Global cardiothoracic surgery: A survey of trainees' interests and barriers

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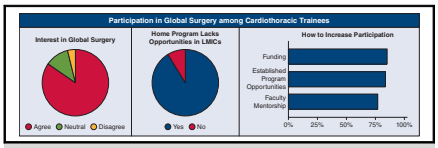
ABSTRACT

Background: More than 5 billion people lack access to surgical care, disproportionately in low- and middle-income countries. The emerging literature demonstrates high interest in global surgery across specialties; however, participation in global cardiothoracic surgical care remains low. To date, there has been no research quantifying the attitudes of cardiothoracic surgeons about global surgery. Our study aimed to acquire a broader understanding of cardiothoracic surgical trainees' interest in global surgery to address barriers and promote cardiac healthcare worldwide.

Methods: An online survey was sent to all North American cardiothoracic surgical residents via the Thoracic Surgery Residents Association email listserv. The survey was designed in the REDCap database and administered twice, in 2021 and 2022. Data were analyzed by descriptive and chi-square analysis using Stata.

Results: Seventy-three cardiothoracic surgical trainees responded to our survey, of whom 95.3% considered increasing cardiothoracic surgical access to be important, and 67.2% identified this as a future career priority. Most respondents (82.8%) would participate in global surgery if opportunities were available through their home institution. Lack of opportunities (70.0%) and finances (66.7%) were the primary barriers to participation. Respondents identified funding (85%) and institutional support (83.3%) as the most significant incentives to increase involvement.

Conclusions: There is strong interest in global surgery among cardiothoracic trainees; however, involvement remains low. A consensus among the North American cardiothoracic surgical community is needed to address barriers to global volunteerism within surgical residency and improve access to cardiac surgery worldwide. (JTCVS Open 2023;16:610-8)



More funding, opportunity, and mentorship support residents' interest in global surgery.

CENTRAL MESSAGE

Cardiothoracic residents demonstrate significant interest in global surgery but face barriers that limit participation. Structured initiatives are needed to address these barriers and promote involvement.

PERSPECTIVE

There has been limited investigation of the interest in and barriers to participation in global health among cardiothoracic surgical trainees. Our study identifies a lack of opportunities and financial support as the most significant factors barring participation and increased access to funding as the most significant factor promoting resident involvement.

Surgical care has been aptly referred to as the "neglected stepchild of global public health."[1] Despite contributing to 30% of the world's disease burden, surgery has often been assumed to be too complicated and too costly to be addressed as a major public health issue.[2] Contrary to this assumption, a study published in 2015 by the Lancet Commission on Global Surgery demonstrated that surgery is cost-effective and a critical component of public health. The Commission further revealed that 5 billion people currently do not have safe and timely access to surgical care.[3]

This deficit in global surgical care is especially evident in the field of cardiothoracic surgery. Cardiothoracic pathologies are among the greatest clinical burdens worldwide; cardiac disease alone accounts for one-third of all deaths and is a leading cause of death globally.[4] Highlighting the ongoing inequities in global surgical care, 80% of all deaths from cardiovascular disease (CVD) and related diseases occur in LMICs, with a large proportion of these deaths attributed to rheumatic heart disease and congenital heart disease.[4,5] Although the mainstay of management for these diseases is surgical in nature, fewer than 1 cardiac surgical care center is available for every 10 million people in LMICs.[6] Thus, >93% of the population of LMICs lacks

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Abbreviations and Acronyms
CSIA = Cardiac Surgery Intersociety Alliance
CVD = cardiovascular disease
LMIC = low- and middle-income countries
NGO = nongovernmental organization
TSRA = Thoracic Surgery Residents Association

access to timely cardiac surgical care, resulting in roughly 250,000 avoidable deaths each year from congenital heart disease alone.[2,7]

Thoracic pathologies are also among the leading causes of morbidity and mortality worldwide.[8] This burden is expected to continue to increase and disproportionately affect LMICs as air pollution becomes a greater global health burden.[9] Exposure to air pollution increases the risk of chronic obstructive pulmonary disease, lung cancer, and lower respiratory tract disorders, diseases for which surgical interventions provide the mainstay of diagnosis, symptom management, and/or treatment.[9] However, studies have suggested that LMICs lack the proper training, equipment, and resources to adequately manage thoracic surgical cases.[10] Thoracic surgical cases account for nearly 10% of the unmet surgical need in some African countries.[10] Although noncommunicable diseases are expected to exacerbate this burden in the coming years, infectious and inflammatory etiologies constitute the majority of the current thoracic surgical need in LMICs.[10] These treatable conditions impose a low health burden in parts of the world with robust thoracic surgical programs but are important contributors to morbidity, mortality, and economic burden in LMICs where urgent surgical management is not available.[10]

