

Predictors, Quality Markers, and Economics of Volunteering Internationally: Results from a Comprehensive Survey of American Society of Plastic Surgeons Members

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Background: Plastic surgeons have a long history of international volunteer work. To date, there have been no outcome-based studies among surgeons who volunteer internationally. The purpose of this study was to describe predictors of volunteering, clinical quality markers, and economics of international volunteering among American plastic surgeons.

Methods: A cross-sectional validated e-mail survey tool was sent to all board-certified plastic surgeons by the American Society of Plastic Surgeons. The survey response rate was 15 percent (745 total individuals), of which 283 respondents traveled within the past 5 years. Analysis was performed in R. Step-wise multivariate logistic regression was performed to determine the predictors of death/complication.

Results: Respondents reported high use of medical records, follow-up care, and host affiliation. Fewer than half of all respondents reported use of international safety surgery guidelines, and the majority of respondents reported volunteering abroad outside of their scope of practice. The majority of children younger than 5 years were not cared for by a pediatric anesthesiologist. The majority of participants reported personally spending more than \$1000 on their last trip and performing surgery estimated to be worth on average \$28,000 each.

Conclusions: International surgical volunteer trips attempt to ease the global burden of surgical disease. The authors' study reports variation in quality of care provided on these trips. Most significantly, the majority of children younger than 5 years were not cared for by a pediatric anesthesiologist, and many plastic surgeons operated outside of their scope of practice. (*Plast. Reconstr. Surg.* 140: 617, 2017.)

Based on the *Lancet* Commission on Global Surgery's definition of access to care, 4.8 billion people, 67 percent of the world's population, are without safe, affordable, timely surgical care.¹ Each year, hundreds of plastic surgery volunteer trips and educational collaborations originate from the United States to work abroad to

address this global problem of surgical disease.²⁻⁸ However, this significant workforce and the nature of its work have been inadequately studied in the medical literature. The paucity of research forms barriers to improving international delivery

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systems for surgical services, cultural competency in U.S. surgical education, and sustainable models for international surgical education.

Our central hypothesis holds that hundreds of plastic surgery volunteer trips go abroad annually from the United States and that the quality of care provided on these trips varies widely. Our goal in this study was to assess the quality of clinical care provided on international trips based on the Volunteers in Plastic Surgery Committee of the American Society of Plastic Surgeons and the Plastic Surgery Educational Foundation Guidelines for Pediatric Surgical Care in Less Developed Countries, and demographic and economic information on volunteer and nonvolunteering surgeons. Our core motivation in undertaking this research is one of improvement; if we have a better understanding of what is currently occurring in aggregate on international plastic surgery volunteer trips, the international community of plastic surgeons can be at the forefront of improving the quality of care provided to the world's neediest patients.

METHODS

Participants

In the fall of 2014, a cross-sectional validated e-mail survey tool was sent to all board-certified plastic surgeons by the American Society of Plastic Surgeons. The survey response rate was 15 percent. The total response number was 746, with 493 participants volunteering internationally as an attending physician in the past and 253 surgeons never volunteering internationally as an attending physician. We used validated survey methodology, including neutral fact-based questions and repeated e-mails to survey nonresponders to maximize the validity of statistical data.

Measure

Survey respondents participated in three arms of the survey based on their volunteer activity (surgeons who volunteered internationally in the past 5 years, surgeons who volunteered abroad in the past but not in the past 5 years, and surgeons who had never volunteered internationally.) Complete text of the survey can be found at: <https://www.surveymonkey.com/r/plasticsurgeryvolunteers>.

Statistical Analysis

Statistical analysis was performed in R using the MASS package. All tests of significance were two-tailed and alpha was defined as 0.05. Reference

groups for analysis were defined as the response group with the greatest number of participants.

Quality Markers, Predictors of Death, and Major Complications on International Volunteer Trip and Predictors of Volunteering

Questions regarding quality, resident and attending participation, and death and major complications on international volunteer trips were asked only of participants who reported traveling within the past 5 years. We determined odds ratios, using Fisher's exact test, for each binary potential predictor of interest. Odds ratios and *p* values for nonbinary predictors were calculated using univariate analysis methods.

