Surgical residency training and international volunteerism: a national survey of residents from 2 surgical specialties

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Background: Many low- and middle-income countries (LMICs) lack basic surgical resources, resulting in avoidable disability and mortality. Recently, residents in surgical training programs have shown increasing interest in overseas elective experiences to assist surgical programs in LMICs. The purpose of this study was to survey Canadian surgical residents about their interest in international volunteerism.

Methods: We sent a web-based survey to all general and orthopedic surgery residents enrolled in surgical training programs in Canada. The survey assessed residents' interests, attitudes and motivations, and perceived barriers and aids with respect to international volunteerism.

Results: In all, 361 residents completed the survey for a response rate of 38.0%. Half of the respondents indicated that the availability of an international surgery elective would have positively influenced their selection of a residency program. Excluding the 18 residents who had volunteered during residency, 63.8% of the remaining residents confirmed an interest in international volunteering with "contributing to an important cause," "teaching" and "tourism/cultural enhancement" as the leading reasons for their interest. Perceived barriers included "lack of financial support" and "lack of available organized opportunities." All (100%) respondents who had done an international elective during residency confirmed that they would pursue such work in the future.

Conclusion: Administrators of Canadian surgical programs should be aware of strong resident interest in global health care and accordingly develop opportunities by encouraging faculty mentorships and resources for global health teaching.

Contexte: Beaucoup de pays à revenu faible et moyen (PRFM) n'ont pas de ressources de base en chirurgie, ce qui entraîne des invalidités et une mortalité évitables. On a vu récemment un intérêt croissant chez les médecins résidents de programmes de formation en chirurgie pour les stages au choix à l'étranger afin d'aider les programmes de chirurgie des PRFM. Cette étude vise à sonder des médecins résidents en chirurgie du Canada au sujet de l'intérêt qu'ils portent au bénévolat à l'étranger.

Méthodes: Nous avons fait parvenir un questionnaire électronique à tous les médecins résidents en chirurgie générale et orthopédique inscrits à des programmes de formation en chirurgie au Canada. Le sondage visait à évaluer les intérêts des médecins résidents, leurs attitudes et leur motivation, les obstacles et les moyens d'aider perçus en ce qui a trait au bénévolat à l'étranger.

Résultats: Au total, 361 médecins résidents ont rempli le questionnaire, ce qui représente un taux de réponse de 38,0 %. La moitié des répondants ont indiqué que la disponibilité d'un stage électif en chirurgie à l'étranger aurait eu un effet positif sur leur choix d'un programme de résidence. Si l'on exclut les 18 médecins résidents qui avaient fait du bénévolat au cours de leur résidence, 63,8 % des médecins résidents restants ont confirmé que le bénévolat à l'étranger les intéressait pour « contribuer à une cause importante », « enseigner » et « améliorer leur expérience touristique ou culturelle » comme principal motif de leur intérêt. Les obstacles perçus comprenaient le « manque d'aide financière » et « le manque de possibilités organisées disponibles ». Tous les répondants (100 %) qui avaient effectué un stage électif à l'étranger au cours de leur résidence ont confirmé qu'ils rechercheraient à l'avenir ce genre de travail.

Conclusion: Les administrateurs de programmes de chirurgie au Canada devraient être conscients de l'intérêt marqué des médecins résidents pour les soins de santé à l'étranger et offrir des possibilités en encourageant le mentorat par des membres du corps enseignant et l'affectation de ressources à l'enseignement sur la santé dans le monde.

Most of the world's burden of surgical disease is carried by low- and middle-income countries (LMICs), where few surgeons and surgical resources are available to meet the clinical demands for basic surgical needs.[1–6] For example, many of the surgeries in sub-Saharan Africa today are performed in district hospitals by generalist doctors, and even by nonphysicians who may have some rudimentary training in surgical skills. As a result, many patients in the developing world are denied the most basic surgical care, the absence of which leads to avoidable yet substantial disability or mortality.[4,7,8] In some African countries, the surgical capacity to perform common and necessary procedures, such as open fractures, amputations or even chest-tube insertions, is estimated to be more deficient than what was available to soldiers during the American Civil War, waged between 1861 and 1865.[9]

