgeon in my current practice
 1. Strongly Disagree, 2. Disagree, 3. Neutral, 4. Agree, 5. Strongly Agree

Survey II: Bariatric Surgery or MIS/bariatric Fellowship Program Directors Survey

1. Your fellowship program is located in the following region:
 - a. Northeast
 - b. Southeast
 - c. Midwest
 - d. Southwest
 - e. West
1. What kind of fellowship program best to describe your program?
 - a. Bariatric
 - b. MIS
 - c. Bariatric/MIS
2. How many fellows do you have in your program this year
 - a. 1
 - b. 2
 - c. 3

Summary Questions

Please Indicate how much you agree with the following statements based on a 5-point Likert scale: Strongly disagree, disagree, neutral, agree, strongly agree

30. There are enough bariatric job opportunities for newly graduated bariatric surgeons today
 1. Strongly Disagree, 2. Disagree, 3. Neutral, 4. Agree, 5. Strongly Agree
31. Current bariatric fellows have an accurate view of the job market

3. When was your fellowship established?
 - a.
4. How many bariatric surgery does a fellow do in a year in your program?
 - a.
5. How many gastric bypass surgery does a fellow do in a year in your program?
 - a.
6. How many revisional bariatric surgery does a fellow do in a year in your program?
 - a.
7. Over the past 5 years, roughly what percentage of fellows graduating from your program found bariatric jobs?
 - a.
8. What are the main reasons your fellows are pursuing the fellowship?
 - a. Passion for bariatric surgery
 - b. Need more training for laparoscopy
 - c. Both

Summary Questions

Please Indicate how much you agree with the following statements based on a 5-point Likert scale: Strongly disagree, disagree, neutral, agree, strongly agree

1. It is more difficult to find a bariatric job for your fellow now compared with 5-10 years ago?
 1. Strongly Disagree, 2. Disagree, 3, Neutral, 4. Agree, 5. Strongly Agree
2. We are training too many bariatric fellows right now
 1. Strongly Disagree, 2. Disagree, 3, Neutral, 4. Agree, 5. Strongly Agree
3. The new fellows are well trained for their bariatric practice
 1. Strongly Disagree, 2. Disagree, 3, Neutral, 4. Agree, 5. Strongly Agree

References

1. McClintock NC, Gray KE, Neville AL, et al. Factors associated with general surgery residents' decisions regarding fellowship and subspecialty stratified by burnout and quality of life. *Am J Surg*. 2019;218(6):P1090–5.
2. National Resident Matching Program. Results and data: specialties matching service. 2019. <http://www.nrmp.org/fellowship-match-data/>. (Accessed 12 Mar 2019).
3. Decker MR, Bronson NW, Greenburg CC, et al. The general surgery job market: analysis of current demand for general surgeons and their specialized skills. *J Am Coll Surg*. 2013;217(6):1133–9.
4. Krishnamurthy VD, Gutnick J, Slotcavage R, et al. Endocrine surgery fellowship graduates past, present, and future: 8 years of early job market experiences and what program directors and trainees can expect. *Surgery*. 2017;161:289–96.
5. Shin JJ, Milas M, Mitchell J, et al. The endocrine surgery job market: a survey of fellows, department chairs, and surgery recruiters. *J Surg Educ*. 2013;70(3):377–83.
6. Reich DJ, Magee JC, Gifford K, et al. ASTS Fellowship Training Committee. Transplant surgery fellow perceptions about training and the ensuing job market—are the right number of surgeons being trained? *Am J Transplant*. 2011;11(2):253–60.
7. Cooper JA, Dubois L, Power AH, et al. Canadian vascular surgery residents' perceptions regarding future job opportunities. *Vascular*. 2015;23(3):253–9.
8. Stephens EH, Odell D, Stein W, et al. Decade of change: training and career paths of cardiothoracic surgery residents 2003 to 2014. *Ann Thorac Surg*. 2015;100(4):1305–13.
9. Mewhort HE, Quantz MA, Hassan A, et al. Trainee perceptions of a Canadian cardiac surgery workforce: a survey of Canadian cardiac surgery trainees. *Can J Cardiol*. 2017;33(4):535–9.
10. Kohn GP, Galanko JA, Overby DW, et al. Recent trends in bariatric surgery case volume in the United States. *Surgery*. 2009;146(2):375–80.
11. “Matching Process Statistics.” 2009 FC Adv GI, Bariatric, Flex Endo, HPB, and Adv GI MIS Matching Process, Nov 19, 2008, *The Fellowship Council*, fellowshipcouncil.org/fellowship-programs/matching-process-statistics/. (Accessed April 20, 2020).
12. “Matching Process Statistics.” 2020 FC Adv GI, Bariatric, Flex Endo, HPB, and Adv GI MIS Matching Process, June 4 2019, *The Fellowship Council*, fellowshipcouncil.org/fellowship-programs/matching-process-statistics/. (Accessed April 20, 2020).
13. “Directory of Fellowships.” *The Fellowship Council*, fellowshipcouncil.org/directory-of-fellowships/?match=1. (Accessed April 30, 2020).
14. English WJ, DeMaria EJ, Brethauer SA, et al. American Society for Metabolic and Bariatric Surgery estimation of metabolic and bariatric procedures performed in the United States in 2016. *Surg Obes Relat Dis*. 2018;14(3):259–63.
15. English WJ, DeMaria EJ, Hutter MM, et al. American Society for Metabolic and Bariatric Surgery estimation of metabolic and bariatric procedures performed in the United States in 2018. *Surg Obes Relat Dis*. 2020;16(4):457–63.
16. Nguyen N, Champion JK, Ponce J, et al. A review of unmet needs in obesity management. *Obes Surg*. 2012;22(6):956–66.
17. Kral JG, Kava RA, Catalano PM, et al. Severe obesity: the neglected epidemic. *Obes Facts*. 2012;5(2):254–69.
18. Funk LM, Jolles S, Fischer LE, et al. Patient and referring practitioner characteristics associated with the likelihood of undergoing bariatric surgery. *JAMA Surg*. 2015;150(10):999–1005.
19. Kim DD, Arterburn DE, Sullivan SD, et al. Association between the publication of clinical evidence and the use of bariatric surgery. *Obes Surg*. 2018;28(5):1321–8.
20. Mor A, Omotosho P, Torquati A. Cardiovascular risk in obese diabetic patients is significantly reduced one year after gastric bypass compared to one year of diabetes support and education. *Surg Endosc*. 2014;28(10):2815–20.
21. Maciejewski ML, Arterburn DE, Van Scoyoc L, et al. Bariatric surgery and long-term durability of weight loss. *JAMA Surg*. 2016;151(11):1046–55.
22. Funk LM, Jolles SA, Greenberg CC, et al. Primary care physician decision making regarding severe obesity treatment and bariatric surgery: a qualitative study. *Surg Obes Relat Dis*. 2016;12(4):893–901.
23. Imbus JR, Voils CI, Funk LM. Bariatric surgery barriers: a review using Anderson's model of health services use. *Surg Obes Relat Dis*. 2018;14(3):404–12.

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