

Hamish Hwang, MD, FRCSC, FACS, Nadeesha Samarasinghe, MD, Karan D'Souza, MD, Daniel Jenkin, MD, FRCSC, Scott E. Cowie, MD, FRCSC

Chasing a moving train: The general surgery workforce versus population growth in British Columbia, 2012–2022

Due to population growth and aging, the deficit in the number of full-time-equivalent surgeons in BC increased from 74 to 105 between 2012 and 2022.

ABSTRACT

Background: General surgeons play a vital role in the health care system and require hospital resources to provide patient care. British Columbia had 5.0 general surgeons per 100 000 population in 2022, less than the Canadian average of 5.7. A study conducted in 2012 showed that BC needed 232 general surgeons but had only 158 full-time equivalents, a deficit of 74 surgeons, and projected a need for 260 general surgeons by 2022. This study examined the general surgery workforce after a 10-year period and compared the results with those of the 2012 study.

Dr Hwang is a general surgeon at Vernon Jubilee Hospital and the economics chair of General Surgeons of BC. Dr Samarasinghe is a general surgery resident in the University of British Columbia Faculty of Medicine. Dr D'Souza is a general surgery resident in the UBC Faculty of Medicine. Dr Jenkin is a general surgeon at Nanaimo Regional Hospital and the past president of General Surgeons of BC. Dr Cowie is a general surgeon at Langley Memorial Hospital and the president of General Surgeons of BC.

This article has been peer reviewed.

Methods: A survey was sent to all members of General Surgeons of BC. Respondents were asked to report the number of surgeons, both by head count and by full-time equivalent, at the hospital where they worked and the number of operating room days available per 4-week block. They were also asked to provide individual wait-time data and open-ended comments. Benchmark operations such as appendectomies and breast cancer operations were tabulated using MSP data from 2012 to 2022. Population data for 2022 were obtained from BC Stats. The Mann-Whitney U test and Wilcoxon signed-rank test were used to analyze the data. A *P* value of less than .05 was considered significant.

Results: To meet the national average in 2022, 302 general surgeons were needed in BC. The actual number was 217 by head count and 197 by full-time equivalent, a deficit of 105. The greatest deficit was in the Fraser Health Authority, where 115 general surgeons were needed but there were only 57 by head count and 51 by full-time equivalent, less than half the number needed. The number of general surgery operating room days by hospital per 4-week block increased between 2012 and 2022 (18.6 vs 21.9, *P* = .033), but the number of operating room days per full-time equivalent was relatively unchanged (4.6 vs 4.4, *P* = .42).

Operating room days per surgeon and wait times for cholecystectomy, hernia repair, bowel resection, and colonoscopy did not change significantly between 2012 and 2022. Many surgeons reported difficulties in recruitment due to nursing shortages and a lack of hospital resources. Appendectomies increased 22% between 2012 and 2022. Breast cancer operations increased 28% in the same period. General surgery consultations for malignancy increased 42% between 2013 and 2022.

Conclusions: The demand for emergency surgery, cancer operations, and other general surgery procedures increased between 2012 and 2022 due to a growing and aging population. The number of general surgeons needed in 2022 was greater than that projected in 2012. Despite adding 39 full-time-equivalent surgeons, the deficit increased from 74 to 105 between 2012 and 2022. This illustrates the importance of planning and deploying adequate resources to recruit the number of general surgeons needed for the future to keep up with increasing demand.

Background

General surgeons play an essential role in the health care system in both urban and rural settings. Patients with breast cancer, melanoma, colorectal cancer, and other

cancers have their cancer removed by a general surgeon. Patients needing a hernia repair or gallbladder operation, as well as those needing emergency surgery for a ruptured appendix, bowel obstruction, or traumatic abdominal injury, also require a general surgeon's services. General surgeons also perform very subspecialized surgeries such as liver transplants, and in many communities they perform emergency surgeries as well as elective gastrointestinal endoscopic procedures such as colonoscopy. No general hospital would be able to function without a general surgery service.