Economics of Volunteering

We asked surgeons how much money they contributed to participate in their last trip, the duration of their last trip, the number of cases they performed per day on their trip, and to identify a single category of plastic surgery that best described their work on their last trip. Using these categories and 2013 Medicare/Medicaid reimbursement data, we assigned each category of surgery "typical" cases with an average dollar value of reimbursement in the United States. Using self-reported number of working days, case volume per day, category of surgery, and the U.S. dollar amounts of reimbursement for index cases representative of each category, we calculated a general "value" of these surgeons' volunteer work. (See **Appendix, Supplemental Digital Content 1**, which shows the value calculations, <http://links.lww.com/PRS/C296>.) We also used the calculated contribution margin per minute described by Pacella et al. for reconstructive plastic surgery in an inpatient facility to calculate the cost of a volunteer surgeon's time away.⁹

RESULTS

Overview of Trips

Two hundred eighty-three surgeons provided 2368 days of surgery in the past 5 years. Survey respondents identified traveling with 137 individual groups from 30 states in the past 5 years. Trips most frequently lasted 8 to 10 days. The majority of respondents were general plastic surgeons without fellowship training (61.7 percent), followed by hand surgery (30.3 percent), and craniofacial/oral and maxillofacial surgery (26.8 percent). The majority of respondents practice general reconstructive surgery in their U.S. practice. Significant overlap of trip location was identified, with the

most common reported locations being Guatemala ($n = 54$), Haiti ($n = 41$), and Peru ($n = 39$) (Fig. 1).

Participants most frequently identified cleft surgery as the primary category of surgery they performed on their last trip [$n = 147$ (50.9 percent)], followed by general reconstruction [$n = 57$ (19.7 percent)], and burn reconstruction [$n = 22$ (7.6 percent)]. Children younger than 12 years constituted the group operated on most commonly [$n = 206$ (71.5 percent)].

Quality Markers of International Volunteer Trips

Using the Volunteers in Plastic Surgery Committee guidelines, we asked seven questions aimed at assessing the quality of care provided on volunteers' trips. Key data points included questions about how follow-up care was arranged, the use of medical records, host affiliation, use of international safety surgery guidelines, whether surgeons were acting within their "scope of practice," use of an anesthesiologist, and death or major complications. We classified participants as practicing within their scope of practice if their reported primary type of surgical practice in the United States (e.g., cosmetic, general, burn) matched their reported primary type of surgery performed on international volunteering trips, or whether

they reported practicing general reconstruction while volunteering abroad.

Respondents reported high use of medical records (98.9 percent), follow-up care (98.2 percent), and host affiliation (74.9 percent). However, only 38.5 percent of respondents reported use of international safety surgery guidelines and only 36.7 percent of all participants reported volunteering abroad within the scope of their practice. Although 91.5 percent of respondents reported the use of any anesthesiologist (pediatric or general), when we looked at the overall pediatric population on all trips, we found that the majority of children were not cared for by a pediatric anesthesiologist (Fig. 2).

Quality Markers of International Volunteer Trips with Residents

Of the 283 participants who reported volunteering internationally within the past 5 years, 151 (53.4 percent) brought residents on their trips. We found no significant difference between participants who reported having brought residents and those who did not regarding the following: arrangement of patient follow-up, use of medical records, having a host affiliation, use of international safety guidelines, and practicing within their scope of practice ($p > 0.05$).