Institutions such as the World Health Organization (WHO) have now recognized the critical need for essential surgical services in LMICs, especially in relation to injuries, pregnancy-related conditions, congenital anomalies and infections.[8,10,11] The increasing importance of road traffic injuries to worldwide morbidity and mortality figures is especially challenging, with the vast majority (> 90%) occurring in LMICs.[2,12–14] Previously held notions that basic surgery in LMIC regions may be too sophisticated or cost-ineffective are now widely disputed, with many surgical programs being shown to be as cost-effective as other major health programs in the world designed to combat diseases such as HIV, tuberculosis or malaria.[10,15,16] Moreover, whereas costs for health care in LMICs will always be limited, many argue that the global shortage of health workers (including surgeons) is possibly a more important issue and a more substantial barrier to safe surgery than resource funding, with the greatest shortage existing in the poorest countries.[8]

Concerns about the negative effects of surgical volunteerism have been raised, including the real effectiveness of short-term missions,[17] the possible negative effects on local resources and surgeons,[18] the appropriateness of technology transfer to LMICs[18] or the ethical dilemma of performing surgical "tourism."[19] To this we add the potential moral and ethical conflicts that may face a surgical trainee asked to perform a difficult procedure that he or she has never seen before but is now asked to do in a challenging environment. Despite the real and perceived shortcomings, some element of surgical volunteerism from high-income countries (HICs) has always been present in the developing world, through medical nongovernmental organizations, religious-based groups, direct hospital to hospital partnerships, or even simply individual surgeons establishing their own contacts to improve surgical care where it is needed. Furthermore, residents in surgical training programs have shown increasing interest in overseas elective experiences,[5,20–23] along with what appears to be an unprecedented student interest in global health education. As such there are increasing demands on universities to provide not only instruction and classes in global health but also hands-on experience in LMICs.[24]

The purpose of this paper is to survey surgical residents about their interest in international volunteerism by reviewing responses from residents from the 2 largest surgical subspecialty programs in Canada: general surgery and orthopedic surgery. Resident interests, attitudes and motivations, and perceived barriers and aids with respect to international volunteerism were reviewed and compared with surveys reported in the literature. If the apparent trend of interest in surgical globalism is seen in surgical trainees, then academic departments of surgery will need to provide mentors, infrastructure and research to balance the benefits of the high energy and enthusiasm brought by residents to the LMIC setting with the potential problems of inexperienced surgeons dealing with surgical conditions beyond their capacity. Ethical, moral, personal safety and even legal implications can also arise from this. If surgical residents are going to increasingly become involved in providing some forms of surgical care in LMICs, then it behooves administrators of surgical training programs to assess their abilities to guide and provide a safe and fruitful elective period for the surgical resident. In an already cost-constrained health care system, opponents of globalism might ask if use of resources for surgical activity in countries other than their own can be currently justified. Finally, we hope to use the information gathered in this study to establish a Canadian directory of international volunteering opportunities to assist interested surgical residents in identifying programs and individuals willing to counsel them and facilitate their involvement.

Methods

The web-based survey, outlined in Box 1, was designed using a tailored method and administered anonymously via the Internet using SurveyMonkey software (surveymonkey.com).[25] Surveys were sent to all general surgery and orthopedic surgery residents enrolled in surgical training programs accredited by the Royal College of Physicians and Surgeons of Canada (RCPSC). English-language medical schools were sent an English survey, and a French version of the survey was sent to French-language universities in Quebec (Université Laval, Université de Montréal and Université de Sherbrooke). Programs in general surgery and orthopedic surgery were selected for 2 reasons: they are the 2 largest Canadian surgical training programs, and traditionally identified surgical needs in LMICs are frequently, but by no means exclusively, within these 2 surgical realms.[26]

An email containing a link to the survey was sent to every general surgery and orthopedic surgery program's chief resident and program director's administrative assistant, who then forwarded this message to all of the residents in each respective program. Receipt of the original email, as well as compliance with distribution, was confirmed by

return email. Two subsequent reminder emails were delivered in the same fashion at 1-month intervals. The survey was conducted in 2008.

The first component of the survey focused on resident demographics and the second inquired about past volunteering experiences before the start of residency. The third and final section of the survey asked participants to clarify reasons for wanting to pursue international electives and what specific barriers (experienced or perceived) would render organization of such a project difficult.

The Canadian Post-MD Education Registry (CAPER) annual census for 2007–2008 issued by The Association of Faculties of Medicine of Canada (AFMC) was used to calculate response rates.[27] We carried out a descriptive analysis of the data and performed a selective χ^2 analysis on items of interest. Completion of the survey was voluntary, and consent to participate was considered implicit if the survey was completed and submitted. Institutional ethics approval for this study was obtained from the institutional review boards of the Children's Hospital of Eastern Ontario and the University of Ottawa's Faculty of Medicine. Respondents' anonymity was maintained.

