

Physician Shortage in Canada: A Review of Contributing Factors

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Abstract

The physician shortage in Canada is multifactorial. It is important to identify potential factors and policies contributing to the problem. An extensive literature review to retrieve primary source articles was performed using the PubMed database. Other sources of information included reports identified using the websites of organizations, associations, government bodies and Google scholar, as well as additional primary source articles identified using reference lists of retrieved articles and reports. Healthcare policy changes in the 1990's limited the growth of physician supply through the reduction of medical school enrolment, restrictions on recruitment of international medical graduates into the workforce, redistribution of family physician and specialist mix and loss of physicians to the US. Inadequate supply of primary care physicians is reflected in the low interest among medical students in a family medicine career and the shortage of physicians in rural areas. Reduction of physician productivity is characterized by an aging physician population, greater proportion of women in the workforce and the reduction of direct patient care hours among the new generation of physicians. The problem is further exacerbated by inefficiencies in healthcare expenditures, judging from high healthcare spending and low physician-to-population ratio. An understanding of factors contributing to the physician shortage is essential in order to develop successful strategies to alleviate inadequate physician supply.

Keywords: family physician, healthcare, international medical graduate, medical education, physician shortage, physician-to-population ratio, residency, rural physician

1. Introduction

In the 1970's Canada enjoyed one of the highest physician-to-population ratios among developed countries and the number of physicians per population was growing steadily until 1993, reaching 1.91 physicians/1000 (Canadian Medical Association [CMA], 2015). At that time the national consensus was that Canada had a surplus of physicians. This viewpoint was reflected in the 1992 Barer-Stoddart report on physician human resources (Barer & Stoddart, 1992), which argued that there was an oversupply of physicians in Canada. The Canadian government followed up on this by implementing various policies to control the growth of the physician supply.

As a result of these policies, the net inflow of physicians into the physician practice pool dropped from 1040 physicians per year in the period of 1990-1993 to 313 physicians in the period of 1994-2000 (Chan, 2002). The absolute physician-to-population ratio (physicians/1000) decreased from 1.91 in 1993 to 1.84 in 1997 before starting to gradually increase again, such that by 2006/2007 it was at the same level as in 1993 (CMA, 2015). Moreover, the aging general population (which utilizes more healthcare services) and aging physician population (which has a lower work intensity), suggests that the "real" physician-to-population ratio in 2006/2007 was still below its level in 1993. Recognizing the problem Canadian government made a significant effort to boost the number of physicians, including the 48% increase in medical school enrolment between 2003 (7808) and 2013 (11 565) (AFMC, 2014) and incorporation of more international medical graduates (IMG) into the workforce, among other things. Despite these efforts, in 2014 physician-to-population ratio was still at 2.24/1000, which ranked Canada 28th among 34 OECD countries with an average of 3.2/1000 (Canadian Collaborative Centre for Physician Resources [C3PR], 2013).

Currently, there is a well-recognized physician shortage in Canada. Statistics Canada reported that 15.3% of Canadians aged 12 and older lack a regular family physician (FP) (Statistics Canada, 2011). The situation in rural areas is particularly alarming. Data shows that less than 10% of the total physician workforce practices in rural areas and access to specialists is even worse with only 2% of specialists residing in rural areas, where 18% of the

Canadian population lives (C3PR, 2013). Physician shortage is further exacerbated by an aging physician pool (in 2013 41% of Canada's 74 526 physicians were aged 55 or older (C3PR, 2013)) and aging general population (Canadians aged 65 and older consume 45% of the total healthcare budget (Canadian Institute for Health Information [CIHI], 2014)).

The nature of physician shortage in Canada is multifactorial. It is important to identify past and present factors contributing to the shortage currently seen in the country. An extensive literature review was performed to determine which factors most significantly contribute to the problem. Understanding of these factors is essential in order to develop successful strategies to alleviate inadequate physician supply.

2. Methods

To ensure comprehensive analysis of the topic several search strategies were used to locate both peer-reviewed primary source articles and reports relevant to the topic.

