

### CANADIAN HUMAN RESOURCE NEEDS IN VASCULAR SURGERY

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**OBJECTIVE:** To outline the distribution of vascular surgeons in Canada and to determine the present and future human resource needs in vascular surgery practice in Canada.

**DESIGN:** Voluntary questionnaires sent to all members of the Canadian Society for Vascular Surgery (CSVS), the administrators of hospitals in Canada with more than 100 beds, and interrogation of the membership database of the CSVS.

**MAIN OUTCOME MEASURES:** The perceived present and future needs for fulltime and part-time vascular surgeons, determined by a variety of methods.

**PARTICIPANTS:** One hundred and forty active members of the CSVS and administrators of 120 hospitals.

**MAIN RESULTS:** From the CSVS members 62 responses were received from those residing in Canada, revealing 47 fulltime vascular (more than 75% of the practice) surgeons working with 0 to 5 colleagues (mean 1.8 [SD 1.3]). Fifteen responding surgeons combined the practice of vascular surgery with another specialty. Perceived immediate needs were 24 surgeons, with 42 required in 4.8 (1.8) years. Of 120 hospitals offering vascular surgery services, 90 stated that they met the needs of their community; however, additional immediate manpower requirements totalled 27 surgeons. Hospital administrators predicted a need of 55 additional vascular surgeons in a mean of 5.5 (4.6) years. Over 85% of hospitals stated that they had the resources to support the currently practising surgeons and their immediately required additions.

**CONCLUSIONS:** Prediction of the need for additional vascular surgeons should be based on an estimated retirement age of 65 years, with an adjustment for the increasing percentage of the Canadian population reaching the age of 60 years. All methodologies used in this study predict the need for additional human resources in vascular surgery. The need for continued training of new vascular surgeons is apparent, but the optimal number of trainees per year is less clear.

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**OBJECTIF :** Décrire la répartition des chirurgiens vasculaires au Canada et déterminer les besoins actuels et futurs en chirurgiens vasculaires au Canada.

**CONCEPTION :** On a envoyé à tous les membres de la Société canadienne de chirurgie vasculaire (SCCV) et aux administrateurs des hôpitaux du Canada qui comptent plus de 100 lits des questionnaires auxquels ils étaient libres de répondre. On a aussi interrogé la base de données sur les membres de SCCV.

**PRINCIPALES MESURES DE RÉSULTATS :** Les besoins actuels et futurs perçus en chirurgiens vasculaires à plein temps et à temps partiel, déterminés par toutes sortes de méthodes.

**PARTICIPANTS :** Cent quarante membres actifs de la SCCV et les administrateurs de 120 hôpitaux.

**PRINCIPAUX RÉSULTATS :** Soixante-deux membres de la SCCV résidant au Canada ont répondu : il y a 47 chirurgiens vasculaires à plein temps (plus de 75 % de l'effectif) travaillant avec de 0 à 5 collègues (moyenne, 1,8 [ET, 1,3]). Quinze des chirurgiens qui ont répondu exercent la chirurgie vasculaire et une autre spécialité. Les besoins perçus s'établissent à 24 chirurgiens immédiatement et à 42 dans 4,8 (1,8) ans. Sur 120

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*\*Dr. Provan died on July 25, 1996, before this manuscript was submitted for publication. However he was instrumental in setting up the study and analysing the data. It was therefore considered appropriate that he should be recognized as coauthor of this paper.*

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hôpitaux offrant des services de chirurgie vasculaire, 90 affirment répondre aux besoins de leur communauté, mais on a besoin immédiatement 27 chirurgiens de plus au total. Les administrateurs d'hôpitaux ont prédit qu'on aurait besoin de 55 chirurgiens vasculaires de plus dans 5,5 (4,6) ans en moyenne. Plus de 85 % des hôpitaux qui ont répondu affirment avoir les ressources nécessaires pour supporter et les chirurgiens actifs et les autres dont on a besoin immédiatement.

