

# Ten Year Trends in Minimally Invasive Surgery Fellowship

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## ABSTRACT

**Background:** Minimally Invasive Surgery (MIS) is one of the more recently established surgical fellowships, with many candidates applying due to a perception of inadequate exposure to advanced MIS during residency. The desire for advanced training should be reflected in increased competitiveness for fellowship positions. The aim of this study is to determine the desirability of MIS fellowships over time through review of national application data.

**Methods:** We reviewed the fellowship match statistics obtained from The Fellowship Council, the organizing body behind the MIS fellowship match. Data from January 1, 2008 – December 31, 2019 were included. We compared match rates to other specialties using the National Resident Matching Program, a nonprofit organization established for US residency and some fellowship programs.

**Results:** In the period of 2008 to 2019, the number of certified MIS fellowship programs increased from 124 to 141. While this program expansion was associated with a 19% increase in available positions, the number of applications increased 36%. As a result, the number of positions filled increased from 83% to 97%, but the match rate among US applicants fell from 82% to 71% during this interval. In comparison, the match rates for pediatric surgery, surgical oncology, vascular surgery, and surgical

critical care fellowships remained largely unchanged, most recently 50%, 56%, 99%, and 100% respectively.

**Conclusion:** Over the last decade, US residents have shown an increased interest in pursuing MIS fellowship positions. As a consequence, the match process for MIS fellowships is becoming increasingly competitive.

**Key Words:** Minimally invasive surgery, Laparoscopy, Fellowship, Procedures.

## INTRODUCTION

The evolution of Minimally Invasive Surgery (MIS) created a need for additional training in advanced minimally invasive techniques beyond that available in general surgery residency programs. Accordingly, the first academic fellowship in minimally invasive surgery in the United States was established at the University of Maryland in 1990.

MIS fellowships quickly proliferated and in 2004, programs organized under the Fellowship Council.<sup>1,2</sup> In the first match, in 2004, there were 80 total programs throughout the country. As the number of fellowship programs increased, exposure to laparoscopy during residency continued to increase as well. While some questioned whether there would remain a demand for an MIS fellowship, most residents described an ongoing need for additional training.<sup>3,4</sup> In addition, the competitiveness of existing fellowships has not been well described in the literature.

The aim of this study is to determine the desirability of MIS fellowships over time through review of national application data.

## MATERIAL AND METHODS

Match statistics were reviewed and analyzed from January 1, 2008 – December 31, 2019 as reported by The Fellowship Council, the organizing body for the MIS fellowship match. Match rates were compared to other specialties, using published reports from the National

Department of Surgery, University of Maryland Medical Center, Baltimore, Maryland (all authors).

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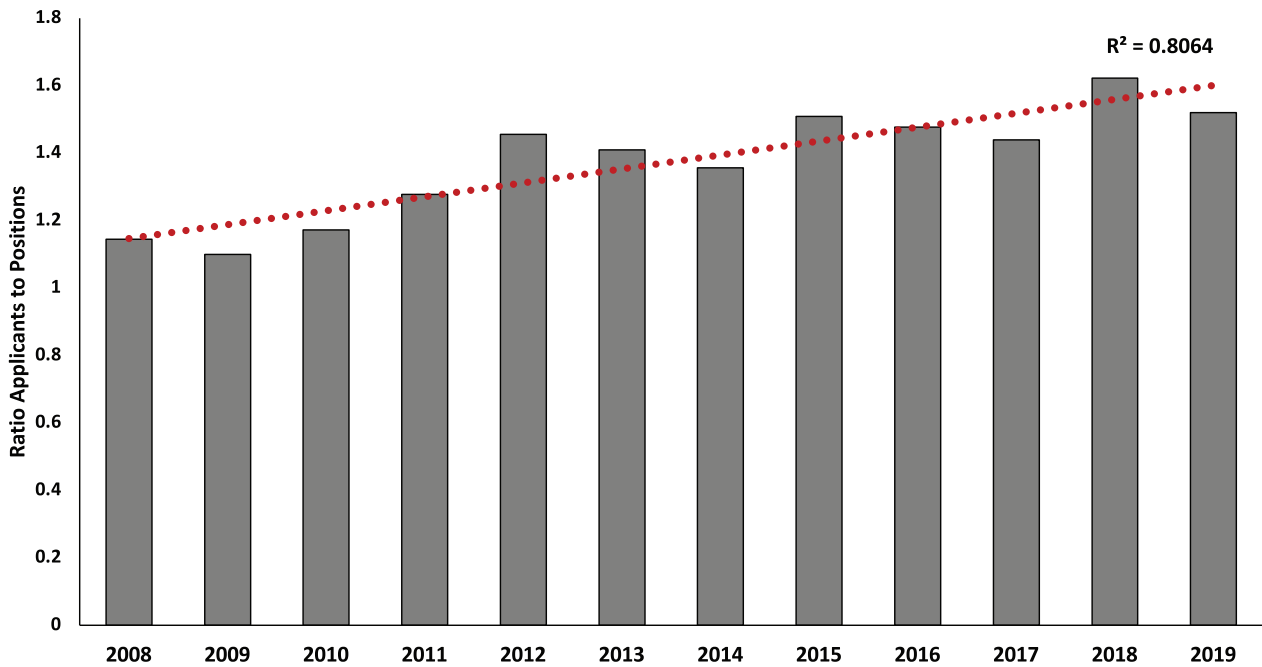
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**Figure 1.** Change in ratio of applicants to certified positions over time.