General surgery is a hospital-based specialty that is dependent on hospital resources such as an operating room, an endoscopy suite, nurses, surgical equipment, instrument reprocessing infrastructure, and inpatient hospital beds for patients to recover. A surgeon by themselves cannot treat patients without these critical resources. It is not enough to train or recruit more surgeons; hospital resources also need to be increased accordingly so the additional surgeons can meet the demand for surgical services.

According to the Canadian Institute for Health Information (CIHI), in 2022, the average number of general surgeons per 100 000 population was 5.7 in Canada but 5.0 in British Columbia, where there were 263 surgeons: 184 male and 79 female.¹ BC lags behind the rest of Canada in terms of the number of general surgeons per 100 000 population, though in the 1970s, the number exceeded the Canadian average [Figure 1].¹

A study conducted in 2012 showed that 158 general surgeons were in full-time practice at hospitals in BC, which was 74 less than the Canadian average of 232.² To keep up with population growth, it was projected that 260 general surgeons would be needed in BC by 2022. The purpose of this study was to compare the actual number of general surgeons in BC in 2022 with the number in 2012 and the number needed in 2022 with the number projected to be needed in 2022 by the 2012 study.

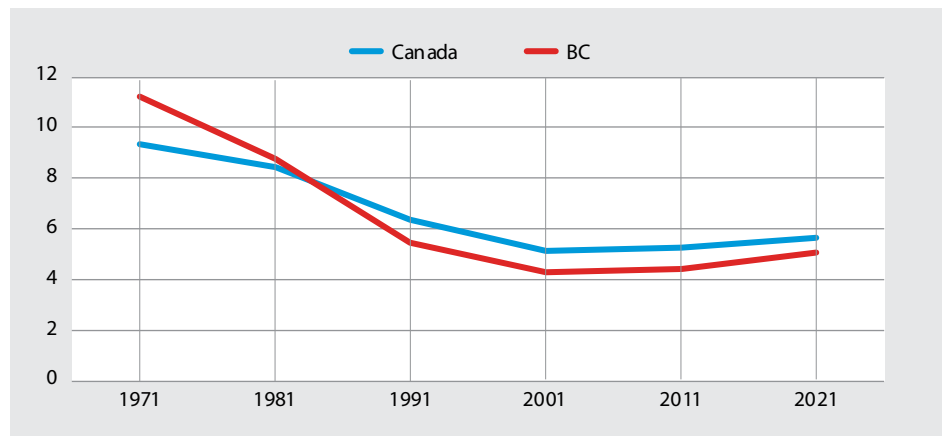


FIGURE 1. Number of general surgeons per 100 000 population in BC versus Canada, 1971–2021.

Methods

We sent an anonymous survey to all 240 members of General Surgeons of BC in October 2022 and aimed for a 50% response rate. We asked respondents to identify the hospital where they worked; count how many general surgeons worked at their hospital, both by head count and by full-time equivalent (FTE); and provide the number of operating room days assigned to each respondent and to the entire general surgery service at their hospital per 4-week block. We also asked respondents to report their personal wait times for cholecystectomy, inguinal hernia, bowel resection, and colonoscopy; list obstacles to recruitment; and provide open-ended comments about workload, wait lists, access to resources, and recruitment in general. Follow-up emails and phone calls were conducted to fill in any missing information and resolve discrepancies. Research ethics approval was obtained from the UBC Office of Research Ethics (H22-02779).

Population data were obtained from BC Stats for 2022.³ We compared those data with the original raw data from the 2012 study.² Using the Canadian average of 5.7 surgeons per 100 000 population and BC population statistics,³ we calculated the number of general surgeons needed in 2022. We also compared the number of operating room days and wait times reported by the respondents with those reported in the 2012 study.²

Billing data were obtained from the BC MSP payment data series.⁴ Appendectomy, the most common emergency general surgery operation that is seldom done on a scheduled basis (unlike cholecystectomy, for example), was selected to represent acute care surgery volumes. Breast cancer operations were similarly selected to represent cancer surgery volumes.