An extensive literature review of the PubMed database was conducted using a combination of MeSH terms ("Canada", "physicians", "medically underserved area", "health manpower", "career choice", "health expenditures", "health care reform", "students, medical", "internship and residency", "choice behavior" and "health services needs and demand") and keywords ("healthcare", "healthcare policy", "physician shortage", "physician workforce", "primary care physicians", "family physicians", "rural physicians", "physician demographics", "recruitment", "retention", "international medical graduates" and "medical education"). The search was limited to articles published in English language and date exclusion was applied as follows: articles published in the last 10 years were used in searches related to physician shortage and physician workforce; articles published in the last 5 years were used in searches related to healthcare reform and health services needs. No date exclusion was used in searches related to healthcare policies, medically underserved areas, medical students and their career choices, health expenditures and residency training. Google Scholar was searched using the following combination of terms: "Canada", "physician shortage", "physician workforce", "physician facts", "medical education", "health spending" and "international medical graduates". Titles and abstracts returned from every search were screened for their relevance to the topic and after excluding review articles, news, editorials and commentaries, articles judged as eligible were retrieved and thoroughly reviewed. Articles were selected for the final analysis based on their relevance to various aspects of physician shortage in Canada, such as government policies that contributed to the problem, the supply of primary care and rural physicians, changing physician demographics and emigration of Canadian physicians.

Reports from organizations, associations and government bodies were identified using different sources. The search of websites of Canadian Institute of Health Information (CIHI), Canadian Medical Association (CMA), Canadian Resident Matching Service (CaRMS), Association of Faculties of Medicine of Canada (AFMC) and Canadian Post M.D. Education Registry (CAPER) was conducted. The reference lists of articles identified using PubMed were also screened for relevant reports.

Furthermore, reference lists of retrieved articles and reports were used to identify additional articles used in the final analysis.

3. Results

The physician shortage in Canada is multifactorial but four main factors were identified that most significantly contribute to the problem— government healthcare policies implemented in the 1990's, inadequate supply of primary care physicians (PCP), shortage of physicians in rural areas and reduction in physician productivity.

3.1 Policies Responsible for Limited Growth of Physician Supply

A number of policies implemented in the 1990's significantly contributed to the physician shortage observed in Canada. In his 2002 report to the Canadian Institute of Health Information, Chan (2002) identified policies that contributed to observed drop in physician supply. Policies that directly limited growth of physician supply included: 5% and 10% reduction in medical school enrolment in 1987 and 1993 respectively; restriction on IMGs entering Canadian workforce, which resulted in the drop of IMGs practicing in Canada from 28% in 1986 to 22% in 2004 (CIHI, 2007); and various retirement incentives. Indirect policies, the unintended consequences of which were a reduction in physician supply included: elimination of one-year rotating internship and making a two-year family medicine (FM) residency a minimum requirement for practice; increase in the ratio of specialist to FM residency positions, which not only increased total time spent in residency training but also decreased the number of physicians starting practice as FP from 80% in the early 1990's to 45% in 2000; and policies that resulted in exodus of physicians to the US. The latter included: physician remuneration and expenditure caps, limits on interprovincial physician migration, financial penalties for practicing in "over-serviced" areas and sharp decline in

opportunities for physicians to return to postgraduate training.

Ryten, Thurber and Buske (1998) showed that 1 out of 9 Canadian graduates from the “class of 1989” was practicing in the US in 1996 (193/1722). A cross-sectional analysis of the 2006 American Medical Association physician masterfile identified 8162 Canadian medical graduates who provided direct patient care in the US in 2006 (2491 PCPs and 5671 specialists) (Phillips, Petterson, Fryer, & Rosser, 2007). Considering the number of physicians in Canada in 2006 (CMA, 2006), Canadian-educated PCPs and specialists practicing in the US in 2006 represented a substantial proportion of the Canadian physician workforce— 7.7% (2491/32 241) and 18.5% (5671/30 656) for PCPs and specialists, respectively. In contrast, only 408 US medical school graduates practiced as fee-for-service physicians in Canada in 2004. Although net physician migration to the US has stopped in the last decade, the efforts to address this potential issue in the future would be beneficial. For example, a recent study performed by the Royal College of Physicians and Surgeons of Canada [RCFSC] reported a growing number of specialists and subspecialists in Canada experiencing employment issues (RCPSC, 2013). Around 20% of newly certified Canadian specialists, who have not been able to secure a position, cited that they would look for work outside Canada. Predicted shortage of more than 90 000 physicians in the US by 2020 (Association of American Medical Colleges [AAMC], 2010; Council on Graduate Medical Education [COGME], 2005) can offer attractive opportunities for unemployed Canadian specialists.