There are significant disparities in the cardiothoracic surgery workforce worldwide. Cardiac surgery providers in high-income countries outnumber those in LMICs by 100-fold, and there are 277 times more cardiac surgical centers per capita in North America compared with African countries.[6] Insufficient data exist to quantify disparities in access to thoracic surgery in the same way, but it is well described that access to thoracic surgery is inadequate in resource-limited areas in both high- and low-income countries, and there is growing emphasis on building thoracic surgery infrastructure in these settings.[8] Although the ultimate goal is to train cardiothoracic surgical teams and develop independent, self-sufficient surgical centers in countries locally, this requires significant investment of resources and time from local communities and ministries of health. Thus, international cardiothoracic societies, nongovernmental organizations (NGOs), and academic institutions must play a strong, supportive role in providing care while strengthening countries' ability to provide surgical services independently.[11]

The current landscape of these contributors to the international cardiovascular workforce and the volume of procedures performed in LMICs remains poorly defined.[6] In 2019, representatives of the primary international cardiothoracic societies established the Cardiac Surgery Intersociety Alliance (CSIA) to support the development of cardiac surgical centers in LMICs.[12] Even in its infancy, and facing barriers created by the Coronavirus disease 2019 pandemic, the CSIA initiative has begun to support new sites as more local cardiac centers are being established in the developing world.[6] The CSIA has accepted applications and selected 2 sites, one in Mozambique and the other in Rwanda, to receive support and have begun to work with local hospital leaders in addressing surgical needs.[13]

NGOs also have emerged as substantial players in the delivery of cardiac surgical services to LMICs.[14] Vervoort and colleagues identified 86 NGOs worldwide, ranging from traditional fly-in–fly-out medical mission trips to long-term partnership models with a goal of establishing in-country healthcare infrastructure.[6,14] Collectively, these NGOs perform more than 10,000 cardiothoracic surgical procedures annually in more than 96 LMICs.[14]

Although the role of academic institutions in global cardiac surgery has been described to a lesser degree, academic hospitals also have established partnerships and concomitant sustainable models of care. Through an initiative known as the International Quality Improvement Collaborative, Boston Children's Hospital has developed 64 cardiac centers in 25 LMICs, encouraging the expansion of locally driven cardiac centers around the world.[6]

Across all areas of surgery, such overwhelming evidence supporting the need for global surgical care has led to increasing interest in becoming involved among both surgical providers and trainees. A study of its members conducted by the American College of Surgeons, the largest surgical organization in the world, found that 84% of respondents were interested in international volunteerism.[15] Similarly, studies from the United States and Canada have indicated a high level of interest in international volunteerism and electives among surgical residents,[16,17] and other studies have suggested that the primary barrier to trainee involvement is a lack of knowledge of available opportunities.[16,18,19]

In the field of cardiac surgery, attention to the worldwide cardiac health burden has led to efforts by cardiothoracic governing bodies to redress global international humanitarian efforts. The Thoracic Surgery Residents Association (TSRA), in partnership with the Society of Thoracic Surgeons, identified this as an area of importance and created a Global Outreach Fellowship in 2018, which is awarded to eligible cardiothoracic surgery trainees on an annual basis.[20] While the development of this fellowship suggests a