We used either the two-tailed Mann-Whitney U test or the Wilcoxon signed-rank test, as appropriate, to compare continuous variables using an online calculator.⁵ A *P* value of less than .05 was considered significant.

Results

There were 151 responses to the survey, a 63% response rate. All five regional health authorities were represented: Vancouver Coastal Health (29.1%), Fraser Health (26.0%), Interior Health (20.5%), Northern Health (7.1%), and Island Health (17.3%). Of 120 respondents who answered the question concerning employment status, 70% (84) indicated they worked full-time, 16% (19) worked part-time, 4% (5) worked as a locum, 5% (6) only did surgical assists, and 5% (6) were fully retired.

Table 1 shows the number of general surgeons with a permanent hospital position in BC in 2022. The totals from 2012 are also included, but the breakdown of male versus female surgeons was not available. Because many surgeons worked part-time,

TABLE 1. General surgeons in BC, 2012 and 2022, and population growth, 2012–2022.

Health authority	General surgeons									
	2012 (head count)	2012 (FTE)	2022 (head count)			2022 (FTE)			Needed	Deficit (FTE)
	Total	Total	Total	Male	Female	Total	Male	Female		
Vancouver Coastal Health	42	35	55	33	22	49	30.4	18.6	72	23
Fraser Health	47	44	57	37	20	51	33.3	17.8	115	64
Interior Health	42	36	46	34	12	42	30.5	11.5	48	6
Northern Health	15	14	19	16	3	19	16.0	3.0	17	(2)
Island Health	32	29	40	29	11	36	26.3	9.7	50	14
Total	178	158	217	149	68	197	136.4	60.6	302	105

Health authority	Population 2012	Population 2022	Increase (%)	65+ population 2012	65+ population 2022	Increase (%)
Vancouver Coastal Health	1 161 809	1 261 465	9	158 032	229 899	45
Fraser Health	1 662 540	2 021 030	22	240 432	346 199	44
Interior Health	749 027	843 543	13	146 865	209 803	43
Northern Health	292 030	304 255	4	36 332	49 992	41
Island Health	774 171	885 271	14	149 402	226 166	51
Total	4 639 577	5 315 564	15	731 063	1 062 059	45

FTE = full-time equivalent.

the number of FTE surgeons was less than the number of surgeons by head count. On average, each member of the general surgery workforce worked 0.9 FTE. There was no significant difference between the mean FTE for male surgeons (0.92) and female surgeons (0.89). Overall, there was a deficit of 85 surgeons in terms of head count and 105 in terms of FTE. Every region except Northern Health had a general surgeon deficit. The largest deficit was in Fraser Health, which had less than half the number of general surgeons per population than the Canadian average.

Table 2 shows the number of operating room days and wait times reported by surgeon respondents compared with those reported in the 2012 study. The mean number of general surgery operating room days per hospital increased but remained the same when adjusted for FTE. There were no significant changes in operating room days or wait times for four common procedures.

Barrier to recruitment:

Lack of resources

Of the 92 surgeons who responded to the question about obstacles to recruitment, 57% (52) did not have a need to recruit or had recently recruited; 32% (29) had a need to recruit, but there was a lack of operating room and/or endoscopy resources; 7% (6) had a need to recruit, but there was a lack of suitable candidates in terms of meeting the needs of a remote community and needing to fill a part-time rather than a full-time position; and 5% (5) had a need to recruit but could not due to a shortage of operating room nurses. Forty-seven respondents provided comments in the open-ended question. Many commented on the lack of nurses and the overcapacity of hospital resources. The following are some particularly insightful responses (edited slightly for brevity and clarity):

“We don’t have too much of an issue with surgeons, but we do have trouble with

shortages of nurses. Whenever we have full staff, then something happens and they get rid of nurses so we are short again. MDR [medical device reprocessing] is not on call, so the nurses do their work. We have too many ALC [alternative level of care] patients, so forever no beds. We have not been prioritized for upgrading our physical plant. How can we recruit?”