3.2 Inadequate Supply of Primary Care Physicians

The inadequate supply of PCPs in Canada is reflected in the low interest in primary care careers among current medical students. This is a concern because the preference of Canadian medical graduates has an important impact of the mix of practicing physicians in the country. Scott, Wright, Brenneis and Gowans (2009) conducted a study to assess how closely career preferences of students entering eight Canadian medical schools align with the current primary care and specialist mix in Canada. A survey of 3225 newly admitted medical students showed only 25.9% interest in FM. A 2011 study used the data from 2007 National Physician survey for medical students to show 30.2% and 31.4% interest in FM among preclinical and clinical students, respectively (Vanasse, Orzanco, Courteau, & Scott, 2011).

Even though preferences change over time there is a strong correlation between the initial preference and ultimate postgraduate training choice. For example, Scott, Gowans, Wright and Brenneis (2012) conducted a survey at eight Canadian medical schools to show that 46.4% of students had matched to their top career choice and 77.5% had matched to one of their top three choices indicated upon medical school entry. Another study compared the specialty choice of 519 alumni of the University of Washington School of Medicine with the their interest upon medical school entry (students were surveyed on their interests upon entry) and found that 70% of the graduates had a stable career choices (Carline & Greer, 1991). Zeldow, Preston and Daughtery (1992), who compared career interests of 121 students at one mid-western medical school in the US to actual National Residency Match Program (NRMP) outcomes, reported interesting results. At orientation, 45% of student had correctly identified their ultimate career choice and by the end of the second year this number had increased to 69%.

There are a number of studies that looked at personal student characteristics associated with the subsequent choice of residency in FM (Feldman et al., 2008; Gill, McLeod, Duerksen, & Szafran, 2012; Scott et al., 2011; Vanasse et al., 2011). Vanasse et al. (2011) analyzed the data available from the 2007 National Physician Survey for medical students to show that those who hoped to become FPs as opposed to specialists were more likely to be from rural regions and small towns. Interestingly, desire for research was negatively associated with an FM career preference compared to specialist career preference. Among the most important factors linked with an FM career were desires for public health activities and short residency to pay off debt. Other factors associated with an FM career included flexible work hours and continuing medical education.

Scott et al. (2011) reported similar results among Canadian medical students. Students who chose a career in FM were older on average, a smaller proportion of them had family members or friends practicing medicine, and a greater proportion came from rural areas and volunteered in a developing nation. Societal orientation, desire for a varied scope of practice and lower interest in research were among factors associated with an FM career choice. On the other hand, students who chose specialty careers were influenced by prestige, higher income, research and living in urban areas (Feldman et al., 2008, Gill et al., 2012; Vanasse et al., 2011). Lower remuneration compared to specialists was also shown to be an important factor in the lack of interest in FM (Morra, Regehr, & Ginsburg, 2009). The importance of payment as a factor in career decision-making increased with higher debt and advanced training. Besides this, there are currently few opportunities for practicing FPs to reenter postgraduate training. This may discourage students who feel that entering FM would eliminate options to retrain as a specialist later on.

A relative lack of PCPs is reflected in high numbers of medical specialists currently practicing in Canada. The

2013 RCPSC Employment study (RCPSC, 2013) reported a growing number of specialist and subspecialists in Canada who are unemployed or under-employed. For example, 16% of them could not find work and 31% had plans to further pursue training to become employable. Furthermore, the proportion of specialist reporting employment issues increased from 13% to 17% from 2011 to 2012 and that of subspecialist increased from 15% to 21% over the same period. More research is needed to understand whether high rate of specialists' unemployment is attributed to the saturation of the market or inadequacy of resources to hire specialists or both.

3.3 Rural Physician Shortage

The Canadian shortage of physicians is especially acute in rural areas (see section 1). Moreover, high physician turnover in rural Canada is a problem. For example, it was reported that in 2007 the average length of practice of physicians in rural areas was 9.5 years compared to 12.6 years in urban areas (CIHI, 2007). Not surprisingly, rural population had a higher overall mortality rate compared to their urban counterparts and performed worse on several health-related measures (CIHI, 2006).