Box 1. Summary of survey questions

Respondent demographics

- Age
- Sex
- Marital status
- Children/dependents
- Spoken languages
- Current surgical training program
- Year of training
- Undergraduate medical training
- Degrees other than medical degree
- Influence of the availability of international surgery elective on choice of residency training programs
- Allocation of elective time to complete international surgical elective in current training program

International volunteerism experience

- Timing of experience (before or during residency)
- Frequency
- Type of volunteer work
- Involvement with organizations
- Duration of elective/experience
- Location (continent)
- Willingness to pursue more volunteering abroad
- Barriers (real and perceived) to pursuing international volunteerism (see below)

Barriers to international electives

- Lack of elective time
- Lack of program support
- Lack of financial support
- Lack of organized opportunities
- Fear of wasting time that could be better used to secure a potential fellowship position
- Lack of commitment from spouse/partner
- Fear for personal safety
- Fear for medical safety
- Fear of litigation
- Other

Reasons for wanting to volunteer abroad

- Teaching
- Enhancing technical/clinical skills
- Exposure to uncommon pathologies
- Determine interest in future similar experiences
- Tourism
- Contribution to an important cause
- Establishing contacts abroad
- Other

Results

A total of 361 residents completed the survey for an overall response rate of 38.0% of all potential resident respondents from the 16 faculties of medicine in Canada that house general surgery and orthopedic surgery training programs. General surgery residents constituted 60.4% (218) of the respondents and the remaining 39.6% (143) were orthopedic surgery residents. This 1.5:1 ratio of respondents from each subspecialty accurately reflects the total national number of residents for each subspecialty: 579 general surgery residents and 371 orthopedic surgery residents[27] ($p = 0.05$).

Respondent demographics

In total, there were 66.5% male and 33.5% female respondents (Table 1). Looking at each specialty separately, 85.3% of the orthopedic surgery respondents were men, which is considerably higher than the 54.1% male proportion among the general surgery respondents. This difference in male:female ratio in general surgery versus orthopedic surgery programs is reflected in the total numbers seen in the CAPER annual census for 2007–2008, which shows that 79.7% of orthopedic residents and 58.8% of general surgery residents are men.[27]

Most residents were between the ages of 25 and 30 years (65.4%), followed by 31–35 years (22.2%), whereas 6.1% of residents were younger than 25 years and 6.4% were older than 35 years. The age distribution was roughly equal between the 2 specialties. Half of the general surgery residents were married or in a committed relationship, which is lower than the 61.5% reported among the orthopedic residents. Similarly, a higher proportion of orthopedic residents (26.6%) reported having children or dependents compared with 13.8% of the general surgery residents. Overall, 54.6% of the respondents were married or in a committed relationship and 18.8% had children.

In terms of language proficiency, 39.9% of the residents spoke a language other than French or English. The respondents were evenly distributed among the Canadian universities and their respective programs (data not shown). The postgraduate years (PGYs) of the respondents are shown in Table 1. Among the orthopedic resident

respondents, the distribution was roughly even throughout the 5 years of training. For the general surgery group, there were more respondents in PGY-1 and PGY-3. However, overall respondents were evenly distributed among PGY-1 to PGY-3 (24.7%, 20.5% and 21.9%), which was slightly lower than PGY-4 (15.8%) and PGY-5 (15.2%).

In terms of educational background, 87.4% of survey respondents graduated from Canadian medical schools and 12.6% graduated from medical schools outside of North America. There was an even distribution of Canadian graduates from each university surveyed (data not shown). Two-thirds of surgical residents (65.7%) had a Bachelor of Science (BSc) degree, whereas 14.1% had a Master of Science (MSc) degree and 2.8% had a doctorate-level (PhD) degree. The proportion of postgraduate degrees was roughly similar in both groups. A small number, 67 (18.6%), of respondents had no postgraduate degree other than their Doctor of Medicine (MD).

Table 1. Demographic characteristics of orthopedic and general surgery residents who responded to a survey on international volunteerism, *n* = 361

