

# Trends in female representation in gastroenterology fellowships in the United States

Morgan Starkey<sup>a</sup>, Judy Daboul<sup>b</sup>, Jacob Lang<sup>a</sup>, Benjamin Hart<sup>a</sup>, Obi Ekwenna<sup>a</sup>

University of Toledo College of Medicine and Life Sciences; The Ohio State University, Ohio, USA

## Abstract

**Background** Women have historically been underrepresented in gastroenterology (GI). Currently they compose only a small percentage of practicing GI physicians in the United States. Despite the rise in women graduating medical school, the percentage of current female GI fellows has remained low in recent years. In this study, we sought to examine the trends of female representation in GI over the past 10 years, to further elucidate the disparity, and to illustrate if any major changes have occurred. The findings were compared to those for other specialties to shed light on the relationship between them.

**Methods** This retrospective study used data on the gender of residents obtained through the Accreditation Council for Graduate Medical Education Data Resource Books from 2009-2019. Chi-square statistical testing was used to compare representation percentages across groups. Significance was determined at the  $P < 0.05$  level, while  $P < 0.01$  was also reported.

**Results** Over a 10-year period from 2009-2019, an average of 33.6% of GI fellowship positions were filled by women, an increase of only 3.3% since 2009. Chi-square analysis of proportions across groups demonstrated a significantly lower percentage of female representation in GI in comparison to other specialties.

**Conclusions** Despite an increase in the number of women entering and graduating from medical school within the last decade, the number of female gastroenterologists remains a poor reflection of it. GI continues to have a significantly lower female representation than other specialties over the last decade.

**Keywords** Female representation, women in gastroenterology, gender bias, gastroenterology fellowship

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## Introduction

The number of women applying for and getting accepted into medical school has drastically increased over many decades. One

<sup>a</sup>University of Toledo College of Medicine and Life Sciences (Morgan Starkey, Jacob Lang, Benjamin Hart, Obi Ekwenna); <sup>b</sup>Department of Internal Medicine, The Ohio State University (Judy Daboul), Ohio, USA

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Correspondence to: Obi Ekwenna, MD, 3000 Arlington Ave, Toledo, Ohio 43614, USA, e-mail: obinna.ekwenna@utoledo.edu

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of the first notable increases of women entering and graduating from medical school was in the 1970s, with over 20,000 women graduating from medical school from 1970-1980, compared to only 14,000 women from 1930-1970 [1]. A major milestone was reached in 2018 when for the first time ever, women made up the majority of both applicants and matriculants for medical schools, averaging approximately 50.9% of applicants and 51.6% of first-year matriculants [2]. Then in 2019, data from the Association of American Medical Colleges (AAMC) revealed that, for the first time ever, women represented the majority of medical students, making up 50.5% of all enrolled students nationwide [3]( $n=92,733$ ). The increased presence of women in medical school has also been reflected in the increased number of women active in residency, making up 45.64% of US residents ( $n=134,951$ ) in 2019 [4].

Despite these changes, there are a number of specialties in which women remain vastly underrepresented, with the smallest percentages in those that are procedural-predominant, such as orthopedic surgery (16.1%), interventional radiology (18.4%), neurosurgery (19.3%), and thoracic surgery (22.0%),

as reported by the Accreditation Council for Graduate Medical Education (ACGME) for 2019-2020. The number of women who go on to subspecialize and complete a fellowship in internal medicine has even decreased since 1991. Among the 9 major subspecialties, women made up 33.3% of internal medicine fellows in 1991, compared to only 23.6% in 2016, with women being least represented in cardiology [5].

The specialty of focus in this paper is gastroenterology, where women have been historically underrepresented. This is reflected in the number of active female gastroenterologists, with only 18.9% of 15,450 practicing gastroenterologists being female [6]. Possible causes for the lack of women in gastroenterology can be attributed to work-life balance, lack of female mentorship, gender bias, and the lack of women in gastroenterology leadership positions in academic medicine and professional societies.

This study aims to explore the historic distribution of women in gastroenterology in comparison to women in internal medicine and its subspecialties, to better understand representation trends, identify potential causes and challenges that women face, and highlight possible areas of intervention for gender equality in the field of gastroenterology.