Unpopularity of rural FM among medical students is reflected in their low interest in this specialty. Feldman et al. (2008) showed only an 11.1% interest in rural FM among first year students in Canadian Medical Schools. The interest ranged from 4.7% at the University of Toronto to 20.2% at McMaster University. Scott et al. (2009) obtained similar results. This is especially a concern since rural FPs provide most of care in rural areas.

Several factors contribute to the unpopularity of rural practice among physicians. The university of Western Ontario conducted a study to compare the scope of practice and the degree of personal and professional satisfaction of rural FMs to their urban counterparts (Incitti, Rourke, Rourke, & Kennard, 2003). Compared to their urban counterparts FPs were more involved in hospital work, including attending births, emergency services, performing anesthesia, assisting in operating rooms and performing minor surgical procedures in addition to their office practices. Rural physicians were less satisfied with various aspects of their practice, such as work hours, having a professional backup and accessibility of continuing medical education (CME). Rural physicians also seemed to be less content with different aspects of their personal lives, including spousal work opportunities, educational opportunities for children and cultural activities. A qualitative study in the single rural community in the province of Newfoundland and Labrador (Mayo & Mathews, 2006) showed that families who were integrated into the community and families with employed physicians' spouses were more content with rural areas. On the other hand, absence of family and friends and limited recreational opportunities negatively influenced contentment.

A 2005 CIHI study showed an inverse relationship between the size of the community and family physician's scope of practice (CIHI, 2005). For instance, whereas only 15% of FPs in metropolitan areas worked in emergency departments (ED), about 74% of FP in remote rural communities provided ED coverage. Another example is postpartum care, where less than 40% of FPs provided postpartum care in metropolitan areas, compared to 65% of FPs in remote rural communities. Greater proportion of rural FPs were found to be engaged in cancer care, cardiology, chronic disease management, geriatric medicine, home care, hospitalist care, prenatal care and surgical assisting, among other things. FPs in rural communities also performed a wider range of clinical procedures than their urban counterparts, such as joint aspirations, casting/splinting, endometrial aspirations, lumbar punctures and skin biopsies.

To summarize, rural physicians have a significantly wider scope of practice and need to maintain competence in different clinical areas despite having higher work loads, inaccessibility of CME, having no professional backup and limited specialist consultation (judging from low numbers of rural specialists, as reported in section 1).

3.4 Changing Physician Demographics and Work Preferences

The physician shortage can be attributed to both the inadequacy of the physician supply, as outlined above, and the relative reduction in the amount of direct patient care. Several factors specifically contribute to the reduction of direct patient care hours: the increase in the proportion of female physicians, reduction of direct patient care hours among the new generation of physicians and the aging physician workforce.

In 1986, 18% of all Canadian physicians were female (CIHI, 2007) and this number steadily increased to 39% in 2014 (CIHI, 2015). Every year since 2002 females constituted more than 55% of incoming students at Canadian medical schools (AFMC, 2014) and the number of female physicians increased by 23.7% between 2010 and 2014, while the number of male physicians increased by 9.5% in the same time period (CIHI, 2015). It is well documented that female physicians work fewer hours on average than male physicians (Chan, 2002; Crossley, Hurley, & Jeon, 2009; Hedden et al., 2014; Sarma, Thind, & Chu, 2011; Watson, Slade, Buske, & Tepper, 2006). Chan (2002) estimated that, overall, female physicians had a 21% lower practice activity than male physicians, based on their practice activity, as reported by the amount of fee-for-service billings in the National Physician

Database. Not surprisingly, this difference was highest during the childbearing ages of 35-44 (female to male ratio of 0.77) and lowest during the ages of 25-29 (female to male ratio of 0.92). The study by Incitti et al. (2003) (described in 3.3) reported, that 47% of urban female physicians in Ontario worked less than 40 hours per week, while 10% of urban male physicians did so. Interestingly, only 16% and 9% of rural female and male FPs, respectively, worked less than 40 hours per week. A 2005 CIHI study estimates showed that average full-time equivalent (FTE) was 0.69 and 0.89 for female and male physicians, respectively (CIHI, 2005). Hedden et al. (2014) performed a systematic review of articles on the subject published between 1991 and 2013. The authors confirmed that female PCPs report working fewer hours, have fewer patient encounters and deliver fewer services than male physicians, but mentioned that female physicians spend longer with each patient, deal with more separate problems in one visit and see higher proportion of female patients. Moreover, authors pointed out that once family factors had been accounted for, gender had no effect on hours spent working. CMA data also shows that female physicians spend more time on teaching activities and indirect patient care (CMA, 2014).

