

Practice Profile of Practicing Plastic Surgeons: A 20-year Review of Plastic Surgery Statistics

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Background: Evaluation of practice patterns by American Board of Plastic Surgery (ABPS) diplomates allows for a greater understanding as to how the field is progressing. Understanding evolving procedural trends can give insight into plastic surgeons' subspecialty focus and influence resident training to prepare them for future practice.

Methods: American Society of Plastic Surgeons member only projections for aesthetic and reconstructive procedures were reviewed from 1999 to 2018 in 5-year increments to identify shifts in frequency between the beginning (1999–2003) and end (2014–2018) of the timeframe. Tracer utilization for all four ABPS modules were also examined between 2014 and 2018. Descriptive statistics were performed to identify significant changes ($P < 0.05$) in subspecialty focus and procedure trends.

Results: Annual procedure incidence between 2014 and 2018 was compared with that between 1999 and 2003. The annual number of procedures more than doubled from 3,244,084 to 6,628,082. Among reconstructive procedures, there was a statistically significant increase in the number of breast reconstruction, breast implant removal, and maxillofacial surgery procedures, and a statistically significant decrease in the number of procedures focused on reconstruction of birth defects, burn injuries, and hand anomalies. In aesthetic surgery, significant increases were seen in the number of augmentation mammoplasty, abdominoplasty, and mastopexy procedures, with significant decreases in the number of blepharoplasty and rhinoplasty procedures.

Conclusions: Understanding the changing practice patterns of ABPS diplomates is essential to define the direction that our specialty is taking over time, and to guide program directors in plastic surgery on areas of focus for appropriate training of plastic surgeons. (*Plast Reconstr Surg Glob Open* 2023; 11:e5486; doi: 10.1097/GOX.0000000000005486; Published online 22 December 2023.)

INTRODUCTION

Analyzing the clinical practice patterns of plastic surgeons allows for a greater understanding as to how

this field has evolved over the past two decades. Having a strong grasp of these changes is integral to detecting changes in demand and emphasizing certain training modules to better prepare residents for the future.¹ Most published statistics discuss the frequency of plastic surgery procedures performed, irrespective of the practitioner performing these procedures. The present review focuses on procedures performed by plastic surgeons certified by the American Board of Plastic Surgeons (ie, ABPS diplomates). Two of the largest and most reputable data sources for the activities of ABPS diplomates include the member only data of the American Society of Plastic Surgeons (ASPS) and the Continuous Certification (CC) data of the American Board of Plastic Surgery (ABPS).

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A prerequisite to membership in the ASPs is certification by the ABPS, such that member only data by the ASPs is an accurate reflection of the practice pattern of ABPS diplomates. The ASPs is the largest plastic surgery organization, with 93% of all ABPS diplomates being active members.² Since 1998, the ASPs has been collecting data on common plastic surgery procedures, in which about 470 practicing plastic surgeons participate annually. Utilizing ASPs member only data provides invaluable information as to the scope of the field. Contrary to the ASPs National Clearinghouse of Plastic Surgery Procedural Statistics that surveys over 24,000 board certified physicians, regardless of specialty, the ASPs member only data provide exclusive insight into the practice patterns of solely plastic surgeons certified by the ABPS.³ ASPs members are surveyed on the number of procedures they performed in the previous year, and the responses are extrapolated to represent the frequency of procedures performed by all ASPs member surgeons.

The ABPS CC process provides another measure of focus areas of ABPS diplomates, as diplomates submit tracer data on 10 consecutive cases as part of the CC process. Evaluation of this data allows plastic surgeons to compare their current practice patterns with that of their peers. The present study will help better understand procedural trends in plastic surgery as practiced by ABPS diplomates, both with respect to how often procedures are performed in their practice and how individual practices compare with current recommended practices as part of CC. This information will help define the direction that our specialty is taking over time and guide plastic surgery training programs on necessary areas of focus to support future practitioners in plastic surgery.