“This survey had no questions about on-call burden. In smaller communities like mine, the issue is not really access to operating room/endoscopy time but the burden of one in three call. For that reason, we have expanded our group to five surgeons to reduce the burden of call. As a smaller group, when one surgeon is away, the extra work has to be absorbed by the rest of the group, and that can be hard.”

Acute care and cancer care volumes

The number of appendectomies performed per year increased by 22% between 2012

and 2022, based on MSP billing data [Figure 2]. There was a 28% increase in breast cancer operations from 2012 to 2022 and a 42% increase in general surgery consultations for malignancy (a specific fee created in 2013), according to MSP billing data [Figure 3]. There was a notable decline in volumes in 2020–2021, likely due to operating room shutdowns in response to the COVID-19 pandemic, but volumes rebounded in 2021–2022.

Discussion

Although the number of general surgeons in BC and general surgery operating room time per hospital have increased, they have not kept up with unprecedented population growth or demand, in particular for acute care and cancer care services. An important question is why there is a discrepancy between the number of full-time surgeons reported in this study and the number reported by CIHI and MSP. CIHI reported that BC had 263 general surgeons in 2021;¹ MSP reported 284.⁴ The numbers from CIHI are derived from aggregate billing data and do not account for surgeons who are semi-retired and no longer practising as a surgeon, those who have a billing number but not a permanent position, and those who work part-time. MSP data include all physicians who bill MSP, so even if a surgeon billed only \$1 in a year, they would be counted. MSP also reports the number of physicians but excludes those who billed less than \$92 000 per year; this number was 237 in 2021–2022, which is not out of line with our head count of 219.

Pressure points: Acute care and cancer surgery

Our study may have failed to capture some surgeons who practise as acute care surgeons. In follow-up emails, several sites indicated that they have formal permanent acute care surgery positions and included them in their responses. Other sites with informal arrangements did not. This is a new model of practice in busier hospitals where surgeons do not have a traditional elective practice with associated elective operating

TABLE 2. Operating room days and wait times, 2012 versus 2022.

	2012		2022		P
	n	Number	n	Number	
General surgery OR days per hospital per 4-week block (mean)	34	18.6	34	21.9	.033
General surgery OR days per hospital per 4-week block, adjusted for FTE (mean)	34	4.6	34	4.4	.420
OR days per surgeon per 4-week block (mean)	72	4.5	74	4.2	.085
Wait time for bowel resection (mean weeks)	65	9.2	70	10.7	.280
Wait time for cholecystectomy (mean weeks)	65	15.3	71	13.7	.730
Wait time for hernia repair (mean weeks)	63	17.9	71	16.9	.720
Wait time for colonoscopy (mean weeks)	64	20.6	68	14.8	.082

OR = operating room; FTE = full-time equivalent.