Physicians' total hours of work and hours spent on direct patient care have fallen in many developed countries over the last several decades. A CMA physician resource questionnaire mailed to 7922 physicians showed that in 2003, FPs under the age of 45 spent 21% less time providing direct patient care than FPs of the same age group in 1982, while FPs over the age of 55 spent more hours on patient care than their same-age peers two decades earlier (Buske, 2004). Watson et al. (2006) showed a similar trend for a period 1991-2001 measured in terms of office assessments. In 2001, FPs under the age of 35 provided 18% less, those aged 35-44 provided 23% less, and those aged 45-54 provided 12% less office assessments, while FPs aged 55-64 provided 11% more, and those aged 65 and older provided 45% more office assessments than their same-age peers ten years earlier. Crossley et al. (2009) argued that there is a decline in patient care hours in all age cohorts of physicians and not just younger physicians. Irrespective of details, data from the national physician surveys conducted by CMA (CMA, 2014) confirms that direct patient care hours decreased from 35.6 per week in 1997 to 31 hours per week in 2014. Importantly, the decline in direct patient care hours could not be attributed to reallocation of work from direct patient care to other activities (research, teaching, administration, etc.), but rather results from decline of total weekly hours of work (53.2 and 48.7 hours per week in 1997 and 2014, respectively).

The aging physician demographic is also shaping the supply of physicians' services. The proportion of physicians aged 65 and older had increased from 7% to 15% between 1981 and 2014 (Canadian Labour and Business Centre [CLBC], 2003; CIHI, 2015) and the average age of physicians in Canada increased from 46.4 to 50.1 years between 1996 in 2014 (CIHI, 2015). It is not surprising that older physicians work less (Chan, 2002; Crossley et al., 2009; Sarma et al., 2011). For example, Chan (2002), estimated that physicians over 65 have a workload of 0.66 that of national average.

There are rising concerns about the decline of physicians' productivity in Canada and there are no current efforts to control the work hours of physicians in practice. Although ways to address productivity of a physician human resource is beyond the scope of this article, it is worth mentioning the estimates provided by Crossley et al. (2009), who calculated that increasing hours of direct patient care by 5% among current practicing physicians will have a greater impact on effective physician supply than large increases in several Canadian medical school enrolments.

4. Discussion

Although it is important to understand various factors that contribute to the observed shortage of physicians in Canada, it is just as important to address strategies that can help alleviate shortages in various aspects of healthcare discussed above. This section will try to address main difficulties of solving the physician shortage in Canada and offer some tentative solutions.

4.1. Costs Involved in Training More Physicians

Both long- and short-term goals should be considered while trying to address Canada's need for more physicians. Training new physicians locally is the priority, but will take time and considerable investment. Experiences from significant expansion of medical educational programs at the Laurentian University and the University of British Columbia uncovered one-time costs of \$1 000 000 and \$1 500 000 per spot, respectively (Health Canada, 2009). Expansion at the University of Washington medical school showed similar numbers. Moreover, it was estimated that training a new physician costs around \$180 000–\$294 000 (Health Canada, 2009). In 2013, total health spending in Canada reached \$211 billion, which constituted 11.2% of the country's GDP (CIHI, 2013). This makes Canada one of the top spenders on health, as a percentage of its economy, among OECD countries. Substantial costs involved in training more physicians will put a significant strain on an already outstretched budget.

4.2. Targeting Interest in Primary Care Careers

Addressing disparity in the number of PCPs presents a challenge. Data from the 2015 CaRMS match (CaRMS, 2015) showed that only 38.5% of Canadian medical graduates indicated FM as their first choice. Judging from the low interest in medical students' primary care careers, and taking into consideration the relative stability of career choices (as described in section 3.2) and current 51/49 ratio between FPs and specialists (CIHI, 2015), suggests that many future FPs will choose FM not by choice but by limitation of specialist residency spots. This can result in many students finding themselves in careers that they don't enjoy and are not suited for, which in turn could impact physician performance and quality of health delivery.