Characteristic	Specialty; no. (%)		
	Orthopedic surgery	General surgery	Total
No.	143 (39.6)	218 (60.4)	361
Age, yr			
< 25	4 (2.8)	18 (8.3)	22 (6.1)
25–30	91 (63.6)	145 (66.5)	236 (65.4)
31–35	39 (27.3)	41 (18.8)	80 (22.2)
36–40	5 (3.5)	12 (5.5)	17 (4.7)
> 40	4 (2.8)	2 (0.9)	6 (1.7)
Sex			
Male	122 (85.3)	118 (54.1)	240 (66.5)
Female	21 (14.7)	100 (45.9)	121 (33.5)
Marital status			
Single	55 (38.5)	109 (50.0)	164 (45.4)
Married/committed relationship	88 (61.5)	109 (50.0)	197 (54.6)
Children/dependents			
Yes	38 (26.6)	30 (13.8)	68 (18.8)
No	105 (73.4)	188 (86.2)	293 (81.2)
Spoken languages other than English			
Yes	57 (39.9)	87 (40.0)	144 (39.9)
No	86 (60.1)	131 (60.0)	217 (60.1)
Postgraduate year			
1	33 (23.1)	56 (25.7)	89 (24.7)
2	31 (21.7)	43 (19.7)	74 (20.5)
3	26 (18.2)	53 (24.3)	79 (21.9)
4	20 (14.0)	37 (17.0)	57 (15.8)
5	32 (22.4)	23 (10.6)	55 (15.2)
≥ 6	1 (0.7)	6 (2.8)	7 (1.9)
Degrees other than MD			
BSc	97 (67.8)	140 (64.2)	237 (65.7)
MSc	23 (16.1)	28 (12.8)	51 (14.1)
PhD	2 (1.4)	8 (3.7)	10 (2.8)
Other	29 (20.3)	35 (16.1)	64 (17.7)

BSc = Bachelor of Science; MD = Doctor of Medicine; MSc = Master of Science; PhD = Doctor of Philosophy.

Previous volunteering experience before residency

In all, 116 (32.1%) respondents had volunteered abroad in a low-income country before the start of their residency. Of these, 41 (28.7%) residents were in orthopedic surgery and 75 (34.4%) residents were in general surgery programs. Among those with previous experience volunteering abroad, 74.4% had volunteered during medical school, 46.1% had volunteered during undergraduate and graduate school, and another 12.8% had volunteered during high school. Various types of international volunteerism were reported, including general medical electives (34.1%), community development projects (30.7%), surgical electives (20.7%) and missionary (faith group) work (9.5%), whereas 5.0% of the respondents did not specify the category of volunteering they had performed.

Volunteering abroad during residency

Half of the total surgical trainees responding (49.9%) stated that the availability of an international surgery elective would have positively influenced their selection of a training program before the residency match, and 70.9% stated that their program had protected elective time that could be used for volunteering abroad. The duration of these available elective periods were mainly between 2 months (14.9%) and 3 months (39.6%) and in some cases were 6 or more months (11.0%). One-quarter of residents (26.3%) were unaware of the exact duration of allocated time for such opportunities in their current program.

Eighteen residents (12 general surgery and 6 orthopedic surgery), constituting 5.1% of all respondents, had volunteered abroad during their current residency program, with 4 of them having volunteered on more than 1 occasion. This group included 13 men and 5 women, with half of them married or in a committed relationship (2 had children at the time). Seven of these 18 had previously volunteered abroad. Of these 18 participants, 4.5% had completed their elective in PGY-2, 31.8% in PGY-3, 45.5% in PGY-4 and 18.2% in PGY-5. Most electives lasted 1 month (44.4%), with others lasting 2 weeks (27.8%), 2 months (11.1%), 3 months (11.1%) and 5 months (5.6%).

Geographically, the electives were distributed as follows: Africa (45.5%), Asia (27.3%), South America (18.2%), Central America (4.5%) and North America (4.5%). Most (88.9%) were surgical electives. All (100.0%) of the residents who completed an elective during their training stated that they would participate in further volunteer work abroad during their careers.

Regarding major motivations for professional volunteerism during surgical training, the respondents who had

done volunteer work during their training identified that predominantly a "contribution to an important cause" was "very important" (66.7%) and "important" (27.8%) to them (in aggregate, 94.5%). The next most important motivation factor was "determine if volunteering abroad is something you would like to pursue in the future" ("very important" 44.4% and "important" 50.0%, combined 94.4%). "Enhancing technical/clinical skills" ("very important" 44.4% and "important" 44.4%, combined 88.8%) was also of some importance to respondents.

The reported barriers to setting up electives are shown in Table 2. Of these, when combining the "very important" and "important" responses, the "lack of financial support" (64.7%), "fear of wasting elective time that could be used for an elective/potential fellowship program" (47.1%) and "lack of available organized opportunities" (47.0%) were identified most frequently as barriers to organizing the elective. "Fear of litigation," "lack of support from my program" and "my spouse/partner is not as committed to this kind of work as I am (if applicable)" were rarely cited as barriers for setting up the elective.