METHODS

ASPS

The most recent cumulative ASPs member only projections for aesthetic and reconstructive procedures were reviewed. These data represent a universal estimate of the cosmetic and reconstructive plastic surgery procedures performed by ASPs member only surgeons during the calendar year. As of 2018, ASPs recorded data for 15 reconstructive surgical, 28 aesthetic surgical, and 13 minimally invasive procedures. Our study focuses on seven of the most common major reconstructive surgery procedures and aesthetic surgery procedures recorded through the 20-year time span from 1999 to 2018. The total number of reconstructive, aesthetic, and aesthetic minimally invasive procedures were compared between 5-year periods at the beginning (1999–2003) and end (2014–2018) of the time frame. Additionally, the seven most common major reconstructive procedures and aesthetic surgery procedures in 1999 and 2018 were compared.

Due to inconsistencies in their recording over time, the following areas were excluded from analysis: tumor removal, laceration repair, scar revision procedures, breast reduction, lower extremity reconstruction, head and neck reconstruction, and microsurgery procedures.

Takeaways

Question: How have practice patterns of plastic surgeons changed between 1999 and 2018?

Findings: Our study demonstrated that the plastic surgeons are performing an increasing number of aesthetic procedures of the breast and body, as well as breast reconstruction, breast implant removal, and maxillofacial surgery procedures.

Meaning: Plastic surgeon practice patterns have evolved over the past 20 years, and these data may help guide program directors in areas of focus for appropriate training of future plastic surgeons.

ABPS

Since 2003, the ABPS has tracked common plastic surgery operations, or tracer procedures, as a component of the CC process.¹ These tracer procedures were subdivided into four modules: consisting of comprehensive, cosmetic, craniomaxillofacial, and hand surgery. Each module contains procedures selected by the ABPS as representative of a plastic surgeon's practice within that module, and the 23 tracer procedures tracked from 2014 to 2018 are shown (Table 1). Data gathered by the ABPS consist of (1) perioperative assessment, to include physical exam and medical history, (2) location of operation and time in surgery, (3) surgical treatment plan, and (4) surgical outcome, to include adverse events. Cumulative tracer data for all four ABPS modules were reviewed from 2014 to 2018, and utilization of tracer procedures were examined during this period. There were two separate breast reconstruction tracers within the comprehensive module: autologous and implant-based breast reconstruction. These tracer procedures were combined to obtain the aggregate number of breast reconstruction tracer procedures submitted.

Unpaired student *t* tests were performed on Microsoft Excel (Microsoft Excel for Mac Version 16.61; Microsoft Corporation, Redmond, Wash.) to identify significant changes ($P < 0.05$) in procedure frequency.

RESULTS

ASPS

Between 1999 and 2003, an average of 3,244,084 plastic surgery procedures were performed annually. (See **graph, Supplemental Digital Content 1**, which displays plastic surgery trends: 1999-2018. The total number of plastic surgery procedures performed per year between 1999 and 2018, based on ASPs member only projections. <http://links.lww.com/PRSGO/C956>.) Of these procedures, 2,387,092 (74%) were surgical procedures in the aesthetic or reconstructive surgery categories, whereas the other 856,992 (26%) were aesthetic minimally invasive procedures. Excluding aesthetic minimally invasive procedures, there were 1,445,406 reconstructive and 941,686 aesthetic procedures performed between 1999 and 2003.

Table 1. Utilization of ABPS Tracer Procedures Between 2014 and 2018

Tracer Procedure	Tracer Utilization
Comprehensive module	42.34%
Breast reconstruction	11.92%
Reduction mammoplasty	21.11%
Facial skin malignancy	6.30%
Lower extremity acute trauma	0.58%
Pressure sores	0.77%
Wound management (including burns)	1.66%
Cosmetic module	40.51%
Abdominoplasty	6.98%
Face lift	2.87%
Suction-assisted lipectomy	2.67%
Blepharoplasty	2.56%
Primary augmentation mammoplasty	24.50%
Rhinoplasty	0.93%
Craniofacial module	4.82%
Cleft palate (primary)	2.41%
Nonsyndromal craniosynostosis	0.79%
Secondary cleft nasal deformity	0.04%
Zygomatic orbital fractures	0.35%
Mandible fractures	0.51%
Unilateral cleft lip repair	0.72%
Hand module	12.33%
Carpal tunnel syndrome	10.00%
Carpometacarpal joint arthroplasty	0.45%
Dupuytren's disease	0.23%
Flexor tendon laceration	0.55%
Metacarpal fracture	1.09%

Between 2014 and 2018, an average of 6,628,082 plastic surgery procedures were performed annually, which was more than double the annual number between 1999 and 2003. The average number of aesthetic minimally invasive procedures performed annually demonstrated an almost five-fold increase from 856,992 in 1999–2003 to 4,247,318 in 2014–2018.