## Materials and methods

This retrospective study uses data on the gender of residents obtained through the ACGME Data Resource Books. ACGME has published this data annually since 2007-2008. For the purposes of this study, we used the most current available data from 2018-2019 and compared them with 10 years earlier. In concert with the Data Resource Books, the term “resident” includes both residents and fellows from accredited programs. As the study encompasses multiple years, “resident positions filled” was used as a measure of representation in place of “residents” to account for the progression of residents through their program, and therefore the potential for duplicate counting of residents. As surveyed by the ACGME, active residents were listed as male, female, or not reported. Residents identified as not reported in the ACGME Resource books were excluded from the analysis.

For the purposes of this study, residential specialties were divided into 5 categories: gastroenterology, transplant hepatology, other internal medicine (IM) subspecialties, surgical specialties, and all other medical specialties. Transplant hepatology was chosen as a comparator because it is an advanced subspecialty of gastroenterology that is mainly comprised of women. Other IM subspecialties included those listed by ACGME (Supplementary Table 1), including: adult congenital heart disease, advanced heart failure and transplant cardiology, cardiovascular disease, clinical cardiac electrophysiology, clinical informatics, critical care medicine, endocrinology, diabetes and metabolism, geriatric medicine, hematology, hematology and medical oncology, infectious disease, interventional cardiology, nephrology, medical oncology, pulmonary disease, pulmonary disease and critical care medicine, rheumatology, and sleep medicine. Surgical

specialties consist of specialties that perform surgery and those procedurally oriented, including: anesthesiology, colon and rectal surgery, dermatology, general surgery, neurosurgery, obstetrics and gynecology, ophthalmology, orthopedic surgery, otolaryngology, plastic surgery, integrated interventional radiology, vascular surgery, thoracic surgery, urology, as well as their integrated programs (if applicable) and subspecialties/fellowships as listed in ACGME. All other medical specialties included: allergy and immunology, anesthesiology, dermatology, emergency medicine, family medicine, medical genetics and genomics, neurology, child neurology, nuclear medicine, osteopathic neuromusculoskeletal medicine, anatomic and clinical pathology, pediatrics, physical medicine and rehabilitation, preventive medicine, psychiatry, radiation oncology, diagnostic radiology, and IM/pediatrics (and their respective subspecialties, see ACGME Resource Books for breakdown).

Written consent was obtained from the ACGME to use study data. This study was determined to be exempt from Institutional Review Board (IRB) approval as it uses publicly available data.

## Statistical analysis

Chi-square statistical testing was used to compare representation percentages across groups. Significance was determined at the  $P < 0.05$  level, while  $P < 0.01$  was also reported. Data were stored in a Microsoft Excel sheet and analyzed using Stata Statistical Software version 14.2.

## Results

### Analysis of female representation in gastroenterology and other specialties

In total, the study included 14,751 (1.26%) gastroenterology fellows, 346 (0.03%) transplant hepatology fellows, 320,877 (27.4%) other IM resident positions, 322,571 (27.6%) surgical resident positions, and 511,197 (43.7%) from all other medical specialties, and 1,169,742 total residents and fellows (Table 1).

Over a 10-year period from 2009-2019, an average of 33.6% of gastroenterology fellowship positions was filled by women, an increase of only 3.3%. In comparison, over the same 10-year period from 2009-2019, an average of 45.7% of transplant hepatology fellowship positions were filled by women, an increase of 10.5%. Results of chi-square analysis across groups and study years are reported in Table 2. Primary chi-square analysis comparing the first and last years of the study period, 2009-2010 and 2018-2019, demonstrated an increase in female representation in surgical specialties that was statistically significant: 39.5%, 95% confidence interval [CI] 38.8-40.2% vs. 41.4%, 95%CI 40.7-42.1%;  $P < 0.001$ ). Although gastroenterology and transplant also demonstrated

**Table 1** Summary of all residents and fellows included in the analysis. Numbers derived from Accreditation Council for Graduate Medical Education Data Resource Books 2009-2019

Specialty	Female	Male	Not Reported	Total*	Percentage %
Total gastroenterology	4958	9793	199	14751	33.6%
Total internal medicine other	132,798	188,079	25,087	320,877	41.4%
Total transplant hepatology	158	188	6	346	45.7%
Total all other	264,371	246,826	22,042	511,197	51.7%
Total surgical	131,885	190,686	9,832	322,571	40.9%
Total all	534170	635572	57166	1169742	45.7%

\*not included, not reported

an increase in female representation, this was not statistically significant. In contrast to the overall trend, Gastroenterology demonstrated a steady decline in female representation over a 6-year period from 2012-2018 of 2%, although this was not statistically significant.