One of the possible solutions is to consider student factors upon medical school admission that were shown to be positively associated with an FM career choice later on. This could serve, as an important strategy for admission committees to select an appropriate mix of students to meet the healthcare needs of the region. It was shown earlier (see section 3.2) that interest in research was inversely related to interest in FM and directly related to interest in specialist careers. This suggests that introducing optional research components into an FM postgraduate training curriculum could attract student who are interested in research but traditionally associate research with specialist careers.

Bethune et al. (2007) provided interesting findings that showed changes in medical students' interest in FM as they progressed through their training. Their survey of medical students conducted at the Memorial University of Newfoundland from 1999 to 2006 revealed that there was a dramatic loss of interest in FM as a career choice during the first two years of medical school. One of the most plausible explanations why this might be occurring is the "hidden curriculum". Frederic Hafferty first coined this term in 1998 (Hafferty, 1998) and described it as what students learn outside the formal learning environment and stressed the impact of interpersonal interactions and role models in the learning process. During their training students internalize standards, values and norms that characterize their desirable profession. To understand the influence of academic discourse on medical students' identification with FM, Rodriguez et al. (2015) conducted 18 focus groups with 132 medical students and 67 faculty members from UK, Canada, France and Spain. Authors reported that in UK FM was considered a prestigious specialty, students were broadly exposed to various aspects of FM and had positive role models throughout their training, faculty praised the knowledge and skills of FPs and students were more likely to pursue an FM career. In Canada, students reported FM as lacking prestige, faculty often encouraged the brightest students to pursue a specialty career and many students did not identify themselves with FM. Other studies confirm the view of low prestige associated with an FM career among medical students in Canada (Feldman et al., 2008, Gill et al., 2012). Students from the schools where "badmouthing" primary care was prevalent were less likely to choose primary care, while the reverse was true for students identifying positive experiences during their primary care clerkships (Erikson, Danish, Jones, Sandberg, & Carle, 2013). Increasing the prestige of FM among students is a difficult task given preconceived notions about the discipline that pervade the medical education system. On a positive note, it is possible to achieve this, as experience of the Memorial University of Newfoundland has shown. The low interest in FM among students prompted the school to introduce an FM course, where second year students work with FPs in a community for 2 weeks. Also, the arrival of new dean who was a rural FP most likely changed the atmosphere at the school. As a result, there was a dramatic increase in FM interest among graduates (Bethune et al., 2007; Eggertson, 2012).

4.3. Strategies to Increase Interest in Rural Medicine

There are numerous strategies to recruit and retain physicians in rural areas. Current incentive programs offered to physicians to attract them to rural areas put a substantial strain on municipal budgets and are probably ineffective in long-term physician retention (Chan et al., 2005). Rural communities often have to rely on an ad hoc patching of shortages by locum physicians and there is no guarantee of physician supply in any given rural area. Strong institutional commitment is essential for Canadian faculties of medicine to identify the challenges and develop successful strategies in order to provide a consistent output of physicians to rural communities. Numerous studies have shown that there are three factors most strongly associated with physicians choosing rural practice: students' rural background, positive rural clinical clerkship experience and targeted rural postgraduate training.

One of the best predictors of rural practice is enrolling medical students from rural areas (Dunbabin & Levitt, 2003; Dolea, Stormont, & Braichet, 2010, Feldman et al., 2008). Retention of rural physicians is also strongly correlated with students' rural origins (Rabinowitz, Diamond, Hojat, & Hazelwood, 1999; Brooks, Walsh, Mardon, Lewis, & Clawson, 2002). A 2002 study (Dhalla et al., 2002) found that most Canadian medical students were of urban origin and higher socioeconomic status than the national average and only 10.8% of students were from rural areas. Realizing the problem, in 2005 Canada opened its only new medical school in the last 50 years—Northern Ontario School of Medicine. Ninety one (91) percent of the students are from Northern Ontario and between 2009 and