Aesthetic minimally invasive procedures comprised the majority (64%) of plastic surgery procedures done from 2014 to 2018. In the surgical category, the average annual number of aesthetic surgery procedures also increased from 856,992 in 1999 to 2003 to 1,143,268 from 2014 to 2018. However, aesthetic surgical procedures accounted for only 17% of total procedures. The annual number of reconstructive surgery procedures decreased from 1,445,406 to 1,237,496, accounting for 19% of total procedures.

Reconstructive Surgery Procedures

The reconstructive surgery category includes hand surgery, breast reconstruction, maxillofacial surgery, reconstruction of birth defects, breast implant removal, dog bite repair, and burn care (Fig. 1). Procedures categorized as reconstruction of birth defects consisted of surgery for cleft lip and palate, as well as craniofacial reconstruction and hand defects. Surgery categorized as maxillofacial surgery consisted of acute and sequelae of facial trauma and orthognathic surgery. Of the reconstructive surgery procedures evaluated, hand surgery and breast reconstruction were the two most common procedures performed between 2014 and 2018, with an average of 129,981 and 105,152 procedures performed per year, respectively.

When comparing the annual number of procedures done between 2014 and 2018 with those done between 1999 and 2003, there was a statistically significant increase in the number of procedures for breast reconstruction (+36.8%, $P = 0.0004$), maxillofacial surgery (+16.6%, $P = 0.004$), and breast implant removal (+14.7%, $P = 0.04$), whereas there was a statistically significant decrease in the number of procedures for hand surgery (−32.8%, $P = 0.001$), birth defect reconstruction (−30.6%, $P = 0.002$), and burn care (−35.9%, $P = 0.006$). Despite a significant decrease in the later time period, hand surgery remains the most common

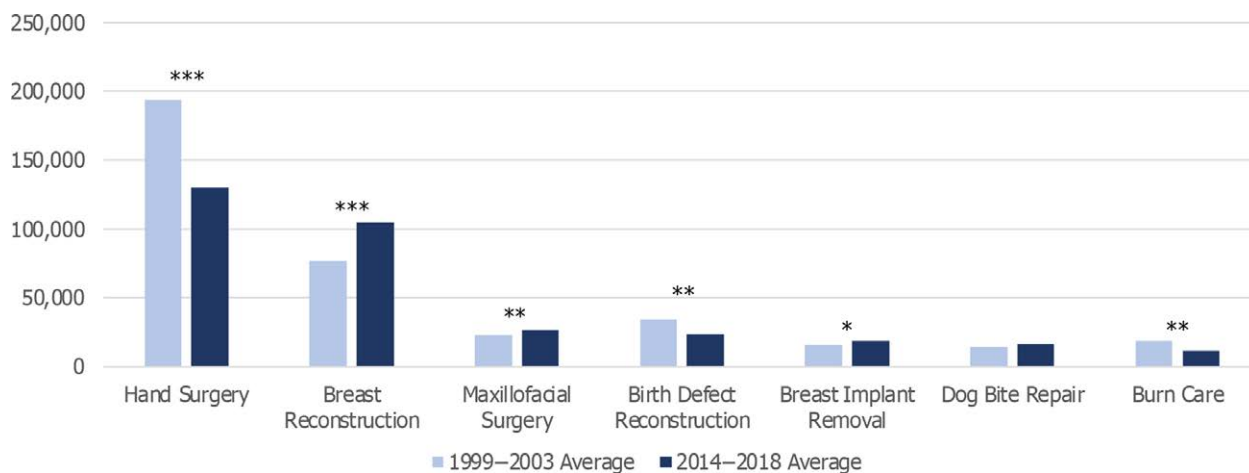


Fig. 1. ASPS member only statistics—reconstructive surgery procedures. Average number of reconstructive surgery procedures performed annually between 1999–2003 and 2014–2018. *Designates statistical significance of $P < 0.05$; **Designates statistical significance of $P < 0.01$; ***Designates statistical significance of $P < 0.001$.