**CONCLUSIONS :** La prévision relative au besoin de chirurgiens vasculaires supplémentaires devrait être fondée sur un âge estimatif de départ à la retraite de 65 ans et sur un rajustement en fonction du pourcentage croissant de la population canadienne qui arrive à 60 ans. Toutes les méthodologies utilisées dans le cadre de cette étude prévoient qu'on aura besoin d'un plus grand nombre de chirurgiens vasculaires. Il est évident qu'il faut continuer de former de nouveaux chirurgiens vasculaires, mais le nombre optimal à former par année est moins évident.

**H**uman resource issues are becoming increasingly important in health care delivery in Canada. There is a perceived mismatch in the supply and demand of surgical services within Canada, and this is compounded by a maldistribution of physicians and specialty services within individual provinces and across the country. The Canadian Society for Vascular Surgery (CSVS) maintains an ongoing interest in ensuring the optimal delivery of care to patients with vascular disease by appropriately trained individuals. Although vascular surgery is a recognized specialty, it is also a subspecialty of general surgery, so that care of the patients is often delivered by a specialist who combines the practice of vascular surgery with general surgery and less frequently cardiac surgery. To further the understanding of the needs for vascular care and hence the requirements for the training of vascular surgeons in Canada, the CSVS requested a study of human resource needs. The goals of this study were to outline the distribution of vascular surgeons in Canada, to determine whether the vascular care needs of the Canadian population are being met by the present number of vascular surgeons and whether the output of the 8 current residency programs is adequate to meet future needs. We appreciate that no single methodology can answer these questions and the use of multiple sources of information with

comparisons of these data may provide the best approximation of our current status and future needs.

## METHODS

Data for the study were obtained from 3 sources:

- The CSVS maintains a membership database that records the demographic data of its members, including their date of birth. The updated 1994 database was used to give information regarding geographic distribution and age of members. Information was available about province and city of practice.
- An anonymous questionnaire was sent to all members of the Society, requesting information regarding type of practice (fulltime or in combination with another specialty), the number of colleagues currently sharing in the practice of vascular surgery and the perceived need for additional human resources both now and in the future. For the purposes of this study only the responses of members living in Canada and actively involved in the practice of vascular surgery were considered.
- The Canadian Hospital Association provided mailing labels for all hospitals in Canada with more than 100 beds. Questionnaires were sent to the administrators of these hospitals requesting information regarding the delivery of vascular services in their hospitals. The administrators were asked to complete the questionnaire

based on their perception of current and future needs for manpower as well as support services. For the purpose of this study a vascular surgeon was defined as a physician who performs aortobifemoral bypass grafting and femoropopliteal bypass grafting and repairs aortic aneurysms.

## RESULTS

### CSVS database and membership questionnaire

In 1994 there were 209 registered members of the CSVS with a membership breakdown as follows: active 140, senior 40, associate 10, honorary 19. Senior membership is granted at the age of 60 years, although many senior members still actively practise vascular surgery. Associate members consist mainly of resident trainees and basic science researchers; their responses were not considered in this analysis. The age distribution of the members is shown in Fig. 1 and the provinces in which they work in Table I. There were 74 responses from 140 active members, but consideration was given only to the 62 (48%) respondents of the 128 members residing in Canada. The proportion of respondents was similar across the country. The mean (and standard deviation) number of colleagues sharing in practice and call was 1.8 (1.3). Eight surgeons were the sole vascular surgeon (full- or part-time) in their geographic area, yet they

did not express a need for further surgical support.

Population figures from 1994 were obtained from Statistics Canada and population-to-surgeon ratios were calculated (Table I). Current practice patterns and perceived needs for addi-

tional manpower according to the CSVS members are shown in Table II.

Survey of hospital administrators

In 1994 there were 279 hospitals of over 100 beds registered with the

Canadian Hospital Association (now the Canadian Healthcare Association). From these, 209 (75%) responses were received, with 120 hospitals indicating that they offered vascular services according to the definition provided. Ninety (43%) of the hospital administrators who responded felt that they met the current vascular surgery needs of the community they served. Also, 90% of administrators at hospitals where vascular surgery is performed indicated that their hospitals provided sufficient resources to support the vascular surgeons practising in their community. Of those who felt there was a shortfall, the area of greatest concern was the noninvasive vascular laboratory support. Table II shows the current practice demographic data and the perceived needs for additional surgeons according to the administrative respondents.