2012 61% of graduates have chosen FM residencies (largest percentage of any medical school in Canada), 65% of graduates were still practicing in Northern Ontario (rural area) in 2013 and many of them indicated their intention to stay in the region (Strasser et al., 2013). The Memorial University of Newfoundland has also shown commitment to increase the number of students with rural background and made rural medicine a part of its curriculum. As a result, 30%-40% of incoming students are from rural areas and data shows a very high rural retention rate 10 years after graduation (Eggertson, 2012; Mathews, Edwards, & Rourke, 2008). Other schools should also aim to boost the number of students of rural origin. Interestingly, Australia experienced similar problems. To boost the percentage of medical students from rural areas Australian government started to offer financial incentives to rural students, medical schools developed schemes to target rural applicants and have substantially revised their curricula. From 1989 to 2000 the proportion of students from rural areas increased from 10% to 25% (Dunbabin & Levitt, 2003) and the rural retention rate is around 40% (Eley, Synnott, Baker, & Chater, 2012).

Studies show that rural exposure during medical education facilitates future rural practice (Chan et al., 2005; Hancock, Steinbach, Nesbitt, Adler, & Auerswald, 2009; Rourke, Incitti, Rourke, & Kennard, 2005). Although medical schools have been increasingly targeting students from rural areas, most of the physicians practicing in rural areas do not have a rural background. A Canadian survey of rural FPs found that two thirds of rural physicians grew up in urban areas (Chan et al., 2005). In this study, rural physicians with rural background cited growing up in rural community as the most influential factor in choosing rural practice, while for urban residents the exposure to rural medicine during medical school and residency was the most influential factor to choose rural practice. Rural training might offer not only the skills essential for rural practice but also an exposure to rural lifestyle and challenges of rural practice, which were also both cited as highly influential by rural physicians with urban background. These students would have difficulty appreciating rural practice without rural exposure during their medical education and/or postgraduate training.

Rural postgraduate educational experiences are also highly important for recruitment and retention of physicians in rural areas (Rourke et al., 2005). A University of Calgary study showed that an interest of specialty residents in rural practice increased from 45% to 76% following a rural rotation (Myhre & Hohman, 2012). Other studies have reported a strong positive relationship between a length of rural exposure during residency and subsequent rural practice (Hogenbirk, Mian, & Pong, 2011; Tate & Aoki, 2012).

There is a growing body of evidence showing that positive association between rural origins, rural exposure and eventual rural practice is at risk of being lost unless continuation of rural pathway is provided (Eley et al., 2012; Strasser, Hogenbirk, Lewenberg, Story, & Kevat, 2010). A Canadian study of 1269 University of Manitoba graduates between 1965 and 2000 reported that a continuum of rural educational exposure from high school through residency training was strongly associated with rural practice (Tate & Aoki, 2012). In addition, time spent in rural training and increasing distance from metropolitan area (Winnipeg) positively correlated with likelihood of practice in a rural region as well. That is, there needs to be a smooth transition between rural-oriented undergraduate training and rural residency to keep the rural intentions alive. Medical school's educational and training curriculum with a strong rural commitment plays an important role in changing rural practice perception among students so they can come to appreciate rural healthcare, rural lifestyle and people in the community.

4.4 The Role of International Medical Graduates in Addressing Physician Shortage

A recent study by Di Matteo (2014) estimated that contribution of increasing physician numbers to provincial health spending ranges from 3.2% to 13.3% of the health spending increase and thus represents a modest health care cost concern. Indeed, physicians' compensation makes up only 15% of Canadian healthcare budget (CIHI, 2014).

Increasing the physician workforce can be accomplished by either increasing medical school enrolment or by incorporating more doctors trained abroad into the workforce. It is much more expensive to increase medical school spots than to bring more graduates of international medical schools. Although there is recognition that Canada should not rely excessively on IMGs to meet its healthcare needs, IMGs and Canadians studying abroad (CSA) in particular offer an attractive short-term to mid-term solution to the current physician shortage. CaRMS estimates showed that in 2010 there were around 3,500 CSAs in foreign medical schools and over 90% of them were eager to return to Canada for postgraduate training (CaRMS, 2010). While Canadian Medical graduates' (CMG) residency match rate was 97.3% in 2011 (2507/2576) (CaRMS, 2011), the match rate of CSAs in 2011 was 38.5% (182/473) in Canada overall (this number had decreased to 31.5% in 2014 CaRMS match, owing mostly to the increase in the number of CSAs applying (287/911) (CaRMS, 2014)) and 23.9% (112/469) specifically in the province of Ontario (Thomson & Cohl, 2011). Where do the rest of them end up? Data shows that in 2011 Canada

issued 303 “Statement of need” letters to Canadian IMGs applying for J1 visa in the US, which had increased to 494 by 2012 (CAPER, 2014). Essentially, we currently observe a significant number of qualified and educated medical professionals who match successfully through NRMP in the US and will most likely stay to practice there instead of in their home country.