General interest in volunteering abroad in residents who had not done an overseas elective

Excluding the respondents who had already volunteered abroad during their residency, 219 (63.8%) of the remaining residents affirmed that they would consider doing an international elective. This percentage is similar between the 2 specialties: 61.3% for orthopedic surgery and 65.5% for general surgery residents.

In the group of interested residents who had not yet volunteered abroad, reasons contributing to their interest are shown in Table 3. When combining the "very important" and "important" responses, residents identified "contribution to an important cause" (94.5%) as the most important reason for volunteering abroad, followed by "teaching" (91.1%) and "tourism/cultural enhancement" (91.1%).

Geographically, 91.6% of these respondents stated that they would like to complete such an elective in an underdeveloped country. When asked specifically about continents, the breakdown of preferences was as follows: most residents would choose to go to Africa (63.5%), followed by Asia (38.8%), South America (36.5%) and Central America (14.6%). Of those interested in completing electives in developed countries, most residents would prefer a European country (18.3%), followed by Australia (15.1%) and North America (4.1%).

Obstacles for volunteerism in residents interested but inexperienced in overseas work

The potential barriers for international volunteerism identified by surgical residents who had not previously volunteered abroad during residency but harboured interest are shown in Table 4. When combining the "very important" and "important" categories, the "lack of financial support"

Table 2. Responses of surgical trainees who volunteered abroad during residency: barriers to organizing the elective, *n* = 18

	Rating; %		
Barrier	Very important	Important	Not important
Lack of elective time	0.0	35.3	64.7
Lack of support from my program	5.6	11.1	83.3
Lack of financial support	23.5	41.2	35.3
Lack of available organized opportunities	17.6	29.4	52.9
Fear of wasting elective time that could be used for an elective/potential fellowship program	11.8	35.3	52.9
My spouse/partner is not as committed to this kind of work as I am (if applicable)	0.0	30.0	70.0
Personal safety (e.g., motor vehicle collisions, terrorism)	0.0	35.3	64.7
Medical safety (e.g., infectious diseases such as HIV)	0.0	41.2	58.8
Fear of litigation	0.0	5.1	94.1

Table 3. Reasons for interest in volunteering abroad among residents who had not previously volunteered during residency, *n* = 219

	Rating; %		
Reason	Very important	Important	Not important
Teaching	21.9	69.4	8.7
Enhancing technical/clinical skills	35.6	53.9	10.5
Exposure to uncommon pathologies	31.1	57.1	11.9
Determine if volunteering abroad is something you would like to pursue in the future	31.9	48.6	19.4
Tourism/cultural enhancement	34.2	57.1	8.7
Contribution to an important cause	57.8	36.7	5.5
Establishing contacts abroad	17.5	47.0	35.5

(81.9%) was identified as the most important perceived barrier, which was also the major barrier identified by the group of residents who had volunteered during their residency. Other listed barriers included "lack of available organized opportunities" (80.6%, combined "very important and important") and "fear of wasting elective time that could be used for an elective/potential fellowship program" (71.8%). The major barriers identified as "not important" by half or more surgical trainees included "fear of litigation" (87.8%), "my spouse/partner is not as committed to this kind of work as I am (if applicable)" (68.3% "not important") and "personal safety (e.g., motor vehicle collisions, terrorism)" (50.0%).

The perceived barriers among residents who were interested in volunteering abroad but hadn't yet done so (Table 4) were significantly different from those reported by residents who had actually volunteered abroad during their residency (Table 2). Overall, several factors were identified as potential barriers by those who were interested but not by those who had actually volunteered (Figs. 1 and 2). These included "lack of financial support" (41.9% v. 23.5% identified as "very important"), "lack of available organized opportunities" (28.7% v. 17.6%) and "fear of wasting elective time that could be used for an elective/potential fellowship program" (27.2% v. 11.8%).

Statistical analysis

We used χ^2 analysis to study 3 items from the respondents: first, the association between previous volunteering experience before residency and a higher probability of volunteering during residency among all respondents; second, the association between previous volunteering experience before residency and an increased interest in volunteering during residency among those who hadn't volunteered during residency; and third, the association between marital status and volunteering during residency. The only strong statistical association was found between previous volunteering experience before residency and interest in volunteering during residency ($p < 0.01$). There was no statistical association between previous volunteering experience before residency and a higher probability of volunteering during residency ($p = 0.71$), nor an association between marital status or committed relationship and the probability of volunteering during residency ($p = 0.88$).