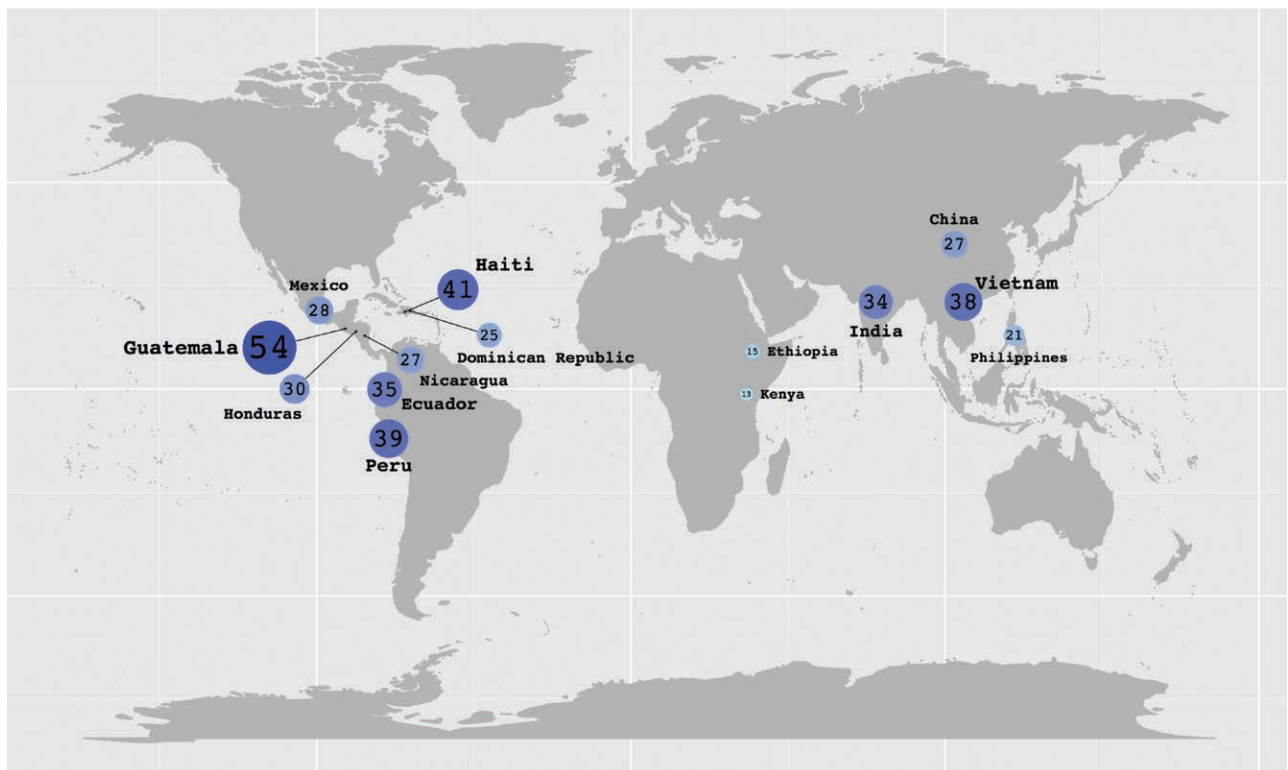


Fig. 1. Number of surgeons reporting volunteering per country in the past 5 years.

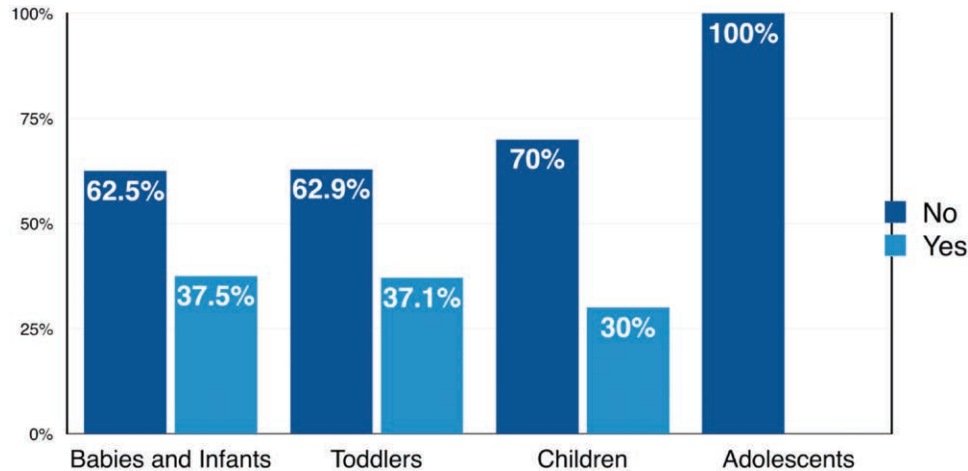


Fig. 2. Use of a pediatric anesthesiologist by age on any trip.

Table 1. Quality Markers on International Volunteer Trips

	Total (%)	With Residents (%)	No Residents (%)	OR (95% CI)	<i>p</i>
Any anesthesiologist (pediatric or general)					
Yes	259 (91.5)	144 (95.4)	115 (87.1)	3.04 (1.27–8.09)	0.017*
Pediatric anesthesiologist					
Yes	73 (25.8)	53 (35.1)	20 (15.2)	3.03 (1.72–5.52)	<0.001*
Guideline use					
Yes	109 (38.5)	61 (40.4)	48 (36.4)	1.19 (0.73–1.92)	0.487
Scope of practice					
Within scope	104 (36.7)	57 (37.7)	47 (35.6)	1.40 (0.82–2.37)	0.208
Follow-up care					
Yes (was arranged)	278 (98.2)	149 (98.7)	129 (97.7)	1.73 (0.28–13.21)	0.551
Medical records					
Yes (kept medical records)	280 (98.9)	149 (98.7)	131 (99.2)	0.57 (0.03–6.00)	0.646
Host affiliation					
Yes	212 (74.9)	115 (76.2)	97 (73.5)	1.15 (0.67–1.98)	0.605
Death					
Yes	83 (29.3)	55 (36.4)	28 (21.2)	2.13 (1.26–3.66)	0.005*

*Statistically significant.