Other IM subspecialties demonstrated a significant decrease in female representation in the 10-year study period from 2009-2010 to 2018-2019: 42.1%, 95%CI 41.3-42.9% vs. 40.7% 95%CI 40.1-41.3%;  $P < 0.001$ . Interestingly, female representation in other IM subspecialties has been stagnant over the past 3 years from 2016-2019. Similarly, female representation in “all other specialties” also demonstrated a significant decrease in the 10-year period from 2009-2010 to 2018-2019: 52.3%, 95%CI 51.7-53% vs. 50.5%, 95%CI 49.9-51.1%;  $P < 0.001$ ).

Chi-square analysis for linear trends within each group is reported in Table 2. Both gastroenterology and transplant hepatology demonstrated a positive trend in female representation; however, this was not statistically significant ( $P = 0.104$  and  $P = 0.642$ , respectively). Surgical specialties demonstrated a significant positive trend in female representation ( $P < 0.001$ ). Conversely, other IM and “all other specialties” demonstrated a significant negative trend in female representation ( $P < 0.001$  for both).

### Comparison of female representation in gastroenterology to various groups

Chi-square analysis for proportion across groups in comparison to gastroenterology is reported in Table 3. Chi-square analysis demonstrated a significantly lower percentage of female representation in gastroenterology in comparison to transplant hepatology: 33.6%, 95%CI 32.7-34.5% vs. 45.7%, 95%CI 38.5-52.8%;  $P < 0.001$ . Similarly, gastroenterology was found to have significantly less female representation than “all other IM” specialties: 33.6%, 95%CI 32.7-34.5% vs. 41.4%, 95%CI 41.2-41.6%;  $P < 0.001$ . There was a further gap when compared to “all other medical specialties” for all study years combined: 33.6%, 95%CI 32.7-34.5% vs. 51.7%, 95%CI 51.5-51.9%;  $P < 0.001$ . Unexpectedly, gastroenterology was also found to have significantly less female representation than surgical/procedural specialties: 33.6%, 95%CI 32.7-34.5% vs. 40.9%, 95%CI 40.7-41.1%;  $P < 0.001$ .

### Discussion

In this study, female representation in gastroenterology was examined and found to be low, with an average of 33.6% over a 10-year period. This lack of female representation has been stagnant over the 10-year period examined, from 2009-2019. These findings are especially concerning compared to surgical/procedural specialties, which seem to be making the right efforts to improve and show a statistically significant 1.9% increase in female representation. Furthermore, compared to other IM specialties combined and all specialties in general, gastroenterology still has a long way to go before it approaches greater parity across gender lines.

Women in gastroenterology fill an important role that is irreplaceable and underappreciated. They provide comfort to patients who seek out female gastroenterologists from office visits to colonoscopy procedures. Numerous studies have documented women's preference for the gender of medical providers, particularly when it comes to endoscopy [7]. About 5% of women in one study would absolutely decline colonoscopy unless they were sure it would be performed by a female physician [8], and this preference may be increasing for office visits as well as endoscopic procedures [9]. It is also important to keep in mind that certain religious and cultural groups require same-gender caregivers. Therefore, having more women practicing gastroenterology could help bridge the colorectal cancer screening gap, where approximately one fourth of adults in the United States have not been screened as recommended [10]. A diverse patient population also benefits from caregivers that are just as diverse, and multiple studies have found that, as the diversity of healthcare professionals increases, health outcomes improve [11-13].