Available opportunities

Only 31.9% of residents who had not previously volunteered during residency were aware of organized volunteer opportunities abroad. Of these, Médecins Sans Frontières was most frequently identified. However, 57.1% of all residents knew of at least 1 staff person in their department who actively participated in international surgical volunteerism and 40.6% reported being influenced by this mentor to pursue such an elective.

Discussion

To our knowledge, this is the first nationwide, multispecialty survey of surgical trainees in Canada to study attitudes, interests and barriers to participating in international volunteerism. This survey had a response rate of 38.0% from general surgery and orthopedic surgery residents, whereas an earlier survey of only general surgery residents in Canada had a 27% response rate.[20] The trend from these 2 surveys indicates that a sizeable portion of Canadian surgical trainees appear to have a genuine interest in global health issues. Likewise, an increase in response rate from 27% to 38.0% may indicate that interest is increasing among surgical trainees, a trend also suggested in U.S. surveys of surgical residents[28] and seen among North American medical students in general.[29] However, this low response rate may indicate that our findings reflect the opinion of the respondents alone and may not reflect the opinions of the whole population, thus possibly introducing a bias in this study.

The overall demographics between the 2 training programs were similar except for the sex ratios, with orthopedic surgery having fewer female trainees than general surgery.[27] Half of the total respondents (49.9%) from both specialty programs stated that the availability of an international

Table 4. Perceived potential barriers to volunteering abroad among residents who had not previously volunteered abroad during residency but were interested, *n* = 219

	Rating; %		
Potential barrier	Very important	Important	Not important
Lack of elective time	18.9	50.0	31.1
Lack of support from my program	15.0	39.9	45.1
Lack of financial support	41.9	40.0	18.1
Lack of available organized opportunities	28.7	51.9	19.4
Fear of wasting elective time that could be used for an elective/potential fellowship program	27.2	44.6	28.2
My spouse/partner is not as committed to this kind of work as I am (if applicable)	5.4	26.3	68.3
Personal safety (e.g., motor vehicle collisions, terrorism)	8.9	41.1	50.0
Medical safety (e.g., infectious diseases such as HIV)	8.8	44.7	46.5
Fear of litigation	1.4	10.8	87.8

surgery elective would have positively influenced their selection of a training program before the residency match.

Our statistical analysis looked at the association between previous volunteering before residency, and interest in volunteering and actual volunteering in residency; the only statistically significant association was in interest in volunteering. This may suggest barriers to volunteering overseas during residency. Indeed, only 5.1% of all respondents actually volunteered during their surgical residency, with the most frequently cited main barriers being a lack of financial support and a lack of organized opportunities in an overseas environment. The third most common reason was fear of wasting elective time. It would appear that time to do an overseas elective is not a major factor, as 70.0% of respondents stated that their programs had "protected time" for such electives. Residents in Canada appear, then, to be well aware of the RCPSC allowance of up to 3 months for overseas electives during residency training.[30]

It is difficult to compare our result of 5.1% of respondents actually doing an overseas elective during their training with the results reported by Barton and colleagues[20] from Canadian general surgery residents, because the authors did not appear to delineate between electives done by residents during medical school or during residency. As in Barton and colleagues' study, our survey found that many more overseas electives were done by respondents during medical school (74.4%). Overseas electives appear to be easier to actually carry out during the more structured medical school period (in which programs often have summer breaks between academic years). We believe that concerns about using up valuable elective time during medical school would also be a concern among medical students vying for competitive residency positions.

In our survey of surgical residents who had completed an overseas elective, primary motivations were ranked with "contribution to an important cause" and "determination if volunteering abroad was of interest." "Enhancement of technical/clinical skills" ranked third in importance. In

