

Attitudes and factors contributing to attrition in Canadian surgical specialty residency programs

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Background: We recently studied attrition in Canadian general surgical programs; however, there are no data on whether residents enrolled in other surgical residencies harbour the same intents as their general surgical peers. We sought to determine how many residents in surgical disciplines in Canada consider leaving their programs and why.

Methods: An anonymous survey was administered to all residents in 9 surgical disciplines in Canada. Significance of association was determined using the Pearson χ^2 test. The Canadian Post-MD Education Registry (CAPER) website was used to calculate the response rate.

Results: We received 523 responses (27.6% response rate). Of these respondents, 140 (26.8%) were either “somewhat” or “seriously” considering leaving their program. Residents wanting to pursue additional fellowship training and those aspiring to an academic career were significantly less likely to be considering changing specialties ($p = 0.003$ and $p = 0.005$, respectively). Poor work–life balance and fear of unemployment/underemployment were the top reasons why residents would change specialty (55.5% and 40.8%, respectively), although the reasons cited were not significantly different between those considering changing and those who were not ($p = 0.64$). Residents who were considering changing programs were significantly less likely to enjoy their work and more likely to cite having already invested too much time to change as a reason for continuing ($p < 0.001$).

Conclusion: More than one-quarter of residents in surgical training programs in Canada harbour desires to abandon their surgical careers, primarily because of unsatisfactory work–life balance and limited employment prospects. Efforts to educate prospective residents about the reality of the surgical lifestyle and to optimize employment prospects may improve completion rates.

Contexte : Nous avons récemment étudié les taux d’attrition dans les programmes de chirurgie générale canadiens; toutefois, on ne dispose pas de données pour déterminer si les résidents inscrits dans d’autres programmes de chirurgie ont les mêmes intentions que leurs collègues de chirurgie générale. Nous avons voulu savoir combien de résidents des disciplines chirurgicales au Canada envisagent de quitter leur programme et pourquoi.

Méthodes : Tous les résidents de 9 disciplines chirurgicales au Canada ont passé un sondage anonyme. La portée de la corrélation a été déterminée à l’aide du test χ^2 de Pearson. Le site Web du Répertoire canadien sur l’éducation post-MD (RCEP) a été utilisé pour calculer le taux de réponse.

Résultats : Nous avons reçu 523 réponses (taux de réponse de 27,6 %). Parmi les répondants, 140 (26,8 %) envisageaient « peut-être » ou « sérieusement » de quitter leur programme. Les résidents qui souhaitaient suivre une formation de surspécialité et ceux qui aspiraient à une carrière universitaire étaient notablement moins susceptibles d’envisager un changement de programme ($p = 0,003$ et $p = 0,005$, respectivement). Les problèmes de conciliation travail–famille et la crainte du chômage ou du sous-emploi ont été les principales raisons invoquées par les résidents pour changer de spécialité (55,5 % et 40,8 %, respectivement), même si les raisons citées n’étaient pas sensiblement différentes selon que les répondants envisageaient ou non un tel changement ($p = 0,64$). Les résidents qui envisageaient un changement de programme étaient notablement moins susceptibles d’apprécier leur travail et plus susceptibles d’invoquer le considérable investissement de temps déjà consenti comme raison pour ne pas changer de programme ($p < 0,001$).

Conclusion : Plus du quart de résidents des programmes de formation en chirurgie au Canada souhaitent abandonner leur carrière en chirurgie, principalement en raison des problèmes de conciliation travail–famille et des perspectives d’emploi limitées. Des efforts pour renseigner les candidats sur ce que représente réellement la vie de chirurgien et pour optimiser les perspectives d’emploi pourraient améliorer les taux d’achèvement des programmes.

The rate of, and reasons for, attrition from general surgical residency programs in the United States have been studied extensively. Recent data suggest that although up to 58% of such residents were seriously considering abandoning their general surgery careers, the true figure for voluntary attrition remains between 17% and 26% over a 5- to 7-year residency program.¹⁻³ This figure, however, is still considerably greater than in most other specialties, and the majority of residents leaving general surgery tend to move into nonsurgical fields.⁴⁻⁶ The reasons cited by those considering leaving have been primarily to do with a desire for an improved work-life balance both during and after residency.^{1,5,7} Qualitative studies have suggested that prioritization of work provision over education, lack of perceived freedom to express concerns, lack of role models demonstrating an improved work-life balance and negative interactions with senior colleagues were all common themes among former surgical trainees who actually had left their programs.⁸ A recently published study by our group has sought to determine whether or not the same phenomenon was occurring among residents in comparable Canadian general surgery programs.⁹ However, to our knowledge, no data presently exist to see if residents enrolled in other Canadian surgical specialty residency programs harbour the same intents as their general surgery peers. This study was conducted with a view to addressing this deficit in the literature.