There are many potential causes for the lack of women in the field of gastroenterology, ranging from personal reasons to intrinsic gender bias. Work-life balance in medicine has always been a constraint to women, who bear a disproportionate responsibility for raising a family. The time it takes to complete a gastroenterology fellowship often occurs during the years many women are considering starting a family and will need to take maternity leave, putting their education on hold and potentially making it harder to graduate on time. One study showed that 35% of women in

**Table 2** Results of Chi-square analysis across groups from 2009-2019

Specialty	Year	URM % (95%CI)	Trend Directionality P-value for trend (P for departure if applicable)	Change from first to last year (P-value for Chi-square)
Gastroenterology	2009-10	31.3% (28.3-34.3%)	Positive 0.104	3.3% (0.052)
	2010-11	31.4% (28.4-34.4%)		
	2011-12	33.2% (30.2-36.3%)		
	2012-13	35% (31.9-38.1%)		
	2013-14	34.9% (31.9-38%)		
	2014-15	34.7% (31.6-37.7%)		
	2015-16	33.9% (31-36.9%)		
	2016-17	33.5% (30.6-36.4%)		
	2017-18	33% (30.3-35.8%)		
	2018-19	34.6% (31.9-37.4%)		
Total	33.6% (32.7-34.5%)			
Transplant hepatology	2009-10	27.3% (5.5-49.1%)	Positive 0.642	10.5% (0.395)
	2010-11	54.5% (23.7-85.4%)		
	2011-12	43.5% (16.5-70.4%)		
	2012-13	43.8% (20.8-66.7%)		
	2013-14	44.7% (23.5-66%)		
	2014-15	52.5% (30-75%)		
	2015-16	47.5% (26.1-68.9%)		
	2016-17	48.7% (26.8-70.6%)		
	2017-18	51.1% (30.2-72%)		
	2018-19	37.8% (19.8-55.7%)		
Total	45.7% (38.5-52.8%)			
IM other	2009-10	42.1% (41.3-42.9%)	Negative <0.001 (0.863)	-0.7% (<0.001)
	2010-11	42.2% (41.5-43%)		
	2011-12	42.3% (41.6-43.1%)		
	2012-13	41.7% (40.9-42.4%)		
	2013-14	41.6% (40.9-42.3%)		
	2014-15	41.2% (40.5-41.9%)		
	2015-16	41.3% (40.6-41.9%)		
	2016-17	40.8% (40.1-41.4%)		
	2017-18	40.7% (40-41.3%)		
	2018-19	40.7% (40-41.3%)		
Total	41.4% (41.2-41.6%)			
Surgical	2009-10	39.5% (38.8-40.2%)	Positive <0.001 (0.311)	1.9% (<0.001)
	2010-11	40% (39.3-40.7%)		
	2011-12	40.4% (39.7-41.1%)		
	2012-13	40.7% (40-41.4%)		
	2013-14	40.8% (40.1-41.5%)		
	2014-15	41% (40.3-41.7%)		
	2015-16	41.3% (40.6-42%)		
	2016-17	41.9% (41.2-42.6%)		
	2017-18	41.4% (40.7-42%)		
	2018-19	41.4% (40.7-42.1%)		
Total	40.9% (40.7-41.1%)			
All other	2009-10	52.3% (51.7-53%)	Negative <0.001 (0.078)	-1.8% (<0.001)
	2010-11	52.5% (51.8-53.2%)		
	2011-12	52.4% (51.7-53%)		
	2012-13	52.5% (51.9-53.2%)		
	2013-14	52.2% (51.5-52.8%)		
	2014-15	52% (51.3-52.6%)		
	2015-16	51.6% (51-52.2%)		
	2016-17	51% (50.4-51.6%)		
	2017-18	50.9% (50.3-51.4%)		
	2018-19	50.5% (49.9-51.1%)		
Total	51.7% (51.5-51.9%)			

CI, confidence interval; IM, internal medicine

**Table 3** Chi-square analysis of proportion across groups compared to gastroenterology

Specialty	% Female	Comparator	% Female (comparator)	P-value
Gastroenterology	33.6% (32.7%-34.5%)	Transplant hepatology	45.7% (38.5-52.8%)	<0.001
		IM other	41.4% (41.2-41.6%)	<0.001
		Surgical	40.9% (40.7-41.1%)	<0.001
		All other	51.7% (51.5-51.9%)	<0.001