Resident Matching Program, a nonprofit organization established for US residency and many fellowship programs. All results were compiled into an Excel database.

**RESULTS**

Over the last 10 years, there has been a 36% increase in the number of applications, with an unequal increase in available certified positions (**Figure 1**). In 2008, there were 124 certified MIS fellowship programs in The Fellowship Council. By 2019 this increased to 141, yielding 177 Fellowship Council certified positions. We found an increasing trend in the ratio of Fellowship Council certified applicants to positions over the 10 years studied, with an R<sup>2</sup> value of 0.8. The match rate among US applicants has fallen from 82% to 71% during this interval.

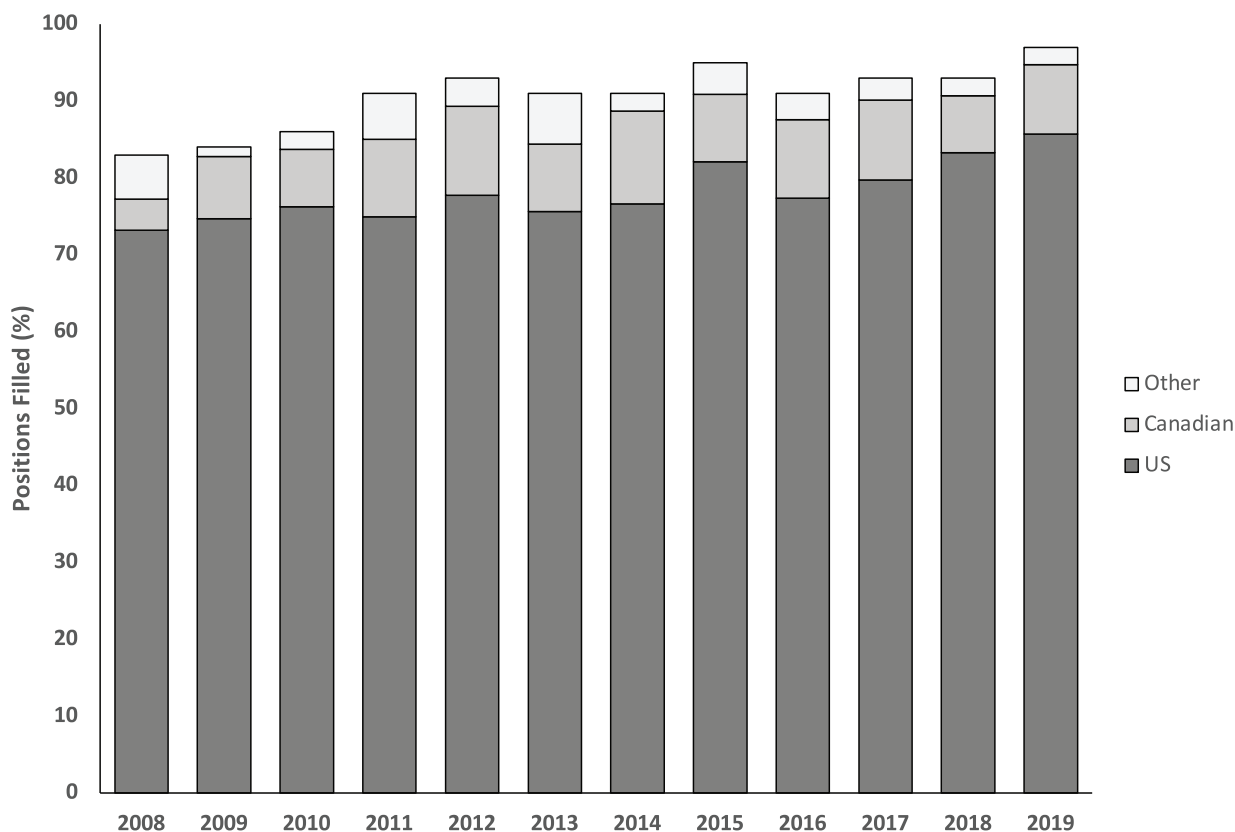
**Figure 2** illustrates the composition of matched positions from 2008 to 2019. Initially, 17% of available MIS fellowship positions remained unmatched. However, unfilled positions declined to 9% in 2011 and to 3% in 2019. Moreover, the number of positions filled by US graduates has increased from 73% in 2008 to 85% by 2019. The increase in US graduates filling fellowship positions has been offset by a decline in the number of Canadian graduates, who initially doubled from 2008 to 2009, but then declined by nearly 30% from 2012 to 2013 and an additional 30% from 2014 to 2015.