METHODS

This study was approved by the University of Saskatchewan Research Ethics Board. The contact emails of the program directors and program coordinators for all general surgery, orthopedic surgery, urology, neurosurgery, plastic surgery, otolaryngology, cardiac surgery, ophthalmology and vascular surgery residency programs in Canada were collected from the Canadian Resident Matching Service (CaRMS) website.¹⁰ An anonymous online survey was piloted with the general surgery residents at our institution to test the response rate and face validity of the questionnaire. Once the investigative team felt satisfied that these were acceptable, the same survey was distributed to all 17 general surgery residency program directors in Canada for their approval and subsequent dissemination to the residents in their respective programs.⁹ It was also distributed via the weekly email from the Canadian Association of General Surgeons. The same questionnaire was then adapted to make it less specific to general surgery by removing questions regarding activities that were not applicable to trainees in the other 8 specialties (e.g., satisfaction with colonoscopy training). This modified, generic questionnaire was then submitted in a similar fashion to the program directors in the non-general surgery programs for their approval and dissemination. Similarly, where feasible, the professional associations for those specialties were also asked to circulate

the survey to their resident members. The analysis reported in this paper therefore concerns only those questions posed to all respondents, regardless of program or specialty. One reminder email was sent out 2 weeks after the initial approach. The Canadian Post-MD Education Registry (CAPER) website, which maintains annual, individual-level data on all postgraduate medical residents and fellows in Canadian programs, was then used to calculate how many residents were presently enrolled in each specialty in order to enable us to calculate the response rate to the survey.¹¹

The first 2 sections of the questionnaire included questions pertaining to the general demographics of respondents (age, sex, relationship status, postgraduate year [PGY] status, university and program) and career intent (desire to pursue a graduate degree during residency, desire to pursue fellowship training and/ or an academic-based career postresidency). It should be noted that our reason for asking about university affiliation was simply to allow us to identify whether some program directors had declined to participate; the purpose was not to be able to identify residents. Respondents were then asked to indicate on a Likert-type scale how seriously they were considering leaving their current program (not at all, casually considering, somewhat seriously considering, seriously considering). The final section of the questionnaire asked respondents to rank their top 3 reasons for both why they would consider leaving their current program (i.e., work-life balance in residency, work hours in residency, concern about future unemployment or underemployment, concern about the need for fellowship training to secure employment, financial strain from deferred income, lack of sleep/fatigue, expected poor future quality of life as a surgeon, harassment or intimidation, other [free text box available to allow respondents to specify the reason]) and why they would remain in their current program (i.e., support of family/friends, support of fellow residents, support of faculty/mentor, too much invested to quit now, enjoyment of work, future financial reward, other [free text box available to allow respondents to specify the reason]). For the purposes of analysis the 3 options selected were treated equally, as it was not felt to be practical or reliable to stratify the proportional significance of each individual's 3 chosen reasons.

Statistical analysis

Once the number of responses had plateaued, data collection was discontinued. Responses categorized as either "not at all" or "casually considering" were amalgamated and interpreted as no intent to leave one's specialty, and all other responses were interpreted as a serious intent in order to facilitate analysis by creating a dichotomous outcome. Any association between potential factors and serious consideration of leaving one's program was determined using the Pearson χ^2 test. We considered results to be significant at $p < 0.05$.

RESULTS

Overall we received 523 responses. The total potential maximum once the residents from programs declining to take part were accounted for was 1895, for an overall response rate of 27.6%. As demonstrated in Table 1, the rates among the individual specialties varied considerably, with plastic surgery yielding the lowest response rate (11.9%) and orthopedics yielding the highest (42.8%).