Based on a retirement age of 65 years, extrapolations can be made to predict the number of surgeons needed to replace the retirees. This, however, does not take into account the aging population, which may require an increase in the number of vascular surgeons to meet their needs. Therefore, a correction based on the portion of the population over the arbitrary age of 60 years was calculated based on figures from Statistics Canada to permit a more realistic assessment of the need for vascular surgeons (Fig. 2).

DISCUSSION

No methodology is uniformly accepted in the assessment of human resource needs in medicine. At best, the various methodologies may only reflect a prediction of the practice patterns, disease processes and alteration in population demographics. The methods employed in this survey included a survey of the providers (CSVS membership data), a survey of

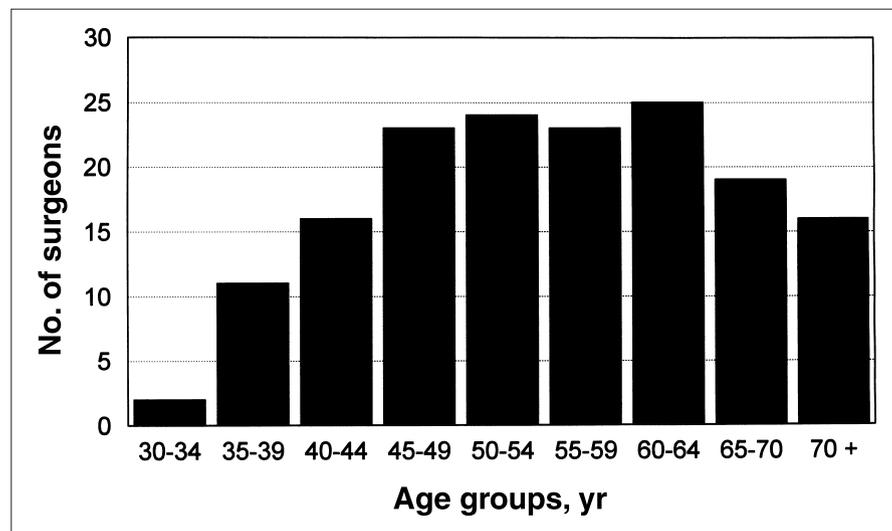


FIG. 1. Age distribution of vascular surgeons practising in Canada. Mean (and standard deviation) age for Canadian Society for Vascular Surgery (CSVS) members under 65 years of age was 51.9 (8.2) years.

Table I

Demographics of Vascular Surgical Practice

Source of data	Membership database*		Hospital responses†	
	No. of members	1000 population/surgeon	No. of responses	1000 population/surgeon
British Columbia	25	150	43	87
Alberta	11	249	33	83
Saskatchewan	4	255	10	102
Manitoba	8	142	10	114
Ontario	83	133	115	96
Quebec	31	236	55	133
Nova Scotia	9	104	8	117
New Brunswick	8	95	7	109
Prince Edward Island	1	135	1	135
Newfoundland	4	145	5	115
Outside Canada	25	—	—	—
Total/mean	209	164	287	109

\*Includes all categories of Canadian Society for Vascular Surgery (CSVS) membership  
 †Data returned by hospital administrators

the consumers as represented by the hospital administrators, and projections based on the age of the current members of the CSVS, assuming a retirement age of 65 years. It is hoped that by using the 3 different methods of assessing need, real trends will be confirmed. Our data are supported by the information gathered and presented in the 1995 Royal College of Physicians and Surgeons of Canada specialty physician work-force study. It reported on 119 surgeons who described vascular surgery as their main interest; 22 (4 cardiac surgeons, 18 general surgeons) spent more than 50% of their time in other specialties.<sup>1</sup> Distribution patterns of surgeons were similar in both reports.

No ideal doctor-to-population ra-

tio is defined for vascular surgery. In the United Kingdom, where surgical practice is somewhat different, a baseline figure of 1 vascular surgeon per 200 000 people has been proposed.<sup>2</sup> In Canada, however, these population-to-surgeon ratios are not that useful because of the clustering of the population in the southern portions of a vast country. Similarly, figures of surgical procedures per surgeon may not be applicable in Canada,<sup>3,4</sup> since remote areas require multiskilled generalists to service their population needs, possibly involving some vascular skills for the emergency situation. Table I shows provincial population-to-surgeon ratios ranging from 95 000 to 255 000. The hospital figures are preferred, as membership data

may bear more of a relationship to enrolment in the CSVS than in the actual delivery of care. All categories of membership were included in this calculation. The differences seen in the Quebec ratios may reflect the vascular surgeons' preference for membership in the *Entretien Vasculaire* rather than the CSVS.