Overall, during the 10 years of the study the percentage of matched positions filled by Canadian graduates has ranged from 4.8% to 13.3% of positions, while only 1.4 – 6.9% of matched positions have been made up by non-US or non-Canadian graduates.

In comparison, match rates among US graduates varied by specialty (**Figure 3**). Vascular, critical care, and transplant over the past 10 years had the highest percentage of matched US graduates. Pediatric surgery persistently had the lowest, while US residents applying to MIS have decreased in match rate from 81% in 2008 to 70% in 2019.

**DISCUSSION**

The pursuit of fellowship has become a widespread trend in surgery, and MIS has been no exception.<sup>5,6</sup> A decade ago, roughly 70% of trainees entered a fellowship after residency, and most recently has exceeded 85%.<sup>7,8</sup> Interestingly, during this period, MIS has become increasingly popular as a post-residency specialty training route. While not initially viewed as a specialty, MIS fellowships were established to meet the demands for general laparoscopic training in the early 1990s. However, it rapidly evolved to encompass advanced laparoscopic, endoscopic, and more recently, robotic surgical training as the scope of MIS expanded. In 2004, the first year of the organized match under the Fellowship Council,



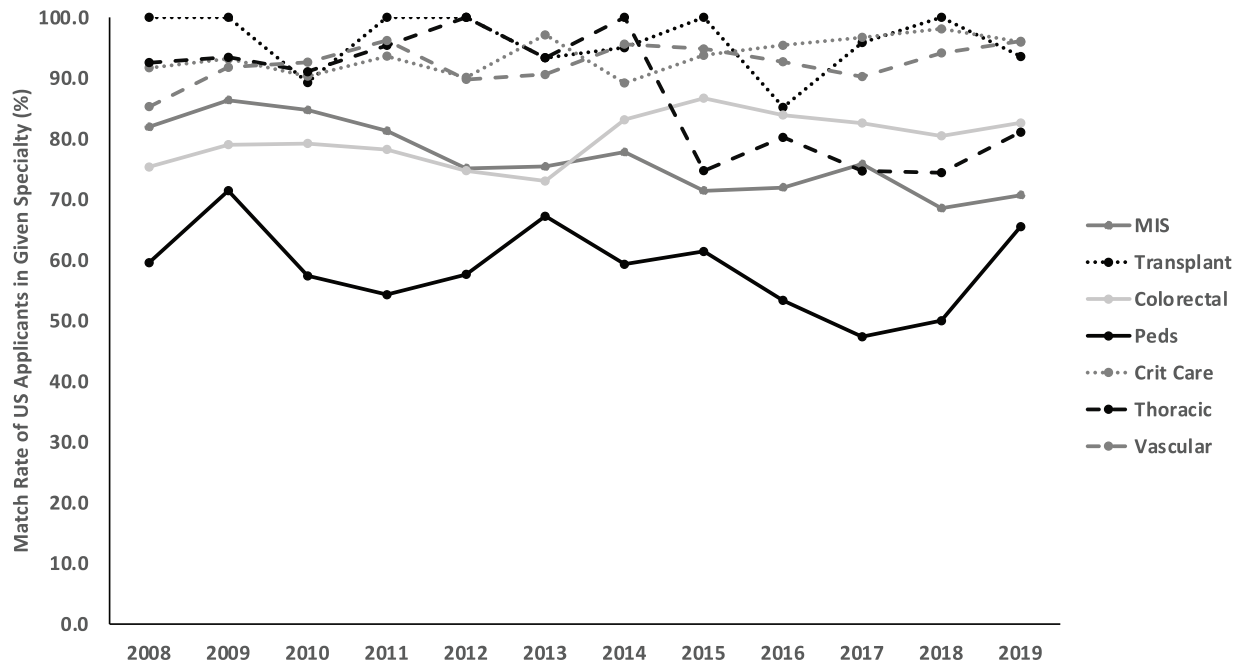
**Figure 2.** Change in percentage of filled programs over time.