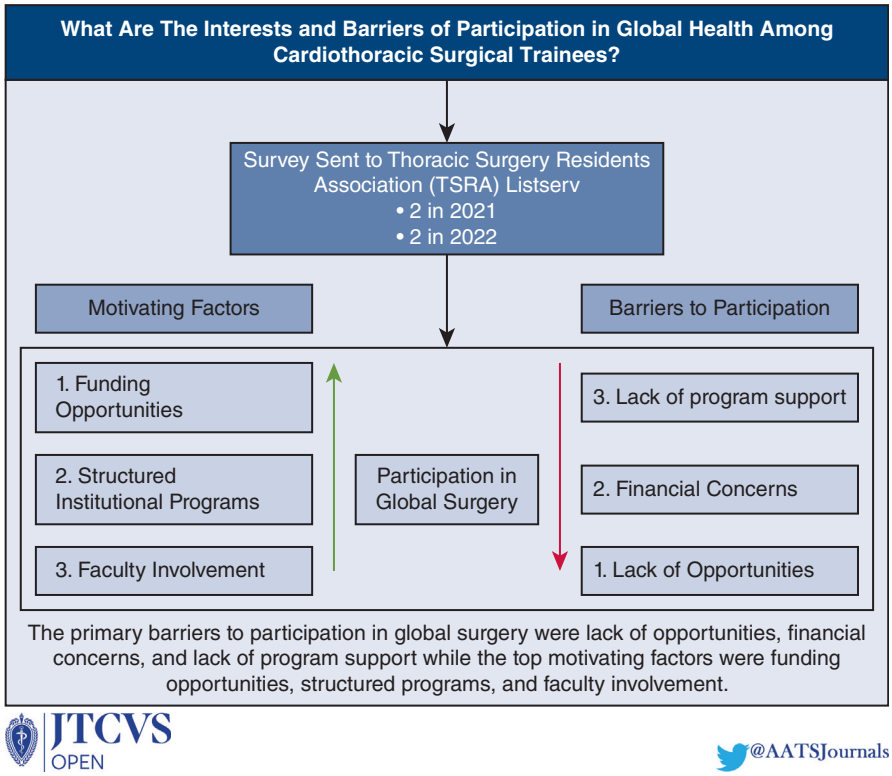

FIGURE 1. Interests and barriers of participation in global health among cardiothoracic surgical trainees.

level of interest in global cardiac surgery that has extended to the organizational level, to date there have been no studies focused on characterizing the perspectives of cardiothoracic surgeons and trainees regarding global surgery. Therefore, our objective was to gain a better understanding of cardiothoracic surgery trainees' interests, awareness of opportunities available to them, and barriers to their participation in global opportunities. Figure 1 provides a graphical abstract of the study.

METHODS

Ethics

This study was reviewed by the Colorado Institutional Review Board (Protocol 20-1567) and given exempt status on June 18, 2020. Participation in this study was both voluntary and anonymous.

Study Design and Data Collection

An online survey was created to identify global surgical interest among current cardiothoracic surgical trainees. Baseline demographics and previous involvement in global surgery, interest in global surgery, reasons for participation in global surgery, and barriers to participation in global surgery were evaluated. The survey was designed in the REDCap database and consisted of Likert scale, multiple choice, drop-down, and fill-in-the-blank style questions. Survey questions were modified from those created by Powell and colleagues,[16] Barton and colleagues,[17] and Westwick and colleagues[19] to evaluate global surgical interest among other specialties. The survey was distributed twice in 2021 and 2022 to all current cardiothoracic surgical trainees via the TSRA email directory, a listserv that maintains up-to-date contact information of cardiothoracic residents in North America. Participants were informed that survey completion served as consent to participate in the study. Not all participants answered all questions, so the denominator is not always the same between sections of the survey. The data collected through the survey included (1) demographic information, (2) attitudes about the importance of global cardiac surgery, (3) interest in global cardiac surgery, (4) incentivizing factors for participation, and (5) barriers to participation.

Data Analysis

Data were tabulated using REDCap and Microsoft Excel and analyzed using Stata.[21] Data analysis included descriptive and chi-square analyses.

RESULTS

Demographics

Out of the 701 trainees emailed the survey, 73 responded. Respondent demographics are summarized in Table 1. At the time of the survey, the majority of respondents were age 30 to 39 years (n = 57; 78.1%). The current postgraduate year was evenly distributed among respondents, with a mean postgraduate year of 5 ± 2.8, and 52% (n = 38) were in an integrated I-6 program. The respondents are primarily representative of a US physician population; 68.5% (n = 50) were born in the United States, and 86.3% (n = 63) were trained in the United States.

Prior International Experience

Of the 70 individuals who responded to this section, 50.0% (n = 35) had previously participated in an international

TABLE 1. Demographics of survey participants

Characteristic	Number (%)
Age group	
20-29 y	15 (20.5)
30-39 y	57 (78.1)
40-49 y	1 (1.4)
Sex	
Female	25 (34.2)
Male	48 (65.8)
Continent of birth	
Africa	1 (1.4)
Asia	13 (17.8)
Europe	4 (5.4)
North America	59 (80.1)
Country where currently training	
United States	63 (86.3)
Algeria	1 (1.4)
Canada	2 (2.7)
Germany	1 (1.4)
India	1 (1.4)
Kazakhstan	1 (1.4)
Turkey	2 (2.7)
United Kingdom	2 (2.7)
Postgraduate year	
1	15 (20.5)
2	2 (2.7)
3	6 (8.2)
4	11 (15.1)
5	4 (5.5)
6	11 (15.1)
7	7 (9.6)
8	8 (11.0)
9	7 (9.6)
10	1 (1.4)
11+	1 (1.4)
Type of training program	
Traditional 2 y	13 (16.4)
Traditional 3 y	10 (13.7)
Combined general/CT (4/3)	4 (5.5)
Integrated 6 y	38 (52)
Super fellow	4 (5.5)
Other	5 (6.8)

medical experience in an LMIC, with the majority participating in multiple prior experiences (mean, 2.41). Of those respondents, the majority (n = 20; 57.1%) participated during medical school. The respondents also reported having participated prior to starting medical school (n = 14; 40%), during general surgery residency prior to cardiothoracic training (n = 10; 28.6%), or during cardiothoracic fellowship (n = 5; 14.3%). These respondents cited financial constraints (n = 26; 74.3%), scheduling conflicts (n = 20; 57.1%), and inability finding a program in their desired country (n = 12; 34.3%) as the most common difficulties encountered in pursuing their prior global health experiences.