Studies have been undertaken which identify caseload-to-surgeon ratios. However, in Canada, this information is difficult to obtain due to regional government differences in allowing access to information. Individual provinces have undertaken projects to determine manpower needs and to project the need for the training of future vascular surgeons.<sup>5</sup> Some provinces allow researchers access to utilization and billing data, enabling them to assess delivery of and need for health care. However, this access policy is not uniform across Canada. The portability of both physician licences and patients' health insurance across Canada hinders the accurate assessment of national resource needs.

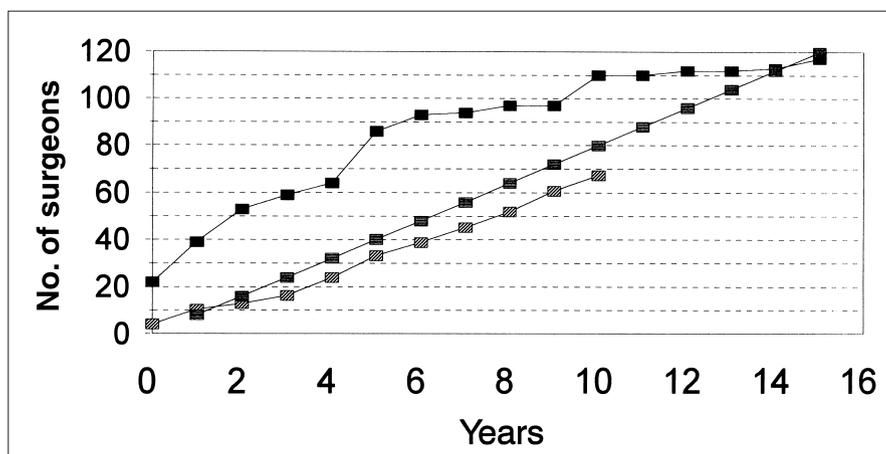
CSVs members identified a current need for 24 additional vascular surgeons, and hospital administrators identified a need for 27. Only 43% of the surveyed hospitals felt that they met the need of their communities in providing care for patients with vascular diseases. This information would support the conclusion that there is a current need for additional vascular surgeons in Canada.

It is accepted that the average age of the population is increasing.<sup>6</sup> With the completion of a number of international trials proving the benefit of surgery, such as NASCET<sup>7</sup> and ACAS,<sup>8</sup> the calls upon the vascular surgeon will increase. A study by Millar, Hill and Cole<sup>9</sup> demonstrated that although the total number of Canadian hospital separations remained constant between 1980 and 1989, there was a reduction

**Table II**

**Surgical Practice (Fulltime or Combined With Another Type of Surgery) According to the 2 Survey Types**

Survey type	Current practice, no.		Current needs, no.	
	Fulltime	Part-time	Fulltime	Part-time
CSVs survey	47	15	17	7
Administrator survey	80 surgeons in 49 hospitals	145 surgeons in 71 hospitals	11	16



**FIG. 2.** Predicted need for vascular surgeons in Canada. Hospital data (black boxes) were obtained from the predicted needs of hospital administrators. The CSVs data (diagonally hatched boxes) were obtained, assuming a retirement age of 65 years and adjusting this number for the increasing portion of the population over the age of 60 years (this line has not been adjusted for the current predicted needs, which would elevate it). Output (horizontally hatched boxes) is based on 8 graduates per year from Canadian training programs who subsequently practise in Canada.

in varicose vein surgery and a 3.7% to 6.4% increase in major arterial reconstruction.<sup>9</sup> Simunovic and colleagues<sup>10</sup> described varying trends in the delivery of care in Ontario, showing an overall tendency toward an increase in many operations with time. Data from the United States suggest that whereas the number of index cases performed continues to increase, the number of nonvascular surgeons performing these procedure decreases.<sup>11</sup> Between 1979 and 1985 the number of procedures performed on the vascular system increased by 59%.<sup>3</sup> Thus, it is reasonable to predict that with the aging population and the increased technical ability to perform revascularizations, there will be an increasing demand for vascular surgery services.<sup>12</sup> The population growth curve will not remain linear, and popular books point out our need for intelligent planning for the over-60 population boom.<sup>13</sup> Difficulties in determining this demand centre around changing technology, with a move toward less invasive procedures, changing practice patterns of general and vascular surgeons and certain lifestyle issues.