Of the 523 residents who completed the questionnaire, 140 (26.8%) were either “somewhat seriously” or “seriously” considering leaving their program. As with the response rates, there was a substantial variation among the 9 specialties (Table 2), with ophthalmology residents reporting the lowest rate of potential attrition (11.5%) and general surgery reporting the highest (32.7%), though this variation did not achieve statistical significance ($p = 0.53$).

None of the demographic factors showed a significant association with the self-reported intent to change specialty (Table 3); however, as shown in Table 4, residents who intend to pursue fellowship training following the completion of their programs and those aspiring to an academic career rather than a community-based practice were significantly less likely to be considering changing specialties ($p = 0.003$ and $p = 0.005$, respectively).

Poor work–life balance and fear of unemployment/underemployment were the top reasons why residents would consider leaving their current program (55.5% and 40.8%, respectively; Table 5), although the reasons cited were not significantly different between residents reporting a serious intent to change career path and those who were not ($p = 0.64$). Conversely, there was a significant difference between the 2 groups when it came to identifying why residents would choose to remain in their present programs. Residents reporting serious consideration to leave were significantly less likely to cite enjoyment of their work as a reason to persist and were significantly more likely to cite having already invested too much time to change as a reason for continuing ($p < 0.001$).

Table 1. Response rate by specialty

Specialty	No. of responses	No. of residents registered on CAPER	Response rate, %
Orthopedics	177	414	42.8
Urology	51	179	28.5
Neurosurgery	23	148	15.5
Plastic surgery	19	160	11.9
Otolaryngology	38	164	23.2
Cardiac surgery	14	76	18.4
Ophthalmology	26	210	12.4
Vascular surgery	10	59	16.9
General surgery	165	485	34.0
Overall	523	1895	27.6

CAPER = Canadian Post-MD Education Registry.

DISCUSSION

When considering the issue of resident attrition one needs first to reflect on a number of fundamental issues. First and foremost, we must ask “is this actually a problem?” On the one hand it could be argued that accepting graduating medical students into a program and then losing them midway through is an inefficient use of time and finite resources as well as a substantial source of stress both to the individuals

Table 2. Intent to leave program by specialty*

Specialty	No. not at all/casually considering	No. somewhat/seriously considering	% Somewhat/seriously considering
Orthopedics	129	48	27.1
Urology	36	15	29.4
Neurosurgery	19	4	17.4
Plastic surgery	15	4	21.1
Otolaryngology	30	8	21.1
Cardiac surgery	12	2	14.3
Ophthalmology	23	3	11.5
Vascular surgery	8	2	20.0
General surgery	111	54	32.7
Overall	383	140	26.8

* $\chi^2 = 0.534$.

Table 3. Demographic characteristics of respondents, stratified by intent to leave program

Characteristic	No. not at all/Casually considering	No. somewhat/seriously considering	% Somewhat/seriously considering	χ^2
Age, yr				0.235
< 25	12	2	14.3	
25–29	212	66	23.7	
30–34	135	56	29.3	
> 34	26	16	38.1	
Overall	385	140	26.7	
Sex				0.874
Female	145	52	26.4	
Male	239	89	27.1	
Overall	384	141	26.9	
Relationship status				0.658
Single	102	31	23.3	
Stable	277	107	27.9	
Other	7	2	22.2	
Overall	386	140	26.6	
PGY				0.131
1	66	15	18.5	
2	62	30	32.6	
3	94	33	26.0	
4	74	25	25.3	
5	70	28	28.6	
6	6	8	57.1	
CIP	6	0	0.0	
Overall	378	139	26.9	

CIP = Clinician Investigator Program; PGY = postgraduate year.

involved and the programs in question. That said, there has been much written about the uncertain future faced by today's residents. Presently the unemployment rate of new specialists and subspecialists in Canada (16%) is more than double that of the country as a whole (7.1%), and this figure could be substantially worse were it not for the 31.2% of new specialists and subspecialists re-entering training positions in order to stave off immediate and future unemployment.¹² Given that 7 of the 9 specialties investigated in this study (all except plastic surgery and vascular surgery) occupy the top 11 specialties with the greatest employment difficulties in Canada, it could conceivably be argued that residents choosing to leave are ultimately doing themselves and their former

colleagues a favour by reducing the overcrowding in an already saturated job market.¹² Those who remain can perhaps take some solace in the fact that the opposite appears to be happening south of the border, with the United States Bureau of Labor Statistics predicting a shortfall of more than 99 000 physicians by 2025 and an increase in the number of physicians employed by 14% over the same time period.¹³ In light of these factors, 2 further questions need to be answered: would greater employment prospects in Canada improve surgical residency completion rates, and would this, in fact, help or hinder workforce planning? Part of the reason for the uncertainty is that accurate data on both resident attrition and employment forecasting are sparse at best and