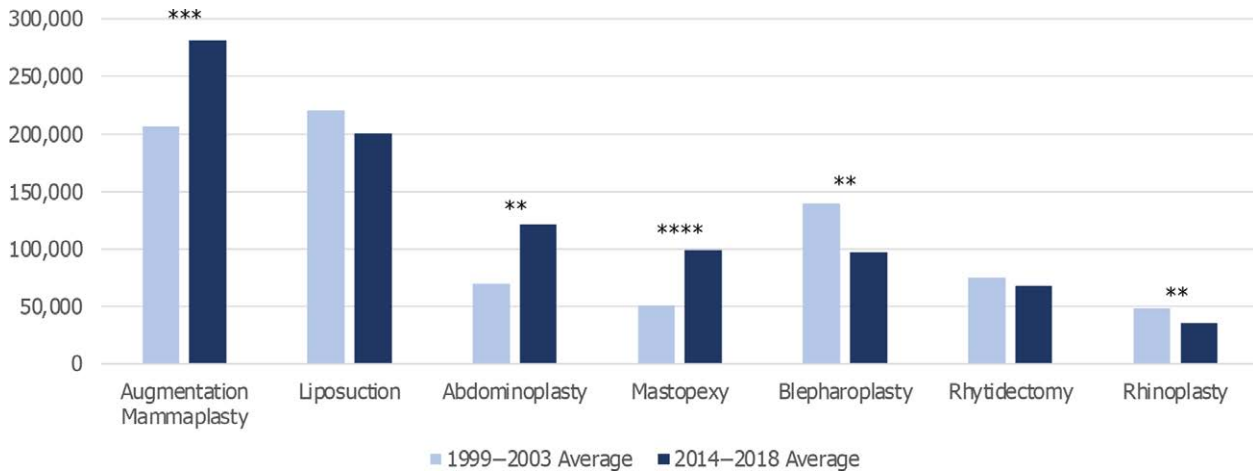


Fig. 2. ASPS member only statistics—aesthetic surgery procedures. Average number of aesthetic surgery procedures performed annually between 1999–2003 and 2014–2018. **Designates statistical significance of $P < 0.01$; ***Designates statistical significance of $P < 0.001$; ****Designates statistical significance of $P < 0.0001$.

major reconstructive procedure performed throughout the 20-year study period.

Aesthetic Surgery Procedures

The aesthetic surgery category includes augmentation mammoplasty, liposuction, abdominoplasty, mastopexy, blepharoplasty, rhytidectomy, and rhinoplasty procedures (Fig. 2). Augmentation mammoplasty and liposuction were the two most common procedures performed between 2014 and 2018, with an average of 281,606 and 200,834 procedures performed per year, respectively.

When comparing the annual number of aesthetic surgical procedures done between 2014 and 2018 with those done between 1999 and 2003, there was a statistically significant increase in the number of procedures for augmentation mammoplasty (+36.1%, $P = 0.001$), abdominoplasty (+73.4%, $P = 0.002$), and mastopexy (+94.9%, $P < 0.0001$), whereas there was a significant decrease in the number of procedures for blepharoplasty (−30.2%, $P = 0.01$) and rhinoplasty (−26.6%, $P = 0.003$).

ABPS

Utilization of ABPS tracer procedures between 2014 and 2018 are shown in Table 1. The comprehensive module was most commonly selected during the CC process (42.3%), closely followed by the cosmetic module (40.5%). The most utilized tracer for the comprehensive module was reduction mammoplasty, accounting for 21.1% of total procedures. There was also a sizable portion of tracer procedures submitted for breast reconstruction, comprising 11.9% of total procedures. Despite total utilization for the cosmetic module being lower than that for the comprehensive module, primary augmentation mammoplasty had the highest utilization of all tracer procedures, accounting for 24.5% of total procedures. In total, 12.3% of procedures selected belonged to the hand module, with carpal tunnel syndrome tracers accounting for 10.0% of total procedures. The craniomaxillofacial

module represented the least amount of tracer utilization, accounting for 4.8% of total procedures. The most utilized craniomaxillofacial tracer was cleft palate (primary), accounting for 2.4% of total procedures.