Participants who brought residents were significantly more likely to report the use of any anesthesiologist or use of a pediatric anesthesiologist. One hundred forty-four participants (95.4 percent) reported use of an anesthesiologist compared with 115 participants (87.1 percent) who did not report bringing residents (OR, 3.0; $p = 0.017$). Similarly, we found that 53 participants (35.1 percent) who reported bringing residents specifically reported use of a pediatric anesthesiologist, compared with 20 participants (15.2 percent) who did not bring residents (OR, 3.0; $p < 0.001$).

However, we found that surgeons who reported bringing residents on trips also were significantly more likely to report a death or major complication on any international volunteer trip. Of surgeons who reported bringing residents on trips, 55 (35 percent) reported having experienced a death or major complication on any previous

international volunteer trip; this is compared to 28 participants (19.7 percent) who reported not having brought residents. We found the odds ratio to be 2.2 ($p = 0.003$). Table 1 lists the complete results of quality markers.

Predictors of Death and Major Complications on International Volunteer Trips

Of the participants who reported traveling within the past 5 years, 86 (29.8 percent) reported ever having a death or major complication while volunteering internationally, and 6.9 percent reported more than one death or major complication. On univariate analysis, we found that there was no significant difference in occurrence of death or a major complication based on the following factors: gender of surgeon, arrangement of follow-up care, or use of medical records (Table 2).

Table 2. Participant Demographics and Death/Major Complication

Predictor	Participants with Reported Death or Major Complication on Trip (%)	OR (95% CI)	<i>p</i>
Age, yr			0.010
<30	1 (100)	NA	0.986
30–39	3 (8.3)	0.23 (0.05–0.72)	0.024
40–49	20 (29)	1.04 (0.51–2.09)	0.918
50–59	24 (28.2)	Ref.	
60–69	30 (41.1)	1.77 (0.92–3.47)	0.091
>70	7 (31.8)	1.19 (0.41–3.19)	0.741
Gender			
Male	76 (30.6)	Ref.	
Female	10 (26.3)	0.81 (0.36–1.70)	0.588
Ethnicity			0.256
White	75 (32.6)	Ref.	
Black	0 (0)	NA	0.986
Asian	5 (20.0)	0.52 (0.17–1.33)	0.204
Hispanic/Latino/Spanish origin	4 (22.2)	0.59 (0.16–1.71)	0.367
Native Hawaiian/other Asian/Pacific Islander	0 (0)	NA	0.992
Total no. of trips			<0.001
1	3 (10)	0.14 (0.03–0.43)	0.002
2–5	13 (16.2)	0.25 (0.12–0.49)	<0.001
6–10	14 (28.6)	0.51 (0.24–1.03)	0.068
>10	53 (43.8)	Ref.	
Primary type of surgery performed at home			0.172
General reconstruction	29 (25.7)	Ref.	
Craniofacial reconstruction	17 (40.5)	1.97 (0.93–4.16)	0.075
Hand	6 (26.1)	1.02 (0.34–2.73)	0.966
Burn reconstruction	2 (100)	NA	0.980
Cosmetic	22 (27.5)	1.10 (0.57–2.10)	0.776
Microsurgery	4 (28.6)	1.16 (0.30–3.76)	0.815

NA, not applicable; Ref., reference.

Total number of trips a participant has worked on was a significant predictor of having experienced a death or major complication. Compared to participants who reported participating in more than 10 international surgical trips, participants who reported participating in fewer trips were significantly less likely to report a death or major complication.

The reported use of general anesthesia was associated with a higher likelihood of reporting a death or major complication (OR, 4.8; $p = 0.036$). Of participants who reported use of a nurse anesthetist, 41 (37.3 percent) reported a death or major complication, compared with only 45 (25.1 percent) of those who did not report use of a nurse anesthetist (OR, 1.8; $p = 0.029$).

In addition, we found that the type of primary surgery performed on international volunteer trips was a significant predictor of death or major complication. Compared with surgeons who primarily performed cleft procedures, participants who completed general reconstruction (OR, 0.5; $p = 0.042$) and hand procedures (OR, 0.3; $p = 0.041$) were less likely to report a death or major complication.

We found the most commonly self-identified cause of death or major complication to be

anesthesia-related events (32.4 percent). The second most commonly cited reason (27.9 percent) for death or complication was the general category of postoperative complications. Figure 3 shows the classification of causes of death and complication as identified by surgeons.

Predictors of International Volunteering as an Attending Physician

Of the 746 participants, 493 (66.1 percent) reported volunteering internationally as an attending physician and 253 (33.9 percent) reported having never volunteered internationally. We found that volunteer experience in medical school and residency was significantly predictive of volunteering as an attending surgeon. One hundred one surgeons (22.1 percent) who volunteered and 11 surgeons (4.4 percent) who did not volunteer reported having volunteered internationally in medical school (OR, 6.1; $p < 0.001$). Two hundred fifty-two surgeons (55.0 percent) who volunteered and 13 surgeons (5.2 percent) who did not volunteer reported having volunteered internationally in residency (OR, 22.3; $p < 0.001$).