Table 4. Postresidency career preferences stratified by intent to leave program

Career preference	No. not at all/casually considering	No. somewhat/seriously considering	% Somewhat/seriously considering	χ^2
Intend to pursue fellowship training				0.003
Yes	326	102	23.8	
No	53	38	41.8	
Overall	379	140	27.0	
Intend to pursue graduate degree				0.507
Yes	122	40	24.7	
No	263	102	27.9	
Overall	385	142	26.9	
Preferred practice type				0.005
Community	184	90	32.8	
Academic	202	51	20.2	
Overall	386	141	26.8	

Table 5. Top reasons cited for why residents would leave their program and why residents would remain in their program versus intent to leave program

Reason	No. not at all/casually considering	No. somewhat/seriously	% first or second reason	χ^2
Considering changing specialty				0.644
Quality of life	46	34	25.7	
Unemployment/underemployment	71	56	40.8	
Fellowship	18	8	8.3	
Hours	43	43	27.6	
Financial strain	9	9	5.8	
Bullying	18	23	13.2	
Fatigue	39	22	19.6	
Work-life balance	97	76	55.5	
Other	3	8	3.5	
Overall	344	279		
Remaining in current program				< 0.001
Family/friends	60	33	32.3	
Fellow residents	15	13	9.7	
Faculty/mentor	7	13	6.9	
Too much time invested now	81	81	56.3	
Enjoy the work	205	47	87.5	
Future income	12	3	5.2	
Other	3	3	2.1	
Overall	383	193		

are frequently contradictory. An example of this would be that ophthalmology, whose residents had the lowest rate of considering leaving their programs in this study (11.5%), has one of the lowest attrition rates among the surgical specialties in the United States (1.1%), but has the fourth highest rate of specialist unemployment in Canada despite there paradoxically being too few ophthalmologists to meet the demand for their services.^{12,14,15} It is, of course, possible that other considerations, such as potential future income, become mitigating factors in the minds of those residents in specialties with higher unemployment rates when considering whether or not to change careers.

If we take the stance that all resident attrition is a bad thing and that the goal should be to have 100% of residents who are accepted into a program at the PGY1 level ultimately completing it successfully, then there are 2 questions that need to be answered: are programs selecting the wrong medical students, and why do residents leave? The second question has briefly been discussed in the introduction, and the primary answer appears to be lifestyle. What, if anything, can or should be done to remediate this is a much tougher question to answer, not least because the term itself is sufficiently indistinct to have vastly differing interpretations from one respondent to another. When consulting the literature it seems that the word “lifestyle” is seldom actually defined in studies, and it is left to both the study participants and to those reading the ensuing paper to determine what aspect or aspects of “lifestyle” are being referred to.^{1,6,7} Alleviating lifestyle issues cannot be as simple as merely reducing working hours, as the introduction of the 80-hour working week was met with a paradoxical increase in resident attrition from general surgical programs in the United States.⁶ Similarly the introduction of a 16-hour maximum workday restriction in Quebec was met with a perceived reduction in quality of life by the affected residents and perceived deteriorations in the quality of care for patients and quality of training for residents by the professors involved.¹⁶ All surgical specialties require a certain amount of hard work, and the nature of the job often involves working antisocial hours, so perhaps it is not unreasonable to shift the focus of attention onto the first question: how can programs select medical students who are committed enough to their specialty to see residency through to completion? Naylor and colleagues¹⁷ suggested that nonacademic factors at the residency matching stage, such as age older than 29 years or a lack of participation in team sports, were more predictive of nonsatisfactory outcomes in general surgery residency than academic factors, such as a lack of superlatives in the dean’s letter. Andriole and colleagues¹⁸ provided evidence that in previous matches the applicant pool for general surgery has not, on the whole, been particularly committed to the specialty. Perhaps then the real challenge for surgical specialty programs is to further their understanding of how medical students come to choose which specialties to rank and to investigate novel ways of determining whether or not those medical students really know what they are getting into.^{3,19-21}