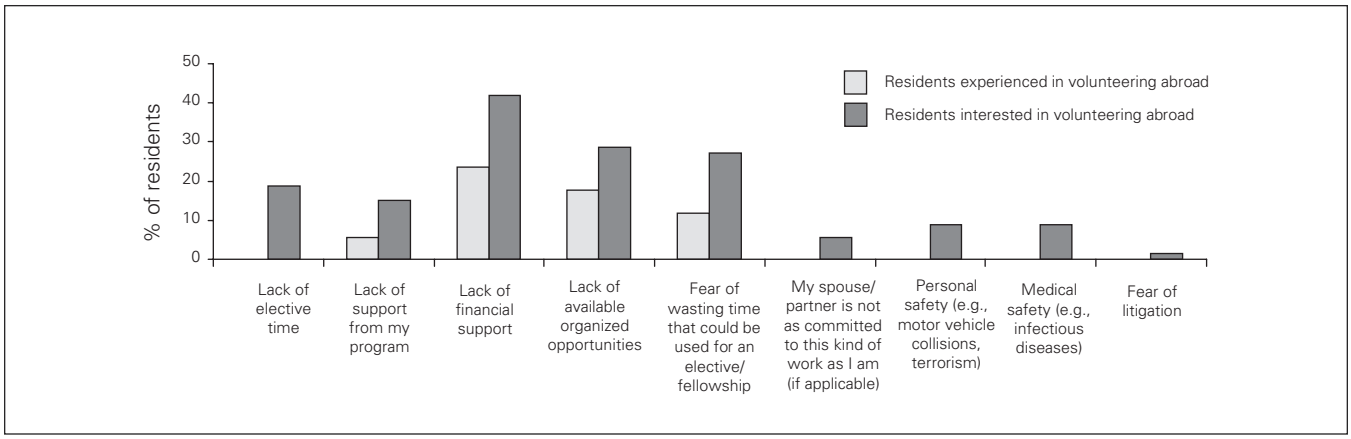

Fig. 1. Potential barriers identified as "very important" by residents interested in volunteering abroad compared with barriers identified as "very important" by residents who had volunteered abroad during residency.

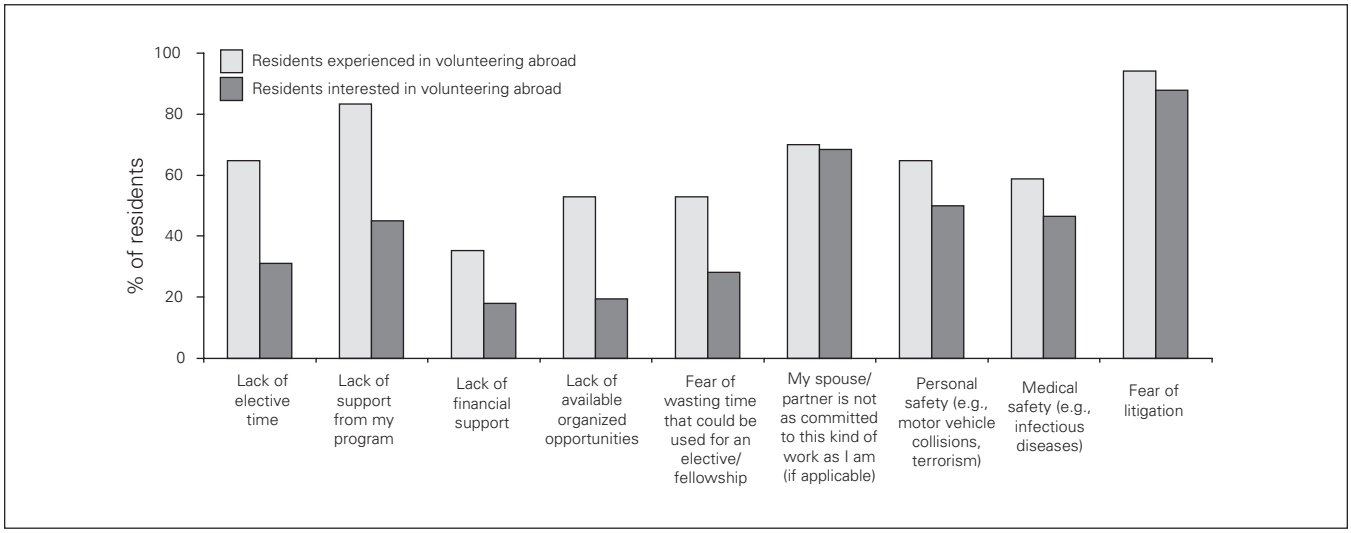

Fig. 2. Potential barriers identified as "not important" by residents interested in volunteering abroad compared with barriers identified as "not important" by residents who had volunteered abroad during residency.

comparison, a survey reported from a single-centre, general surgery program, in which 98% of responding residents (82.5% of the program) reporting interest in international work, residents ranked the acquisition of clinical and technical skills as their main expectation of the international elective. Although survey nuance can play a factor, one wonders if the strict regulation of work hours by U.S. training programs legislated in 2003, with no increase in length of overall programs, might have motivated surgical residents to use international electives to increase their exposure to technical aspects of surgical skills. The senior author (P. M.) is aware of gastrointestinal fellows travelling to Southeast Asia for opportunities to do many procedures (e.g., 250 endoscopic retrograde cholangiopancreatographies in a 1-month elective period) over a relatively short period of time (Dr. Robert Bulat, Tulane University, New Orleans, La.: personal communication, 2002).