Opinion of Global Surgery

Nearly all (95.3%; n = 61) participants agreed (n = 22) or strongly agreed (n = 39) that increasing access to cardiothoracic surgery globally is important (Figure 2). Respondents opined that residents (87.5%; n = 56) and attending physicians (98.4%; n = 63) can have a positive local impact during rotations abroad. Nearly one-quarter (n = 16) responded that increasing access to cardiothoracic surgery in LMICs is a current priority in their careers, and 67.2% (n = 43) reported this as a future career priority.

Motivating Factors

The most-cited motivation factors behind participation included promoting altruism (n = 52; 86.6%), gaining cultural experiences (n = 51; 85.0%), enhancing technical and clinical exposure (n = 40; 66.7%), building international contacts (n = 25; 41.7%), and meeting personal goals (n = 24; 40%).

Interest in Participating

Most respondents (82.8%) indicated that they strongly agreed (n = 34) or agreed (n = 19) that they would participate in a global surgery opportunity if one were sponsored by their home institution (Figure 3), and 70.3% (n = 45) indicated that they would participate in a global surgery opportunity outside of their current program. More than one-half of participants (n = 37; 57.8%) were willing to use their vacation time to participate in global surgery opportunities, and 40.4% (n = 26) were even willing to use their personal funds to finance a global surgery experience.

Barriers to Participation

Despite a high interest in global surgery, participants identified several barriers to participation (Figure 4). The top barriers were lack of available opportunities (n = 42; 70.0%), financial concerns (n = 40; 66.7%), lack of program support (n = 30; 50%), fear of missing training opportunities at home (n = 30; 50%), family obligations (n = 27; 45%), fear of missing career opportunities at home (n = 21; 35%), and hesitancy of their home program to provide time/remove them from the call schedule (n = 20; 33.3%). The large majority (91.7%; n = 55) stated that their program did not offer international opportunities in LMICs. Furthermore, only 8 respondents (13.3%) reported that global health electives were encouraged at their institution, and 32 (53.3%) reported that no cardiothoracic surgical faculty members at their institution participate in international projects (Figure 5).

Factors Increasing Participation

The top reported factors that would increase participation in global surgery opportunities were funding opportunities (n = 51; 85.0%), a structured program through their