80 programs offered 113 positions to which 130 graduates applied (0.87 positions per applicant). Most recently, there are 141 programs, with 177 positions for 269 Fellowship Council certified applicants (0.66 positions per applicant). In the past 10 years, the overall number of Fellowship Council certified fellowship positions has remained essentially stable, but the number of applicants has more than doubled.

Although this study is unable to determine the reason why MIS fellowships have gained popularity in the last decade, it may be related to the new technical challenges associated with advances in endoscopic, laparoscopic, and robotic techniques during this decade long trend. An MIS fellowship currently offers the general surgery graduate an opportunity to perform advanced procedures not previously performed decades ago. As reported by the Fellowship Council, fellows are logging roughly over 300 cases during their fellowship year. This is nearly equivalent to the total number of laparoscopic alimentary tract cases logged into the Accreditation Council for Graduate Medical Education by the average general surgery graduate during their entire residency. Overall, based on 2019 data, an MIS fellowship doubles the trainee’s laparoscopic experience.<sup>9,10</sup>

Another aspect of MIS that has changed dramatically over the last decade and a half is bariatric surgery. From 2002 to 2018 bariatric operations have increased from 70,000 to over 250,000, and now over 90% are performed laparoscopically. At the time of first Fellowship Council fellowship match in 2004, roughly a quarter of bariatric surgery was still being done using the open technique.<sup>11-13</sup> We did not however, subdivide our analysis to include the focus of specific programs. There already exists a distinction between broad-based MIS fellowships and those with a bariatric focus, and there may be further specialization based on procedure type.<sup>14,15</sup> Since the MIS fellowship was created back in 1991, the additional program focus further highlights the interest and growing competitiveness in this area of general surgery.

Residents have continued to voice a need for advanced training in minimally invasive surgery, despite good exposure in residency.<sup>16</sup> Among specialties, MIS fellows on the surgical team seem to augment the resident experience rather than detract from it.<sup>17,18</sup> In addition, the clinical care delivered may be better, with some researchers finding improved outcomes in centers with Fellowship Council-



**Figure 3.** Percent of matched United States applicants by specialty, 2008 – 2019.

accredited fellowships.<sup>19,20</sup> Also driving the trend of increased interest may be word-of-mouth from MIS fellowship graduates, who express that they find fellowship beneficial and positively impacting knowledge, skills, referrals, and overall career.<sup>21</sup>

Initially, the Fellowship Council established the MIS fellowship as fifth-year match. As a result, applicants failing to match into other specialties would often apply successfully for a MIS position giving the MIS fellowship the appearance of being less a desirable “backup” fellowship. However, this is clearly not the case. In 2014, the match timeline was changed to make the MIS fellowship a fourth-year match. Currently, the MIS match rate is solidly in the middle of fellowship match rates, less competitive than pediatric surgery and surgical oncology but more difficult to match into than vascular surgery or surgical critical care. Knowing these trends may help trainees better prepare their applications for a fellowship match that is increasing in popularity and difficulty in matching.

## CONCLUSIONS

As more and more trainees apply to fellowship after general surgery residency, MIS continues to rise in popularity as a career path. With this increase in demand, an unanticipated level of competitiveness has surpassed many other specialty choices.

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