Overall, we found no difference between the proportion of fellowship-trained surgeons who volunteered [$n = 240$ (68.4 percent)] and

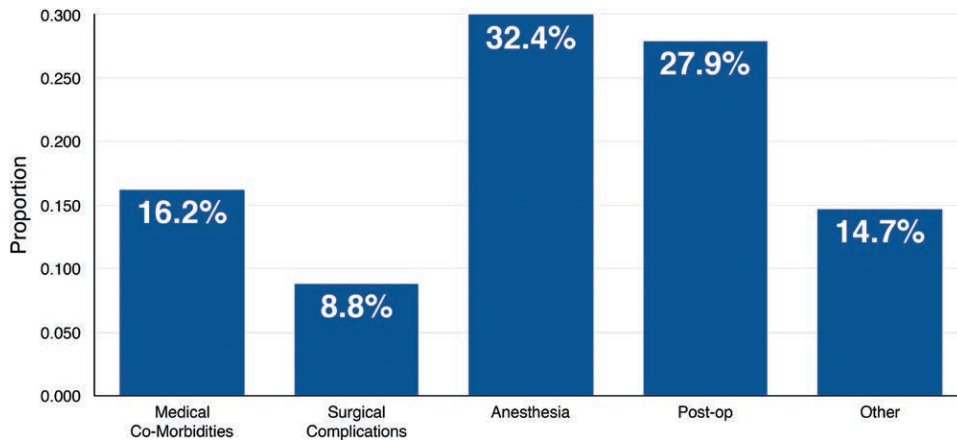


Fig. 3. Reported causes of death/complication on international volunteer trips.

non-fellowship-trained surgeons who volunteered [$n = 253$ (64.1 percent)]. Within the individual types of fellowship training, we found that craniofacial/oral and maxillofacial surgery fellowship-trained surgeons reported the highest volunteer participation [$n = 90$ (84.1 percent); OR, 3.1; $p < 0.001$]. Cosmetic fellowship-trained surgeons had the lowest level of volunteer participation, with 43 (50 percent) having volunteered (OR, 0.5; $p = 0.001$).

Predictors of Not Volunteering

Female gender was a significant predictor of not volunteering, with 134 surgeons (18.7 percent) who had ever volunteered as an attending physician identifying as female and 581 (81.3 percent) as male. Of female physicians, 75 (56.0 percent) reported having volunteered internationally in the past compared with the 394 male surgeons (67.8 percent) who reported having volunteered internationally in the past (OR, 0.60; $p = 0.01$).

The three most common reasons surgeons reported for having never volunteered internationally were (1) being unable to take time away from U.S. practice (59.3 percent), (2) being unable to find a group to travel with (18.3 percent), and

(3) not believing their skills were needed (15.9 percent). When we examined men and women separately, we found there was a significant difference in the proportion of women, 11 (18.6 percent), who reported never volunteering because of having children or family responsibilities compared with men [$n = 4$ (2.1 percent); OR, 10.4; $p < 0.001$]. The reported reasons for never having volunteered internationally are listed in Table 3 and presented in Figure 4.

Economics of Volunteering

One-quarter of respondents ($n = 71$) contributed \$1000 to \$2000, and 34.7 percent ($n = 102$) of respondents contributed more than \$2000 (Fig. 5). We calculated the value of international work performed by plastic surgeons as a conservative value of \$8,179,749.55. Per capita of 293 surgeons reporting their work, this assigns a dollar value of \$27,917.23 in Medicare professional fees to each surgeon on their last trip (see Appendix A, Supplemental Digital Content 1, <http://links.lww.com/PRS/C296>).

Although volunteer surgeons are working abroad, they are not operating at their home institutions, and this represents an opportunity cost of international volunteering. Using the calculated

Table 3. Reported Reasons for Never Volunteering Internationally as an Attending Physician

	Total (%)	Men (%)	Women (%)	OR* (95% CI)	<i>p</i>
Unable to take time from U.S. practice	164 (59.3)	111 (59.4)	35 (59.3)	1.00 (0.53–1.91)	1.000
Unable to find group to travel with	45 (18.3)	37 (19.8)	8 (13.6)	0.64 (0.24–1.51)	0.337
Don't believe my skills are needed	39 (15.9)	33 (17.6)	6 (10.2)	0.53 (0.17–1.38)	0.221
Not interested in international volunteer work	34 (13.8)	25 (13.4)	9 (15.3)	1.17 (0.45–2.79)	0.672
Family responsibilities	15 (6.1)	4 (2.1)	11 (18.6)	10.35 (2.91–46.56)	<0.001†
Too much need in my own community	13 (5.3)	11 (5.9)	2 (3.4)	0.56 (0.06–2.69)	0.739
Heard about bad experiences from others	9 (3.7)	7 (3.7)	2 (3.4)	0.90 (0.09–4.92)	1.000

*In reference to male physicians.