Our results suggest that residents intent on pursuing subspecialty fellowship training and academic careers have a significantly lower rate of wanting to change careers. Although it may be difficult to reliably assess such goals at the CaRMS stage, it may be that medical students who are able to display a knowledge and understanding of why they have these career aims and how they can go about achieving them have a greater appreciation for their particular specialty and the rigors and requirements thereof. Involvement with academic activities at the undergraduate level or medical school level may prove to be a marker for this specific career intent, although this study and others have shown a nonsignificant trend toward increased attrition with increasing age, and so years spent in research may become a confounding factor.⁹

The finding that residents reporting serious consideration to leave were significantly less likely to enjoy their work but felt that it was too late to change career paths is a potentially concerning one. A longitudinal assessment of residents through the early years of practice to determine what long-term effects may result could yield useful insight into the difficulties encountered by some newly independent practitioners.

Limitations

If nothing else our study contributes to the literature by investigating purely Canadian surgical specialty programs rather than those in the United States and by providing a means of comparison among the 9 disciplines. It does, however, come with several limitations that must be borne in mind. Chief among these is the response rate of 27.6%, which at first glance may seem very low but is quite in keeping with similar surveys of Canadian physicians.²² There is no doubt that a higher response rate would enhance the validity of the study, and consequently efforts have been made to identify strategies to encourage greater participation.²²⁻²⁶ Although shorter surveys, repeated approaches and monetary incentives have yielded some benefits in the past, they have not been shown to consistently improve response rates among physicians.^{22-24,26} The reason for the considerable variation in response rates from the 11.9% of plastic surgery residents to 42.8% of orthopedic residents is likely to be multifactorial. How enthusiastically program directors and professional associations encouraged their residents to participate in the study will doubtless have played a part, but it must also be considered that those responding to this type of questionnaire may be a self-selecting group. In other words, residents considering leaving their programs may also be those most likely to want to answer questions about why they may wish to do so.

The response rate issue notwithstanding, there is always the issue of operant conditioning in any questionnaire-based study. It is almost impossible to completely eliminate the risk that survey responders may provide answers that they feel are the ones the administrators of the survey want

to hear, particularly when leading questions and check-box option answers are used. With this particular study it may be seen as a potentially confounding factor that the questions used for the general surgery residents were not identical to those for the residents in the other 8 specialties, although we would argue that this effect is likely to be minimal because the changes made to the questionnaire were centred on adapting the survey to make it more generic. The final limitation of this study is that it focuses on residents who have not (yet) left their programs. As discussed, up to 58% of general surgery residents may say they are thinking about leaving their program, but the true rate of those who actually leave is less than half of that figure.^{1,2} Studies that target residents who have actually gone through the process of changing careers carry their own limitations, such as reduced numbers and the fact that they require those former residents still to be in contact and good relations with their former employers.^{3,8}

CONCLUSION

Our study suggests that approximately one-quarter of residents in surgical specialty training programs in Canada have given serious consideration to abandoning their surgical careers primarily for fear of ending up with a poor work-life balance after qualifying or being unable to find satisfactory employment after residency. Residents wanting to pursue postresidency fellowship training and/or academic careers are less likely to want to switch specialties. Conversely, dissatisfied residents who consider leaving but who persist in their programs are less likely to enjoy their work and continue principally because they feel they have invested too much time to change. Efforts by medical schools to educate prospective residents about the reality of the surgical lifestyle and governmental initiatives to improve postresidency employment prospects may reduce resident attrition rates.

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Contributors: S. Adams, D. Ginther and E. Neuls designed the study. S. Adams acquired and analyzed the data, which P. Hayes also analyzed. S. Adams wrote the article, which all authors reviewed and approved for publication.