DISCUSSION

There are limited resources available to quantify the changing practice patterns of plastic surgeons. We collaborated with the ASPS to review the annual number of procedures performed by ASPS member surgeons, all of whom are ABPS diplomates. Our data focus on member only surgeons, compared with the ASPS National Clearinghouse of Plastic Surgery Procedure Statistics, which surveys more than 24,000 physicians to compile reports highlighting the changes in plastic surgery procedure frequency, regardless of specialty training.³

Hand Surgery

There was a decrease in the number of hand surgery procedures performed between 1999 and 2018. This is further exemplified by the decreasing number of plastic surgery diplomates receiving Certificate of Added Qualifications in Surgery of the Hand between 1990 and 2007, which Higgins attributes to three main reasons: lack of hand surgery exposure before application submission for hand surgery fellowships, fewer mentors in hand surgery with a plastic surgery background, and the financial appeal of aesthetic surgery.⁴ Interestingly, plastic surgery residents performed significantly more hand cases than orthopedic surgery residents between 2010 and 2019.⁵ This raises the question: why are plastic surgery residents performing more hand cases, but losing interest in the field of hand surgery?

Despite the higher number of hand cases performed by plastic surgery residents, their exposure is often limited to emergencies and trauma compared with their orthopedic peers.^{4,6} This influences plastic surgeons' practice patterns, as their clinical practice consists mainly of emergency

room referrals, compared with the more elective cases that are referred to orthopedic surgeons.^{7,8} Chung et al⁹ emphasized the need for plastic surgery residency programs to expose their trainees to both trauma and elective hand surgery, but little has been done to improve this.^{6,7,9} To reinvigorate plastic surgery residents' interest in hand surgery, residency programs should increase their trainees' exposure to elective hand cases to match their peers' experience in orthopedic surgery residency.

Facial Plastic Surgery

There was a decrease in the number of aesthetic facial procedures such as rhinoplasties and blepharoplasties between 1999 and 2018, and this may in part be due to a rise in otolaryngologists performing these procedures. According to the American Academy of Facial Plastic and Reconstructive Surgeons, 96% of their member surgeons, a majority of whom are certified by the American Board of Otolaryngology, performed rhinoplasty procedures in 2018.^{10,11}

Burn Care

Burn care procedures also decreased in the 2014–2018 cohort. Interestingly, a 2020 survey by Vrouwe et al found that over 75% of plastic surgery residents are interested in burn surgery to some extent, despite the misconception that plastic surgeons no longer want to pursue burn care.¹² They cited two factors that may prevent residents interested in burn surgery from pursuing it as a career: the narrow scope of practice restricting them from having a nonburn component of their practice and the lack of exposure during residency training. Similar to the concerns expressed for hand surgery, a lack of a diverse practice and minimal exposure during residency training may push aspiring surgeons away from these fields.

Aesthetic Surgery of the Breast and Body

The rise of social media promoting beauty standards has driven the increased interest in aesthetic surgery.¹³ It is not surprising that the frequency of augmentation mammoplasty, abdominoplasty, and mastopexy procedures increased in the past 20 years. Despite the increase in aesthetic procedures of the breast and body, plastic surgeons should be vigilant for increasing competition by surgeons who are not ABPS diplomates, many of whom advertise themselves as “plastic surgeons” to increase market share. Long et al¹⁴ found that the American Board of Cosmetic Surgery offers certification for physicians whose initial residency training is outside the field of plastic and reconstructive surgery, with abdominoplasty and augmentation mammoplasty being some of the most common procedures performed by diplomates of the American Board of Cosmetic Surgery.

Breast Implant Removal

With the continuous rise in number of breast augmentation procedures performed, one can also expect to see an increase in the number of procedures for breast implant removal. The annual number of procedures for breast implant removal increased by 14.7%, which may be

due to the incidence of capsular contracture and breast-implant-associated anaplastic large cell lymphoma (BIA-ALCL) with textured implants. Previous studies suggest that the symptoms of capsular contracture become more apparent as time progresses after implant placement.^{15,16} Given the peak usage of textured implants in 2016, there may be an increasing rise of breast implant removal due to BIA-ALCL in the coming years.¹⁷

Breast Reconstruction

The number of breast reconstruction procedures performed increased over the past 20 years. The rise in breast reconstruction follows the similar increase in bilateral mastectomies.^{18,19} This increase can be further attributed to the 1998 Women's Health and Cancer Rights Act, which ensures financial coverage for postmastectomy breast reconstruction.²⁰ Yang et al evaluated the insurance categories of women undergoing immediate breast reconstruction between 2000 and 2009, and found a considerable rise in the number of Medicare and Medicaid patients undergoing these procedures.²¹ Additionally, the increase in breast reconstruction may be due to modern microsurgery training models that help build the foundation for plastic surgery trainees to perform microsurgery. First introduced in the 1980s, microsurgery fellowships allow plastic surgeons to further enhance their technical skill set.²²