IM, internal medicine

gastroenterology reported they took maternity leave within their first 3 years of practice, whereas only 3% of men had taken paternity leave. The same study also found that women gastroenterologists have on average one child less than men and have been shown to alter their family planning more often than their male counterparts [14]. Another study found that female trainees were more likely to choose programs according to parental leave policies and “family reasons” more than males [15]. Furthermore, gastroenterologists work longer hours on average than many other specialties; for example, the 2004-2005 Community Tracking Survey reported that gastroenterologists worked 166 more hours than a family medicine physician [16]. Therefore, it is unsurprising that women tend to pick specialties that take less time to complete and cater more to family life, such as dermatology (58.9%), pediatrics (69.5%), and family medicine (53.5%). However, this trend does not hold for other specialties that either are recognized to have long working hours, such as obstetrics and gynecology, or take many years to complete training, such as pediatric gastroenterology, which women are not deterred from and enter in 83.5% or 64%, respectively, as reported by ACGME for 2019-2020. Similarly, in this study, surgical specialties demonstrated significantly greater female diversity than gastroenterology.

With the lack of females in gastroenterology there is also a lack of female mentorship for women interested in pursuing gastroenterology, discouraging many from considering it as a career option. Mentorship plays a vital role in the advancement of young doctors, particularly into administrative roles. A recent survey in 2019 of gastroenterology division chiefs, program directors, and American Society for Gastrointestinal Endoscopy (ASGE) lead members revealed that 76% reported having a mentor, with women being more likely to have more than one mentor (80% vs. 65%). Of the people with a mentor, 49% had only a male mentor, 47% had both female and male, and only 4% had a sole female mentor. In the same survey, women were more likely to report that a same-sex mentor was important (60% vs. 25%), with the top reasons being role modeling desired behaviors and career development [17]. Arlow *et al* also found that female trainees were more likely to have a mentor of the opposite sex [15] (71% vs. 3.4%). Same-sex mentoring is very important for young females, as they try to learn how to balance the demands of home life and deal with gender bias and inequality in gastroenterology. Additionally, it has been shown that there were more women first authors when other women were in the senior author

position, highlighting the importance of mentorship and sponsorship [18].

There are also challenges rooted in intrinsic gender bias in gastroenterology. Surveys over recent years show that women gastroenterologists still perceive gender inequality in fellowship and practice. Schwartz *et al* showed that women were significantly more likely to respond that men and women were treated differently during fellowship, the main differences being a lower starting salary and that the attendings viewed the men as smarter. The same study found that women are also significantly more likely to respond that men and women were treated differently in their current practice, the main differences being that women are paid less and patients treat them differently [17]. Kesavarapu *et al* also found that women leaders in gastroenterology perceived gender bias in their current job, reporting pay inequality and disparate treatment by patients [19]. Pay inequality between men and women remains one of the major gender biases in gastroenterology. In 2017, the Doximity Physician Compensation Report showed that female gastroenterologists earned an average of \$333,000 a year, while men made \$412,000, a difference of \$86,447 or 19% less. The gap is wider in academic medicine, with Singh *et al* finding that the income was \$110,000 lower for women in academic settings and \$96,000 in non-academic settings. The same paper also found that, even when adjusting for practice setting, work hours, practice ownership, free endoscopy center practice and vacation time, female gastroenterologists still earned \$82,000 less than their male counterparts [20].

Another difficulty specific to their gender that women face is the practice of endoscopy. Endoscope dials come in standard sizes and females with smaller hands have trouble reaching them properly, causing more difficulty when attempting endoscopic procedures. In addition, while musculoskeletal injuries are common in endoscopic practitioners, female physicians report more pain and severe pain compared to males. Smaller hand size is a possible cause, as smaller hands lead to more difficulty with the endoscope and a need for more manipulation [21]. In the 2018-2019 academic year, only 12% of incoming advanced endoscopy fellows were women, according to ASGE’s match program. There are also fewer women in advanced endoscopy as a result of concerns about childbearing and radiation exposure [22].