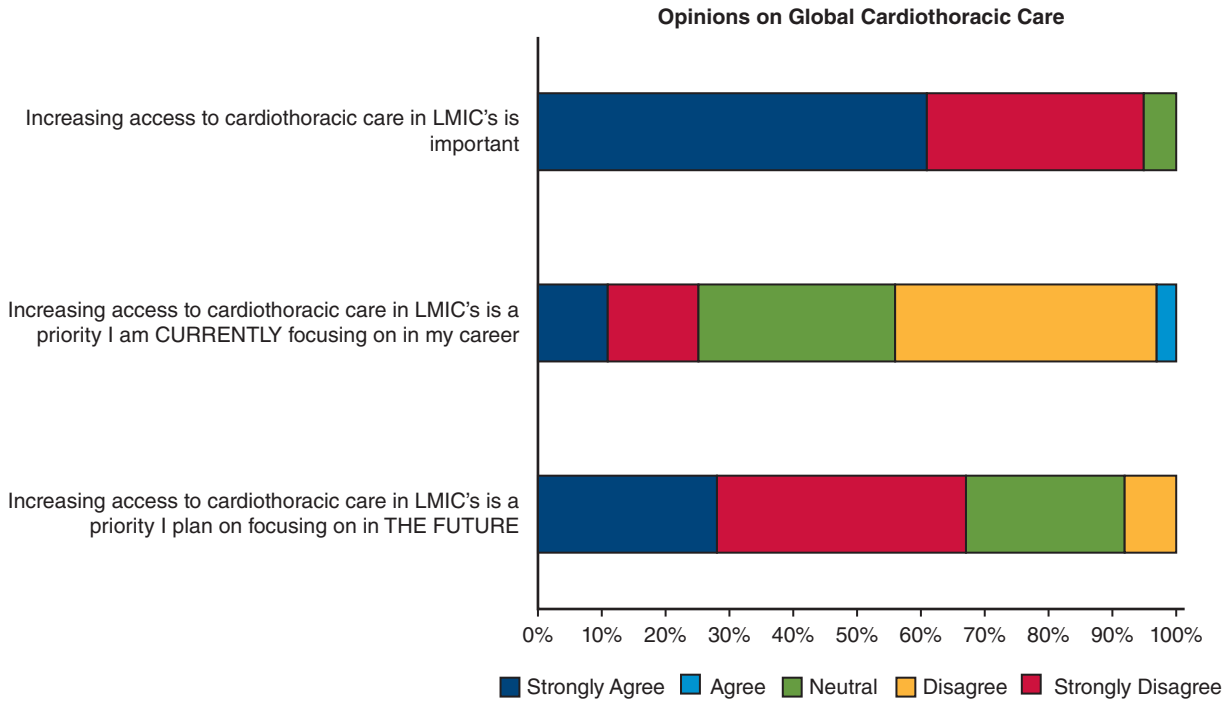

FIGURE 2. Opinions on increasing access to cardiothoracic care in low- and middle-income countries.

home institution (n = 50; 83.3%), involvement of a staff surgeon from their home institution (n = 46; 76.7%), and dedicated elective time for participating (n = 43; 71.7%) (Figure 6).

DISCUSSION

Our objective in this study was to characterize the viewpoints of cardiothoracic surgical trainees regarding their participation in global surgical care, to support their needs and inform future initiatives at local, national, and international levels. Our data demonstrate a nearly universal belief in the importance (95%) and the impact (88%) of trainee involvement in global surgical initiatives. It also shows a strong interest in the provision of global surgical initiatives, with >80% of participants indicating interest in participating and 67% planning to prioritize global surgery in their future careers. More than one-half (57%) of the trainees were willing to use vacation time to participate in international volunteerism. These responses are similar to what has been observed across other surgical subspecialties in North America, including general surgery, oncology, trauma, and orthopedics.[19]

Despite this high level of interest in global surgical initiatives, our study identified many barriers that discourage participation. The most formidable barrier faced by current trainees is a lack of opportunities for involvement. Nearly all residents (91%) reported a lack of access to global surgery opportunities at their home institutions. This finding also is consistent with what has been shown across different surgical specialties, as well as across regions of the world. A study published in 2020 found that Canadian neurosurgical residents reported inadequate access to and information on global surgical programs as a barrier to their participation.[16] These findings are consistent outside of North America; only 4.6% of medical schools in Europe have an associated global surgery center.[22] These data demonstrate the need to expand the accessibility of global surgical opportunities for trainees across specialties and around the globe.

These opportunities always should emphasize collaboration with local providers, sustainability, and safety. One effective strategy may be to create partnerships between academic institutions and NGOs that have established trusted relationships with the countries to which they provide healthcare.[23] As long-time contributors to the field of global surgery, many NGOs have demonstrated the effectiveness and sustainability in cardiothoracic surgical care initiatives.[24] An example of this is the partnership between Penn State Health Children's Hospital Children's Heart Group NGO and Hospital de Ninos Roberto Gilbert in Guayaquil, Ecuador. Since its outset in 1998, this joint academic and NGO partnership has sent physicians, specialists, fellows, and students on biannual visits to support pediatric cardiothoracic surgery in Guayaquil. The team successfully evaluated more than 5000 children and performed more than 350 open heart surgeries in their early years. This transitioned to fostering the development of an independent cardiac surgical center in the region that now performs more than 200 cardiac surgeries annually, totaling over 1300 patients since 2014.[25]