†Statistically significant.

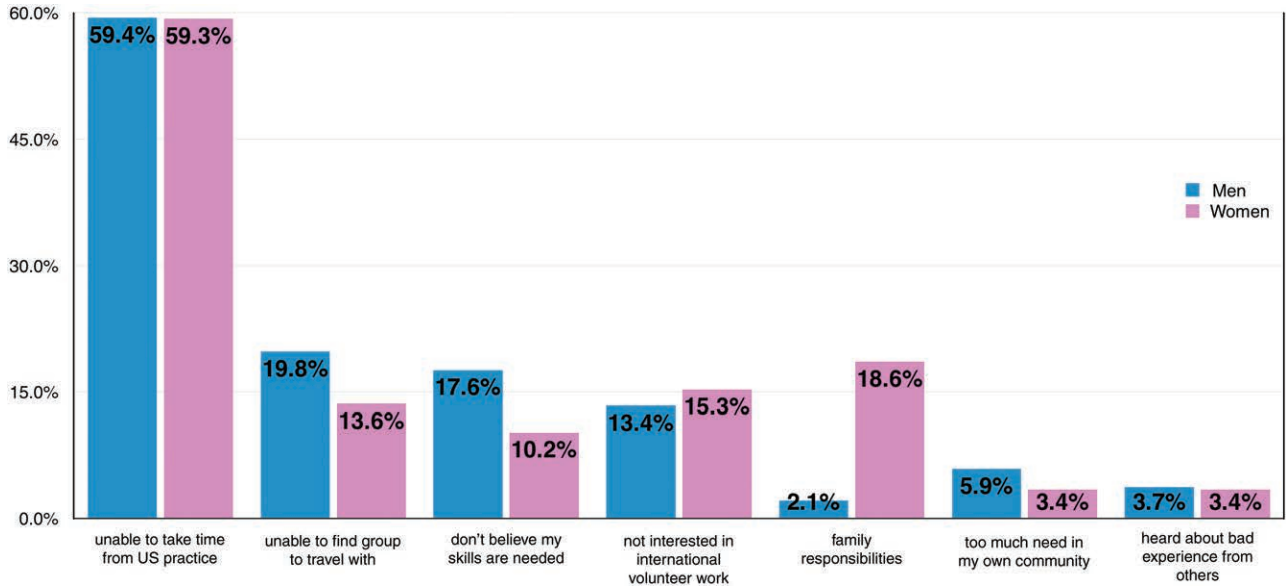


Fig. 4. Reasons surgeons have never volunteered internationally, by gender.

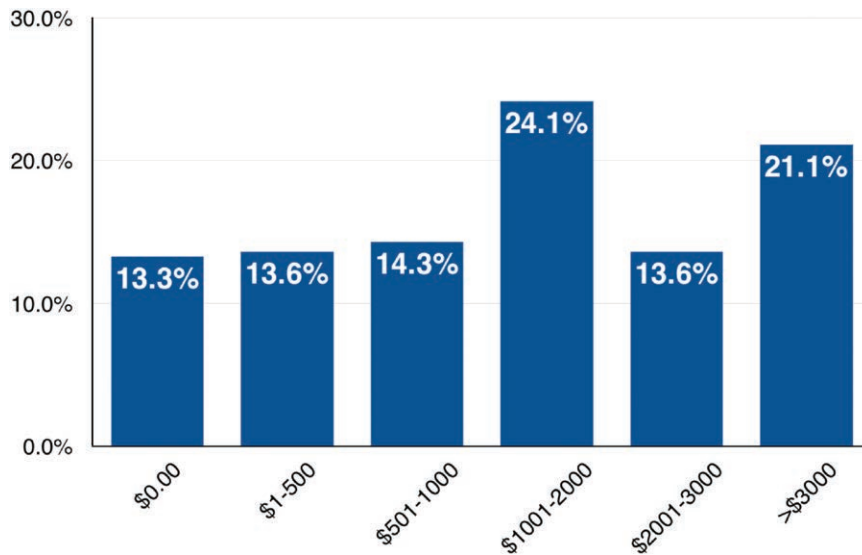


Fig. 5. Reported amount of money participants contributed on a trip.

contribution margin per minute described by Pacella et al. for reconstructive plastic surgery and surgeons' reported time working abroad on their last trip, aggregate deferred facility contribution margin was calculated as over \$43 million, adjusted for inflation to 2016.