Women leaders in gastroenterology have been and continue to be few and far between. In the years since the 4 major gastroenterology societies in the US were



formed—ASGE, American College of Gastroenterology, American Gastroenterological Association, and American Association for the Study of Liver Disease (AASLD)—only 12 women have ever been elected as their Presidents. Women gastroenterologists also tend to hold fewer leadership positions in academic medicine. According to the AAMC Statistics and Benchmarking Report from 2013-2014, only 21% of full professors, 14% of department chairs and 12% of medical school deans are women [23]. Another study by Diamond *et al* revealed that, out of the 581 academic female gastroenterologists they studied, only 11% (n=63) held the rank of professor, compared to 30% (n=557) of the 1859 males in their study. Of the women in their study, only 29% (n=169) were senior faculty (professor or associate professor), compared to 50% (n=921) of men. The most common academic rank held by the women was an assistant professorship, with 47% (n=272) of the women holding that rank. The reasons for the lack of women in leadership positions may be related to matters already discussed, such as responsibility for their family, lack of mentorship and intrinsic bias. They can also be attributed to other things, such as women being less likely to receive funding for projects. A Swedish study of MD/PhD candidates showed that women asked for less research money and were less likely to receive funding grants [24]. Another study showed that men and women applying for grants were awarded drastically different startup packages. The median startup package size for men was 67% higher than that for women [25] (\$980,000 vs. \$585,000). The continued lack of women leaders in a male-dominated subspecialty leads to a lack of female mentorship and a lack of female recruitment and interest.

One area of gastroenterology that has a surprising number of women is transplant hepatology, with 50% of fellows being female (n=26) in the 2019-2020 year (ACGME 2019-2020). Compared to general gastroenterology, transplant hepatology demonstrated significantly greater female representation. This could be largely due to the fact that a woman, Professor Dame Sheila Sherlock, helped establish hepatology as a medical specialty. Hepatology's large female base is also reflected in the members of the AASLD. Between 1952 and 1994, female members were in the single digits, which increased to 278 by 2014. In 2015 alone 236 more women became members, with females representing 36% of all members in 2016 [26]. This suggests that, when women are in positions of leadership and mentorship, other women are more likely to join—though of course other factors, such as lifestyle, can also come into play.

In conclusion, although there continue to be more women in medicine, the need for more female gastroenterologists remains high. Over the past 10 years there has only been a slight increase in female gastroenterology fellows, and it was not significant. More progress needs to be made to increase the number of practicing women gastroenterology physicians, especially in comparison to other similar specialties such as transplant hepatology. To our knowledge, this is the only study that has examined data over a 10-year period to evaluate female fellow representation in gastroenterology and other specialties.

## Summary Box

### What is already known:

- There are more women entering and graduating medical school than ever before
- There is a lack of women physicians in gastroenterology

### What the new findings are:

- Women in gastroenterology fill an important role that is irreplaceable and underappreciated
- From 2009-2019 the number of women gastroenterology fellows increased by only 3.3%
- Gastroenterology continues to have significantly lower female representation than other specialties over the last decade

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## Supplementary material

### Supplementary Table 1 List of all Accreditation Council for Graduate Medical Education fellowships

Adolescent Medicine, Adult Congenital Heart Disease, Advanced Heart Failure and Transplant Cardiology, Allergy and Immunology, Brain Injury Medicine, Brain Injury Medicine, Cardiovascular Disease, Child Abuse Pediatrics, Child and Adolescent Psychiatry, Clinical Cardiac Electrophysiology, Clinical Informatics, Colon and Rectal Surgery, Critical Care Medicine, Developmental-Behavioral Pediatrics, Endocrinology, Diabetes, and Metabolism, Gastroenterology, Geriatric Medicine, Headache Medicine, Hematology, Hematology and Oncology, Hospice and Palliative Medicine, Infectious Disease, Medical Genetics and Genomics, Neonatal-Perinatal Medicine, Nephrology, Oncology, Pediatric Cardiology, Pediatric Critical Care Medicine, Pediatric Emergency Medicine, Pediatric Endocrinology, Pediatric Gastroenterology, Pediatric Hematology/Oncology, Pediatric Infectious Diseases, Pediatric Nephrology, Pediatric Pulmonology, Pediatric Rehabilitation, Pediatric Rheumatology, Pulmonary Disease, Pulmonary Disease and Critical Care Medicine, Rheumatology, Sleep Medicine, Sports Medicine, Complex General Surgical Oncology, Female Pelvic Medicine and Reconstructive Surgery, Gynecologic oncology, Interventional Cardiology, Interventional Radiology - Independent, Maternal-Fetal Medicine, Pain Medicine, Pediatric Anesthesiology, Pediatric Surgery, Reproductive Endocrinology and Infertility, Thoracic Surgery, Vascular Neurology, and Vascular Surgery).