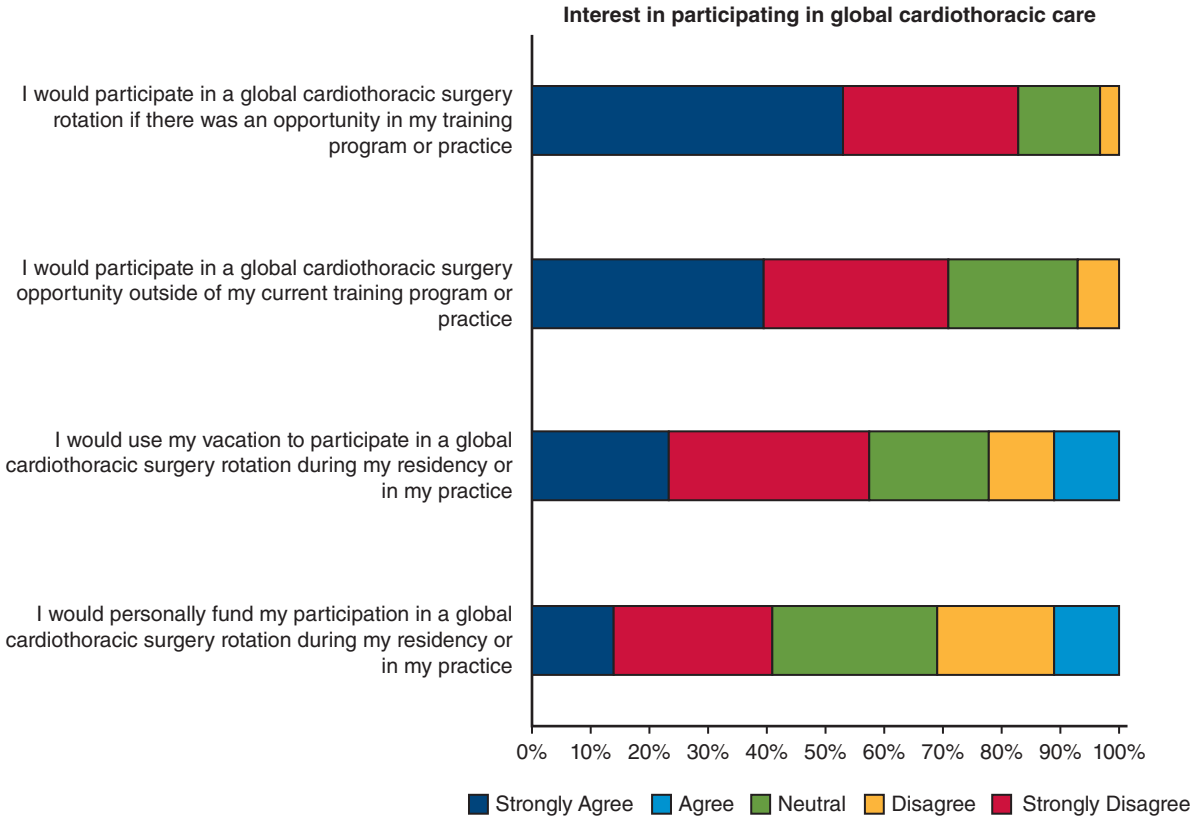

FIGURE 3. Interest in participation in global cardiothoracic surgery opportunities.

A Canadian study identified global surgery partnerships such as this as an effective strategy to expand academic institutional participation in global surgery, increase the volume of specialized surgeons in LMICs, and meet the Lancet commission's ambitious goal of delivering 80% of the world's essential surgical needs by 2030.[26] With the implementation of such bidirectional partnerships, residents could look to their home institution for help in organizing international surgical opportunities, thereby overcoming a primary barrier to participation.

Our data also suggest a lack of cardiothoracic faculty involvement in global surgery as a barrier to trainee participation. One-half (53%) of the respondents reported the absence of cardiothoracic surgical faculty involved in international projects at their home institution. Mentorship has long been part of medical education and plays a key role in

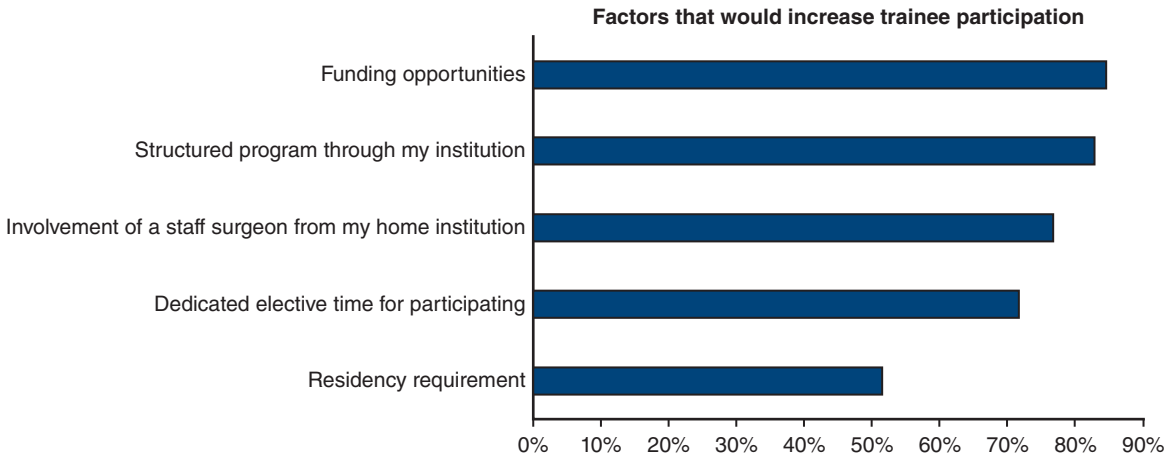

FIGURE 4. Perceived barriers to participation in global cardiothoracic surgery opportunities.