References

- Gifford E, Galante J, Kaji AH, et al. Factors associated with general surgery residents' desire to leave residency programs: a multi-institutional study. *JAMA Surg* 2014;149:948-53.
- Yeo H, Bucholz E, Ann Sosa J, et al. A national study of attrition in general surgery training: Which residents leave and where do they go? *Ann Surg* 2010;252:529-34, discussion 534-6.
- Burkhart RA, Tholey RM, Guinto D, et al. Grit: A marker of residents at risk for attrition? *Surgery* 2014;155:1014-22.
- Kennedy KA, Brennan MC, Rayburn WF, et al. Attrition rates between residents in obstetrics and gynecology and other clinical specialties, 2000-2009. *J Grad Med Educ* 2013;5:267-71.
- Wasserman MA. A strategy to reduce general surgery resident attrition: a resident's perspective. *JAMA Surg* 2015;151:1-2.
- Everett CB, Helmer SD, Osland JS, et al. General surgery resident attrition and the 80-hour workweek. *Am J Surg* 2007;194:751-6.
- Dodson TF, Webb AL. Why do residents leave general surgery? The hidden problem in today's programs. *Curr Surg* 2005;62:128-31.
- Bongiovanni T, Yeo H, Sosa JA, et al. Attrition from surgical residency training: perspectives from those who left. *Am J Surg* 2015; 210:648-54.
- Ginther DN, Dattani S, Miller S, et al. Thoughts of quitting general surgery residency: factors in Canada. *J Surg Educ* 2016;73:513-7.
- Canadian Resident Matching Service. Ottawa (ON):CaRMS; 2016. Available: www.carms.ca (accessed 2016 Feb. 19).
- Canadian Post-MD Education Registry. Ottawa (ON):CAPER; 2016. Available: www.caper.ca (accessed 2016 Feb. 19).
- Fr chet D, Hollenberg D, Shrichand A, et al. What's really behind Canada's unemployed specialists? Too many, too few doctors? Findings from the Royal College's employment study. Royal College of Physicians and Surgeons of Canada; 2013.
- Occupational Outlook Handbook — Physicians and Surgeons. Washington (DC): United States Department of Labor, Bureau of Labor Statistics; 2016. Available: www.bls.gov/ooh/healthcare/physicians-and-surgeons.htm (accessed 2016 Feb. 20).
- Bellan L, Buske L. Ophthalmology human resource projections: Are we heading for a crisis in the next 15 years? *Can J Ophthalmol* 2007; 42:34-8.
- Hatton MP, Loewenstein J. Attrition from ophthalmology residency programs. *Am J Ophthalmol* 2004;138:863-4.
- Lachance S, Latulippe JF, Valiquette L, et al. Perceived effects of the 16-hour workday restriction on surgical specialties: Quebec's experience. *J Surg Educ* 2014;71:707-15.
- Naylor RA, Reisch JS, Valentine RJ. Factors related to attrition in surgery residency based on application data. *Arch Surg* 2008;143:647-51, discussion 651-2.
- Andriole DA, Jeffe DB, Klingensmith M. Do general surgery applicants really want to be general surgeons? *Curr Surg* 2006;63:145-50.
- Bell RM, Fann SA, Morrison JE, et al. Determining personal talents and behavioral styles of applicants to surgical training: a new look at an old problem, part I. *J Surg Educ* 2011;68:534-41.
- Sullivan MC, Yeo H, Roman SA, et al. Surgical residency and attrition: defining the individual and programmatic factors predictive of trainee losses. *J Am Coll Surg* 2013;216:461-71.
- Kelz RR, Mullen JL, Kaiser LR, et al. Prevention of surgical resident attrition by a novel selection strategy. *Ann Surg* 2010;252:537-1.
- Grava-Gubins I, Scott S. Effects of various methodologic strategies: survey response rates among Canadian physicians and physicians-in-training. *Can Fam Physician* 2008;54:1424-30.
- Cunningham CT, Quan H, Hemmelgarn B, et al. Exploring physician specialist response rates to web-based surveys. *BMC Med Res Methodol* 2015;15:32.
- Funkhouser E, Vellala K, Baltuck C, et al. Survey methods to optimize response rate in the National Dental Practice-Based Research Network. *Eval Health Prof* 2016;pii: 0163278715625738.
- Nesrallah G, Barnieh L, Manns B, et al. A charitable donation incentive did not increase physician survey response rates in a randomized trial. *J Clin Epidemiol* 2014;67:482-3.
- Reinisch JF, Yu DC, Li WY. Getting a valid survey response from 662 plastic surgeons in the 21st Century. *Ann Plast Surg* 2016;76:3-5.