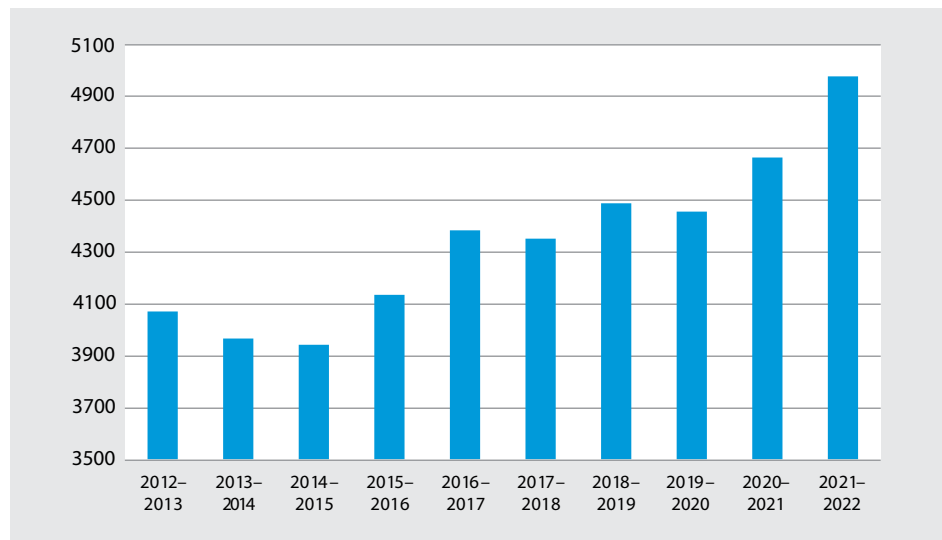


FIGURE 2. Number of appendectomies performed in BC per year from 2012 to 2022.

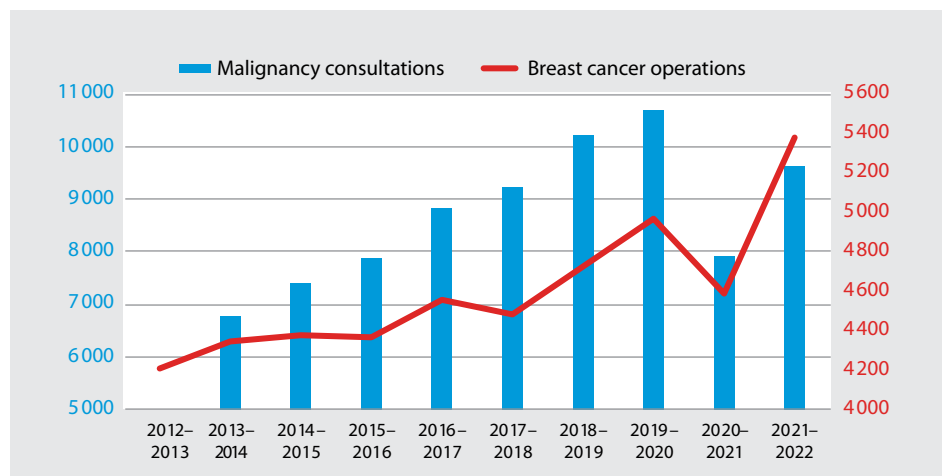


FIGURE 3. Number of breast cancer operations and malignancy consultations in BC per year from 2012 to 2022. Note that the malignancy consultation fee was created in 2013, so there are no data for 2012–2013.

room and endoscopy time and provide only emergency surgical services.⁶ Some of those surgeons are quite busy, which would be reflected in the MSP billing figures but not by our study methodology. In addition, most surgeons have both an elective practice and an on-call acute care surgical practice; this is impossible to identify in the available data and is, therefore, beyond the scope of this study. The 22% increase in appendectomies demonstrates a growing need for acute care surgeons. Granted, this may have just resulted in the same number of surgeons being 22% busier rather than needing to hire 22% more surgeons.

Emergency surgery is not the only area showing growth. The 2012 study predicted an increased incidence of cancer and a growing need for cancer operations.² Cancer care is a resource-intensive area of medicine, requiring not only operating rooms but also oncologists, chemotherapy nurses, and radiation treatment infrastructure. This growing area of need was illustrated by the unprecedented decision to send BC patients to Washington state for cancer treatment in May 2023 due to unacceptable wait times, which made international news.⁷ The increase in breast cancer operations and malignancy consultations illustrates the importance of planning more cancer care resources, including operating room time.