Reconstruction of Birth Defects

We found that there was a decrease in the annual number of procedures for reconstruction of birth defects (consisting of surgery for cleft lip and palate, as well as craniofacial reconstruction and hand defects) performed by ABPS diplomates. This may be influenced by birth defect detection during the late first trimester, potentially leading to pregnancy termination.^{23,24} Ever-changing abortion legislation may further impact the number of birth defect reconstructions performed in the future.

Maxillofacial Surgery

There was an increase in the annual number of maxillofacial procedures, such as facial fracture repair, post-traumatic reconstruction, and orthognathic surgery. This may be due to an increase in recreational activity in older adults. A 2017 study by Plawewski et al investigated the incidence of facial fractures related to recreational activity and found a 45% increase between 2011 and 2015, which they attributed to recommendations by the Centers for Disease Control and Prevention to increase physical activity in older adults.²⁵

Comparison with ABPS Data

The second objective of our study compares the most common procedures performed based on the ASPS member only projections and the frequency of ABPS tracer utilization. Augmentation mammoplasty was the most common plastic surgery procedure performed between 2014 and 2018, which aligns with the ABPS tracer utilization, as it was the most common tracer procedure used during the same time span. Breast reconstruction, the

second most common major reconstructive procedure performed between 2014 and 2018, was also the second most utilized comprehensive tracer procedure during the same timeframe. However, there is slight incongruence when comparing both datasets, as evident by the number of liposuction procedures.

Limitations

Although the active membership of the ASPs consists entirely of ABPS diplomates, the ABPS dataset for CC and the ASPs member only dataset is designed to measure different aspects of the practice profile of their membership. As part of the ABPS CC process, diplomates submit data on 10 consecutive cases of a specific tracer procedure (Table 1). Diplomates are encouraged to submit the same tracer procedure for two consecutive cycles, so they can demonstrate improvement in their practice.²⁶ The ABPS data were not designed to follow trends in practice patterns, but rather it was designed to allow diplomates to evaluate their outcomes on a tracer procedure of choice. Because patient characteristics, operative data, and postoperative complications are recorded, tracer information has been used in numerous studies to address these changes over time.^{27–31} Although the tracer procedure selected reflects a procedure for which the diplomate chooses to represent his or her practice, it does not necessarily reflect the most common procedure performed by that diplomate. In contrast, the ASPs member only projection data are designed to analyze the overall practice profile of its members based on the number and type of cases performed by its members. Evaluation of each dataset over time provides different aspects on the practice profile of plastic surgeons. The ABPS CC data provide information on which module and the specific tracer within that module that plastic surgeons choose to evaluate their practice; the ASPs member only projection data provide information on the number and type of cases performed by these surgeons. While the ABPS offers activities alternative to the tracer procedures, the vast majority of diplomates submit tracer data, whereas submission of member only projection data to the ASPs is completely voluntary, and only 8.5% of active ASPs members, or about 470 practicing plastic surgeons, have participated in this activity annually. Furthermore, member only projections are based on surveys distributed to ASPs members, which are dependent on the surgeon's recollection of the procedures they performed that year. Therefore, although the ASPs dataset provides an index of trends in practice profile of its members, it may not represent the entire specialty represented by ABPS diplomates.

CONCLUSIONS

In 2018, 7,030,380 plastic surgery procedures were performed, the highest number of procedures to date. The number of aesthetic surgery procedures of the breast and body have significantly increased over the past 20 years. There was also an increase in the annual number of breast reconstruction, maxillofacial surgery,

and breast implant removal procedures performed between 2014 and 2018 when compared with those performed from 1999 to 2003. Hand surgery, burn care, birth defect reconstruction, and facial aesthetic surgery decreased in 2014–2018 relative to 1999–2003. Future studies should survey plastic surgeons on their practice demographics and how their focus has changed throughout their careers.

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DISCLOSURE

The authors have no financial interest to declare in relation to the content of this article.

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