DISCUSSION

To our knowledge, our survey is the first attempt to analyze the nature and quality of care provided on international volunteer trips by American plastic surgeons. Impressively, these trips bring an abundant amount of health care to recipient nations.

Our data identify considerable overlap of trip location among American surgeons, and this duplication of efforts does not correlate with the world's neediest locations. The *Lancet* commission illustrated the proportion of the world's population without access to safe, affordable surgical care.¹ A comparison of the *Lancet* findings to the most commonly visited countries by surgeons on their last trip in our data set suggests a significant discrepancy between supply and need (Figs. 1 and 6). We also found that participants who reported traveling to Guatemala and Peru were both more than twice as likely to report a death or major complication compared with the complication

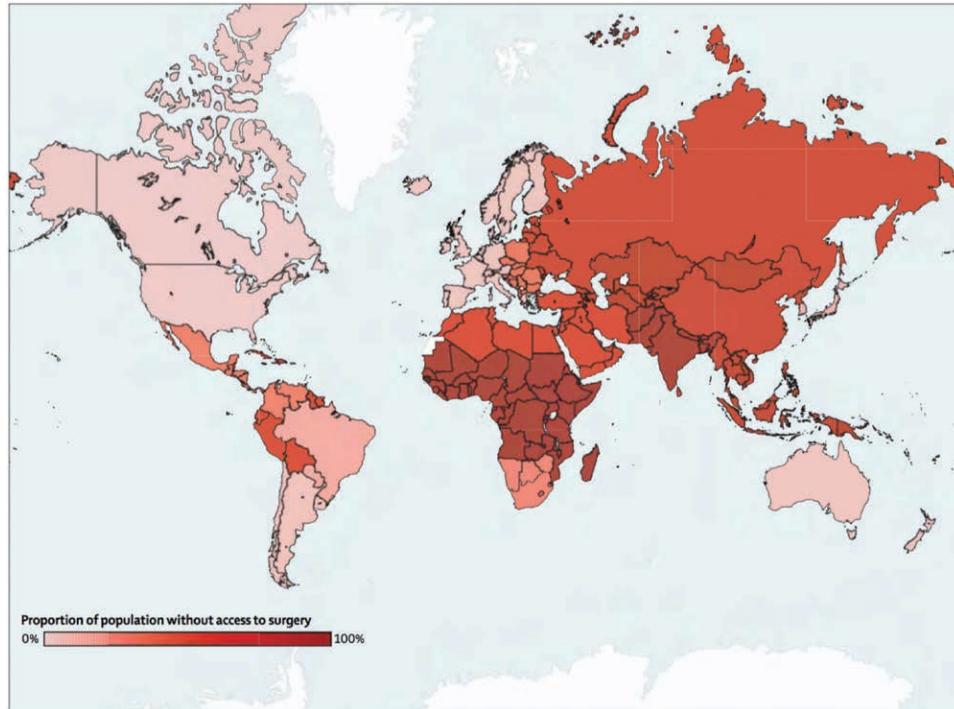


Fig. 6. *Lancet* commission proportion of population without access to surgery by country. (Reprinted from Alkire BC, Raykar NP, Mark G Shrime MG, et al. Global access to surgical care: A modelling study. *Lancet* 2015;3:316–323.)

risk associated with the six other most commonly visited countries.

Quality Markers

We found that the quality of the plastic surgery care provided on international trips as benchmarked by the Volunteers in Plastic Surgery Committee Guidelines for Pediatric Surgical Care in Less Developed Countries varies greatly; 63.3 percent of respondents reported practicing outside of their scope of practice on their last trip, mostly performing cleft repair. In addition, cleft repair as a category of surgery was associated with the highest rate of death or major complication among plastic surgery subtypes. Our crude measure of death or major complication is not nuanced enough to capture all postoperative complications and likely significantly underestimates the potential morbidity of cleft repairs.

Potentially modifiable risk factors to prevent death or major complication in our data set included use of a nurse anesthetist, with surgeons reporting a 1.8 times greater risk of death or major complication compared with participants who did not use a nurse anesthetist. This highlights the importance of international volunteering teams including an anesthesiologist and indicates a significant area for potential quality improvement,

as the majority of children in this data set were not cared for by a pediatric anesthesiologist, the standard of care in the United States.

We found that surgeons who brought residents on trips had equally high use of follow-up care, medical records, and host affiliation compared to surgeons who did not travel with residents and had higher use of international safety surgery guidelines and were more likely to operate within their scope of practice compared with surgeons who did not bring residents on trips. However, these two quality markers were overall low for trips with and without residents.