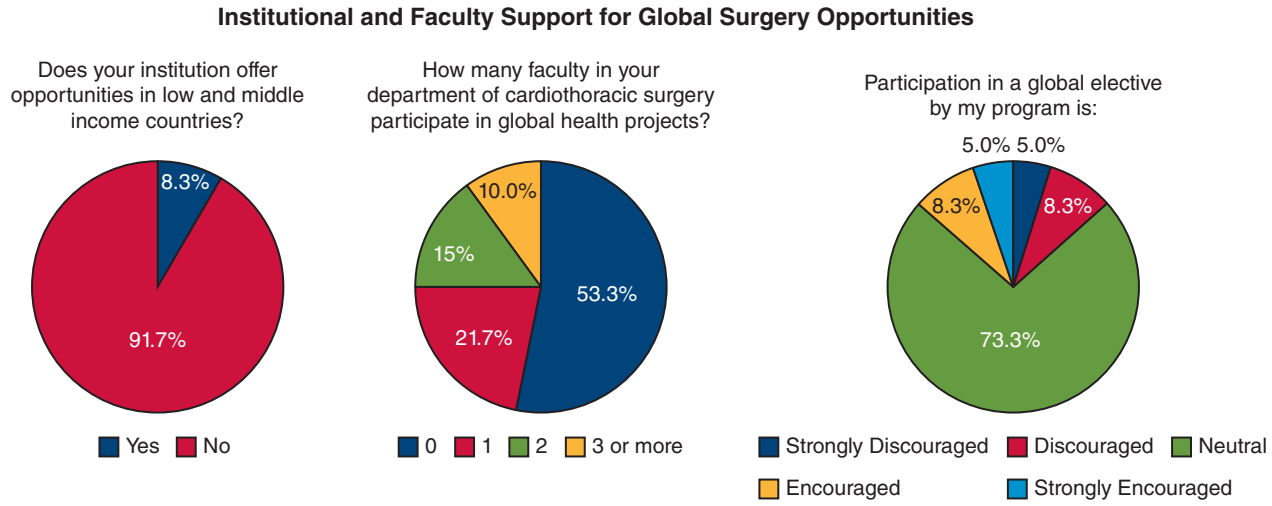

FIGURE 5. Current institutional and faculty support for global cardiothoracic opportunities.

career development and achievement of career goals.[27] In fact, 77% of our study respondents stated that having a staff surgeon from their home institution involved in global surgery would promote their own participation. This highlights the need for attendings with a commitment to global health to support residents who exhibit interest in this work. For the respondents who identified "lack of program support" as a barrier to involvement, a faculty mentor to help them navigate international work and realize their international career goals could significantly impact their willingness to participate.

Another major contributor to resident involvement is funding. Our respondents identified financial constraints as the second greatest barrier to involvement (66%), as well as the primary incentivizing factor that would encourage their participation (85%). This is not unique to cardiothoracic surgical trainees and has been identified as the primary barrier in a cohort of various surgical specialties, suggesting that funding is a major factor prohibiting global surgery participation.[19] Given that the average US medical student graduates with $200,000 in student loan debt[28] and the average resident makes $57,191 in annual salary according to the 2021 survey of resident stipends,[29] it is understandable that a surgical resident might be hesitant to invest funds in these opportunities. Fortunately, there has been an increase in financial resources available to residents in recent years. A 2021 paper aiming to address the financial burden of humanitarian volunteerism for cardiothoracic providers published over 40 resources that offer scholarship, research, and funding opportunities to cardiothoracic surgical trainees seeking to provide care abroad.[30] Among these resources are the Thoracic Surgery Foundation and the TSRA, which demonstrate the support of cardiothoracic governing bodies in increasing access to global cardiac surgery. Programs and departmental leadership should prioritize these funding opportunities to ensure they do not present as stressors to