Vascular surgery services are of high intensity and use resources heavily. It is accepted that most patients are elderly and usually have concurrent medical conditions such as hypertension, coronary artery disease and diabetes. Thus, it may not be appropriate to consider delivery of such high-intensity services at small community hospitals even though basic vascular skills remain a component of the training requirements of general surgery. In the future, regionalization may lead to the consolidation of vascular disease programs, with a reduction in the management of these conditions in the community.

There are 8 Canadian programs currently offering accredited training toward a certificate of special compe-

tence in vascular surgery. It is incumbent upon the surgical community to provide responsible training for the appropriate numbers of surgeons to supply the needs of their own and other Canadian communities. Although quantities are not known, a certain number of graduates leave the country each year. However, provincial training restrictions may limit this number in the future.

With respect to the predicted needs for future vascular surgeons (Fig. 2), assumptions are that retirement is at age 65 years (this is not universal) and that there are 8 graduates of programs across Canada per year (which may not always happen), all of whom practise in Canada. The prediction, based on surgeons' ages, takes into account the increasing population over 60 years of age but does not take into account the perceived current shortfall of vascular surgeons. In Fig. 2, the hospitals' perceived needs for the future delivery of vascular services remains above that of current delivery rates until 14 years into the future, when they finally intersect. Of course, it may be that our current population statistics do not accurately reflect what the needs will be in the future. However, none of the hospitals' calculations specifically take into account the aging of our population or future changes in the practice of vascular surgery. Although most hospitals stated that there were sufficient resources to support the practice of the vascular surgeons needed, hospital budgetary cutbacks may render these predictions inaccurate. Also, hospital desires (e.g., availability to establish hemodialysis access on site) have not been separated from the establishment of a full vascular practice.

A variety of methods of estimating human resource needs have been used in this study, and none reflect the ideal. On the surface, one would as-

sume that the membership of the CSVS would have the greatest interest in this topic; however, the response rate was only 48% from Canadian practising surgeons. In addition, this response rate and the calculation of surgeon-to-population ratios based on responses and membership data reflect only those surgeons with sufficient interest in the practice of vascular surgery to participate in the national specialty society activities and not those who are actually delivering care. On the other hand, despite the provided definition, hospital administrators may not have had a thorough comprehension of what vascular surgery entails and the resources necessary for its safe practice. Despite these concerns, the current perceived needs of the vascular surgeons differed from those of the administrators by only 3 (CSVs members 24, hospital administrators 27). This establishes the fact that vascular surgery is currently an undersubscribed specialty. The majority of administrators felt they had the resources to support their current surgeons as well as those they felt were currently required. Twenty-five percent of the hospital administrators believed they were not currently satisfying the needs of their communities.

In most specialty training programs, output has been determined by the resources available at individual institutions (e.g., salary support, training positions and the ability to deliver an adequate educational experience) to support training within a specialty. A more appropriate model would be to determine the location and size of training programs based on current and predicted needs for delivery of service.

A variable number of residents have been accepted from the United States and other countries with the knowledge that they will be returning to their country of origin to practise.

Most provinces have instituted regulations making this entry path less accessible to international medical graduates. The number of training programs must be determined by Canadian needs. The data in Fig. 2 show that the output of 8 vascular surgeons per year will lag behind the perceived needs of hospital administrators but will provide sufficient surgeons to replace those retiring and will match the increased needs based on an age-adjusted increase in practice. However, it must be emphasized that this output does not meet the current perceived additional needs.

**CONCLUSIONS**

The need for additional vascular surgeons to meet the needs of the Canadian population is apparent in the minds of both hospital administrators and vascular surgeons. At present, there is not a need for increased output from vascular surgery training programs, but the ideal number of vascular surgeons remains elusive.

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