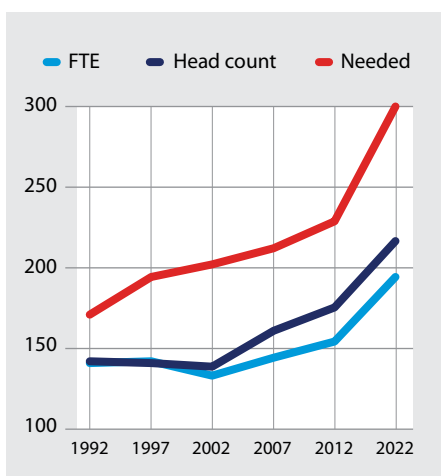


FIGURE 4. Deficit of general surgeons in BC, 1992–2022.

FTE = full-time equivalent.

Running and going backward

The 2012 study projected that 260 general surgeons would be needed in BC in 2022, based on the 2012 Canadian average of 5.0 general surgeons per 100 000 population and a projected 2022 BC population of 5 190 802 at the time of the study.² The Canadian average of general surgeons per 100 000 population was 5.7 in 2022, and the BC population was 5 315 564,³ 2.4% higher than projected in 2012. Therefore, the number of general surgeons needed in 2022 was 302. From 2012 to 2022, the BC population increased by 15% overall, and the population 65 years of age and older increased by 45% [Table 1]. The 2012 study projected a 42% increase in the population 65 years of age and older based on government statistics at that time.² Even the head count number of general surgeons in 2022 was less than the number needed in 2012 [Figure 4]. The BC population in 2032 is projected to be 6 098 221.³ Assuming the Canadian average of 5.7 general surgeons per 100 000 population remains level, 348 general surgeons will be needed in BC by 2032. Given that the 2012 study underestimated both the actual 2022 BC population and the number of surgeons needed, coupled with the fact that the average surgeon works 0.9 FTE, it is possible that the number of surgeons needed in 2032 will be even greater.

Study limitations

Data were gathered using a survey, which required some subjectivity in determining wait times. However, the same methodology was used in the 2012 study, so making comparisons between the two studies is not unreasonable. Also, focusing on surgeons with permanent hospital positions may underestimate patient care provided by acute care surgeons and locums who may not have regular operating room and endoscopy time; this may be reflected in the discrepancy between our results and head counts reported by CIHI and MSP. However, this does not take away from the demonstrated need for more general surgeons to care for increasing numbers of patients who need emergency

surgery, cancer surgery, and other services that general surgeons provide.

Conclusions

Because of population growth and aging, meeting the need for general surgical services is akin to chasing a train that is accelerating away from you. Despite hiring 39 new general surgeons, the deficit in the number of FTE surgeons increased from 74 to 105 between 2012 and 2022. If efforts are not made to train and recruit general surgeons and to increase hospital and other resources accordingly, the train will simply vanish over the horizon, and strains on the system will be felt by both surgeons and patients in the near future.

Competing interests

None declared.

References

- Canadian Institute for Health Information. Physicians per 100,000 population, by specialty. Updated October 2023. Accessed 14 October 2023. www.cihi.ca/en/indicators/physicians-per-100000-population-by-specialty.
- Hwang H, Karimuddin AA. Dividing the pie into smaller slices: A qualitative and quantitative analysis of the general surgery workforce in British Columbia, 1992–2012. *BCM J* 2013;55:26-32.
- BC Stats. Population estimates and projections for British Columbia, 2012. Accessed 14 October 2023. <https://bcstats.shinyapps.io/popApp>.
- MSP payment data series 2021/22. Doctors of BC, October 2022.
- Social Science Statistics. Statistics calculators. Accessed 14 October 2023. www.socscistatistics.com/tests.
- Ball CG, Hameed SM, Brennehan FD. Acute care surgery: A new strategy for the general surgery patients left behind. *Can J Surg* 2010;53:84-85.
- Daniels C. British Columbia begins to send cancer patients to Bellingham for treatment. *KOMO News*. 30 May 2023. <https://komonews.com/news/local/british-columbia-canada-vancouver-bc-bellingham-whatcom-county-cancer-care-health-public-government-funds-vulnerable-payments-cascade-center-joseph-peace-diagnosis-minister-universal-system>.