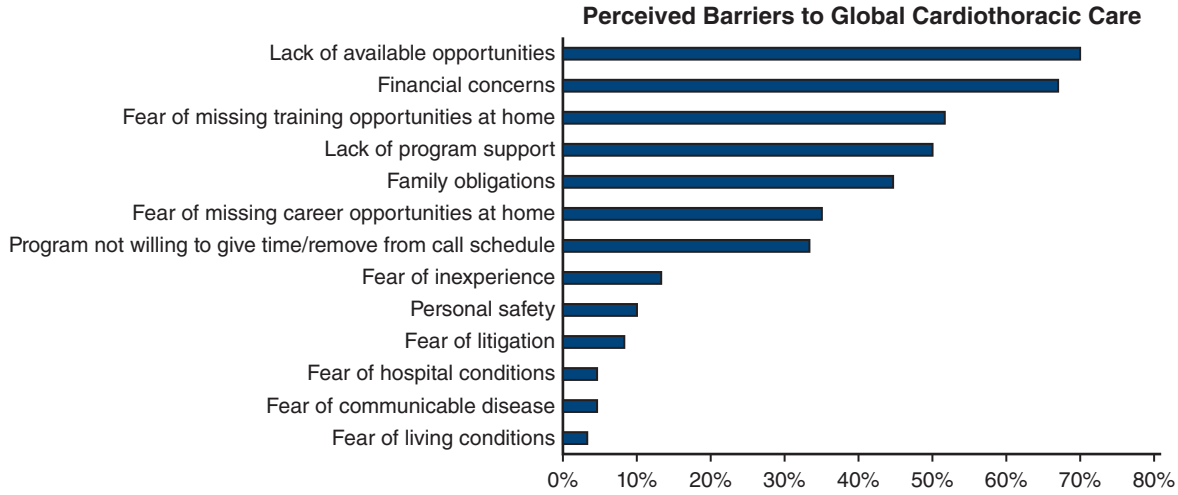

FIGURE 6. Factors that would increase trainees' participation in global cardiothoracic surgery opportunities.

residents who wish to increase their impact on underserved populations.

The association between prior experience and future global health participation also should be considered when evaluating factors that increase participation. Previous studies have shown that trainees with prior international experience are more likely to select residency programs that offer global health training opportunities,[31] and that participating in global health electives during residency is subsequently associated with involvement in international healthcare initiatives postresidency.[32] During the progression through medical training, time for extracurricular activities such as global health often becomes more limited as residents are limited to using call-free elective time to pursue these experiences.[33] This is consistent with our data. Of the respondents that had previously participated in global health opportunities (n = 35), the majority participated during medical school (57.1%) and prior to medical school (40%), whereas far fewer participated during general surgery residency (28.6%) and cardiothoracic fellowship (14.3%). The 2015 Operation Giving Back Survey similarly found that global health interest was increased in those respondents who were younger, were trainees, or had prior international healthcare experience.[15] This demonstrates the need to expose medical trainees to global health opportunities early in their medical training to both increase the odds of participation and promote future involvement.

Although significant barriers to global health participation for cardiothoracic surgical trainees exist, North American medical institutions have taken note of the high interest among trainees as well as the mutual benefit for local partners and resident education. Beyond assisting in program building in LMICs, participation in global surgery opportunities strengthens residents' foundational diagnostic skills and broad medical practice required in austere environments, flexibility to practice in different settings, as well as cost-conscious practice.[17,18] Because of this, many programs have made efforts to improve opportunities. As of 2021, 74 of 154 US medical schools had a structured global health program, up from 32 of 133 in 2011.[34]

Residency programs also are establishing general surgery global health tracks and global health partnerships at an increasing rate.[35] Program examples include the University of North Carolina's Malawi Surgical initiative and Baylor College of Medicine's Global Surgery Track. However, there are no existing resident-level programs in the field of cardiothoracic surgery. As a subspecialty, we must keep up with the current pace of improvements in the global health field at large and ensure sufficient opportunities for involvement and mentorship exist for cardiothoracic trainees.

There are several limitations to this study. One of the primary limitations is sampling bias. Although the survey was sent to the mailing list of the TSRA, those who were previously interested in global surgery might have been more likely to complete the survey. Our respondents were born in countries all around the world, and many had previous experience in global health. Furthermore, survey responses indicating a willingness to participate in a humanitarian initiative are purely theoretical and do not require a guaranteed commitment, which may skew responses in favor of participation.

Despite these limitations, this study marks the first attempt to understand the levels of interest and barriers to participation in global cardiothoracic surgery and includes responses from trainees with a variety of backgrounds and levels of training. Our results indicate a strong level of interest in global cardiothoracic surgery among current trainees and highlight potential areas of improvement that can be targeted to improve participation moving forward.

Future areas of study include evaluating barriers and motivating factors for attending physicians in cardiothoracic surgery. Future studies exploring reasons for the lack of data on global thoracic surgery participation may look at trainee interest in global cardiac versus thoracic surgery and how to address any disparities. Beyond this, it would be beneficial to look at a similar study as ours but surveying attending physicians to elicit their motivating factors and perceived barriers to participation.

CONCLUSIONS

This study demonstrates a strong level of interest in global cardiothoracic surgery among cardiothoracic trainees, with many respondents identifying global surgery as a part of their future career goals. Even so, there remain many barriers hindering participation, and very few trainees are pursuing international surgical opportunities at their current point in training. Steps to improve these conditions include increasing awareness of existing opportunities to participate in global surgery, as well as establishing and expanding scholarships to assist with costs. In doing so, we can not only facilitate new opportunities for trainees to participate in global surgery and realize their career goals, but also work to improve access to much-needed cardiothoracic surgical care on a global scale.

Conflict of Interest Statement

The authors reported no conflicts of interest.

The *Journal* policy requires editors and reviewers to disclose conflicts of interest and to decline handling or reviewing manuscripts for which they may have a conflict of interest. The editors and reviewers of this article have no conflicts of interest.

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