With regard to anesthesia care, a minority of children were cared for by a pediatric anesthesiologist. However, surgeons who reported bringing residents on trips were three times more likely to report the use of any anesthesiologist (defined as a general anesthesiologist or pediatric anesthesiologist) and were three times more likely to report the use of a pediatric anesthesiologist.

Although surgeons who traveled with residents were over twice as likely to report a death or life-threatening complication on any international volunteer trip, this finding should be interpreted with caution. Because we asked surgeons about death or major complication on international trips throughout their career, not just on their last

trip, we do not have a denominator with which to specifically calculate an overall complication rate. Our study does not seek to address causation, simply association. It is plausible that surgeons who bring residents on international volunteer trips perform more complicated procedures or have traveled on a greater number of trips overall, and thus it is likely that the involvement of a resident is associated with a death or major complication rather than being a causal factor.

These data on the quality of plastic surgery care provided on international trips as defined by the Volunteers in Plastic Surgery Committee Guidelines for Pediatric Surgical Care in Less Developed Countries provide an important practical clinical baseline as surgeons use technology, combined research studies, and educational exchanges to collaborate with their international colleagues and work to develop sustainable multidisciplinary teams with locally and culturally appropriate outcome measures.

Predictors of Volunteering

Our study also found that gender, exposure to international volunteer trips in medical school and residency, and type of fellowship training predict international volunteerism among plastic surgeons. Women were significantly more likely to report family responsibilities as the reason for not volunteering internationally compared with men.

We also found exposure to volunteering early during medical training to be highly predictive of subsequent volunteering activities. Recent studies have reported a surge in interest and participation in international volunteer work among medical students and residents.¹⁰⁻¹² We found that surgeons who volunteered as an attending physician were six times more likely to have volunteered internationally during medical school and 22 times more likely to have volunteered during residency compared with surgeons who have never volunteered.

Our data indicate that students' and trainees' volunteer experiences strongly influence subsequent surgeon behavior, highlighting the vital importance of maintaining clinical and educational quality on these trips. Given how strongly these training experiences predict future behavior and the fact that women were significantly more likely to identify family responsibilities as a reason for not volunteering, these data highlight the importance for program directors to ensure, by means of strong institutional mandate and creative practical support, that a diverse cohort of American resident surgeons have the opportunity to collaborate with international colleagues.

Economics of Volunteering

The majority of respondents who volunteered recently spent between \$1000 and 2000 to work internationally. In addition to this cash outlay, surgeons identified the cost of time away from their practice as a heavy burden; surgeons who did not volunteer in the past 5 years or have never volunteered cited the inability to take time off from their U.S. practice as the most common reason for not having volunteered.

We calculated the aggregate deferred facility contribution margin while surgeons were volunteering abroad on their last trip to be over \$43 million, adjusted for inflation to 2016. This figure should be interpreted with caution, as it is not an attempt to explain the cost of care locally or calculate a value of surgery to patients. Rather, this number is a very general descriptor in dollar terms of the far-reaching work volunteer surgeons provide internationally, a body of effort not previously well described in our literature.

Limitations

Our study has several limitations. Our study is a retrospective cross-sectional study and therefore we can only demonstrate correlation, not causation. We readily acknowledge that these data are subject to recall and selection bias and potentially are not fully representative of the entire plastic surgery community. Our survey specifically asked about the last trip of surgeons who had traveled in the past 5 years, although information regarding death and other major complication was queried in the context of a surgeon's entire career. This limits our ability to accurately calculate a total complication rate among surgeons volunteering internationally.

The overall response rate was 15 percent and ideally would be higher. However, the absolute number of respondents ($n = 746$) is large and sufficiently robust statistically to power our general conclusions. Of note, many American Society of Plastic Surgeons-sponsored surveys sample only a portion of the Society's membership; our survey was delivered repeatedly to the entire membership, adding to the survey methodology quality and survey validity.

Despite these limitations, our data set is the largest to date about international volunteer trips. Our further work will focus on a prospective cohort study among plastic surgeons operating abroad.

CONCLUSIONS

There is a well-documented imbalance between surgical need and qualified surgeons in the world,

leaving many developing countries without adequate access to surgical care. International surgical volunteer trips attempt to ease this burden by providing surgical care to the those in need. Our data indicate considerable variation in quality of care provided on these trips. Specifically, the majority of children younger than 5 years were not cared for by a pediatric anesthesiologist, and many plastic surgeons operated outside of their scope of practice. We found that volunteer experiences in medical school and residency were highly associated with volunteer activity as an attending physician, emphasizing the importance of recent work by the Accreditation Council for Graduate Medical Education to foster and supervise high-quality international educational exchanges.^{13–16}

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