Administrators of surgical programs in Canadian medical schools must realize that their residents have an interest in global health care and are interested in spending part of their training participating in this experience. Part of this interest may be the growing trend to participate in global activities and part may be the recognition that overseas experience can foster very positive attitudes and approaches to health care.[29] Furthermore, organized academic medicine in North America is recognizing that overseas electives are valid educational experiences. Schecter and Farmer[31] determined that international experience by residents in LMICs met 4 of the 6 general competencies of the Accreditation Council for Graduate Medical Education (patient care, medical knowledge, interpersonal skills and communication, and professionalism). This was also seen for medical students, in whom Houpt and colleagues[32] recognized 3 domains of competency in global health education.

In 2008, a report of the Global Health Resource Group of the AFMC recognized the role of global health electives and established recommendations and national objectives for all Canadian medical schools.[27] These recommendations included the development of faculty mentors and resources for global health teaching, minimum core material and development of minimum international health knowledge and skills to be assessed in comprehensive examinations within 5 years in Canada. One may predict an increasing demand in the future for organized international experiences for all specialty programs once this cohort of medical students has undergone this nationwide curriculum change. Surgical education in HICs tends to lean toward subspecialization,[3,26] and, as such, residents may not be as well-rounded as necessary to provide the breadth of surgical services in LMICs. However, just as programs are developing for rural needs in HICs, where specialists require broad surgical skills in general surgery, orthopedics, urology, and obstetrics and gynecology, similar programs could easily be adapted for trainees considering substantial work in LMICs.

Conclusion

One-third of surgical trainees in general surgery and orthopedic surgery in Canada reported an interest and willingness to participate in efforts to alleviate the gross disparity of surgical resources in LMICs by volunteering internationally during their surgical training. Only a small number (about 5%) actually volunteered, although 50% stated that a program promoting international work would be a factor in their selection of training programs. Furthermore, of those doing international electives, 100% stated they would do it again and appeared prepared to overcome barriers to working in LMICs. Data suggest that participants in international electives are more likely than nonparticipants to volunteer, both internationally and domestically, after completion of their formal surgical training.[28] Lastly, medical students in Canada are being actively introduced to global health programs in their formal curricula, and as such there will likely be an increasing demand for overseas electives during surgical and other residency programs, a trend already being seen in family medicine training in Canada.[33]

The inclusion of other surgical subspecialties must be factored into future surveys of this nature. Obstetrics and gynecology residents, for example, would be of interest given the huge burden of maternal and perinatal morbidity and mortality in LMICs, which are amenable to basic surgical interventions. Research has also suggested that barriers to international volunteerism may be less during residency than immediately after training, whereas in young specialists, financial concerns and establishing practices are major concerns.[34] Study of the rank order of barriers in this situation may be of benefit to academic departments wishing to support future mentors and experts in global surgery.

Whereas the long-term solution to reducing the global burden of surgical disease in the developing world is in forming a domestic surgical workforce, for the foreseeable future, HIC volunteer surgeons and their trainees will be an important source of surgical personnel, education and infrastructure development. Lett[5] proclaimed that the basis of all sustainable surgical development is education, and so involvement of surgical trainees in international work in LMICs will certainly continue and may be increasing. As such, it behooves administrators of surgical training programs to review their resources to accommodate this significant interest.

Faculties that support their residents' interests in global surgery will themselves need support, given this is still a relatively novel area of formal surgical education and one that will require some commitment of resources by surgery departments.[28,35] This could be achieved by way of formal rounds, seminars and workshops within departments of surgery, as well as by academic surgical departments supporting resident involvement in established global surgery

initiatives in Canada. This would include participation in the Bethune Round Table annual conference, the oldest and largest international meeting solely devoted to surgical care, education and development in LMICs (www.cnis.ca/what-we-do/public-engagement-in-canada/bethune-round-table). Also, membership in the Canadian Network of International Surgery can provide surgical residents (from any country) with the opportunity to teach surgical skills in African countries or to engage in research projects there.[5] Furthermore, a newly formed online graduate-level (MSc) course in international surgical care has been introduced at the University of British Columbia by the Branch for International Surgery (www.internationalsurgery.ubc.ca/surg510_who.html). To our knowledge, this is the first graduate-level course in global surgery offered anywhere in the world and offers the future leaders in this field the opportunity to study global surgery now as a true academic pursuit. As such, there would appear to be the appropriate elements in place to allow Canadian surgeons to expand their tradition of global surgery[20] to the next level, given the interests expressed by our surgical trainees.

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