Attracting more Canadian IMGs/CSAs to Canada can offer a relief in shortage of PCPs. Mok et al. (2011) analyzed data from CAPER to compare CMGs and IMGs who completed residency training in Canada between 1989 and 2007. The proportion of CMG who trained in FM declined from 54% to 38%, while the proportion of IMGs who trained in FM increased from 19% to 37%. Moreover, attracting more IMGs/CSAs to Canada could help address a significant physician shortage in underserved areas, since most IMGs/CSAs entering postgraduate training in Canada sign a “return of service” commitment, obliging them to practice in an underserved community for a number of years after completion of residency depending on the province. In 2004, IMGs accounted for 26% of all physicians in rural Canada, compared with 22% in urban areas; IMGs also accounted for 27% of rural FPs compared with 23% of FPs in urban areas (CIHI, 2005). A cross-sectional study of FPs in southwestern Ontario found that IMGs, in comparison to CMGs, were more likely to practice in small towns and isolated communities and were more likely to accept new patients in their practices (Thind et al., 2007). Attracting more IMGs/CSAs offers an opportunity to specifically address inadequate numbers of PCPs in rural areas.

Although increasing opportunities for IMGs in Canada is suggested as a potential solution to help mitigate physician shortages, there are important considerations that should be taken into account. These include long-term retention rates of IMGs in rural areas and assessment of the equivalency of their medical training. CAPER (2014) data shows that the percentage of IMGs who were still active in jurisdiction they first registered in between 1998 and 2008 was 33.5% while that of CMGs was 66%, although it is unclear what percentage of that constituted specifically rural, underserved areas. Mathews et al. (2008) compared retention rates of FPs in Newfoundland and Labrador between 1997-2000 and 2004. Their data shows that retention among Memorial medical graduates was higher than retention of either IMGs or CMGs from another provinces. Interestingly, IMGs retention was no worse than the retention of CMGs from another provinces. A possible solution to retention rates would be to offer postgraduate training positions to CSAs with local background roots, as there is a strong correlation between rural origin and practice location. There are also legitimate questions about competence of IMGs. A 2005 study that analyzed mortality rates of 127 275 patients admitted to Ontario hospitals for acute myocardial infarction did not find significant differences between patients cared for by IMGs and CMGs (Ko, Austin, Chan, & Tu, 2005). Furthermore, patients in both groups had a similar likelihood of receiving secondary preventive medications at 90 days and cardiac invasive procedures at 1 year. A similar US study of 244 153 hospitalizations with acute myocardial infarction and congestive heart failure showed that IMGs were comparable to US medical graduates in terms of patient mortality (Norcini et al., 2010).

To summarize, IMGs and CSAs in particular have an important role to play in meeting Canada’s physician workforce needs. Specifically, they can provide a relief in physician shortages areas, fill specialties, which cannot attract Canadian graduates and work in underserved rural regions.

4.5 Study Limitations and Future Directions

This article cited a number of studies that relied on questionnaire-based surveys. All of them were limited by not including all medical students, residents or physicians in the country, depending on the study. The accuracy of these studies might be lower than in the case of an entire population and might not be applicable to the entire country. Respondents in the surveys were often forced to select a specific answer, which might have resulted in misclassification of variables in the studies. A number of studies did not follow their sample cohorts in time but rather provided a cross-sectional snapshot in time and, thus, were unable to capture variables that might have changed over time. Two specific studies conducted by Chan (2002) and CIHI (2005), which looked at physician FTE results, relied on the data from the National Physician Database, which contained primarily fee-for-service information and not alternative payment information. As such, this could have had a large impact on FTE results for physicians relying primarily on alternative payment methods.

This article did not provide an in depth analysis of healthcare costs. Although Canada spends more on healthcare as a percentage of its economy than most other OECD countries, its physician-to-population ratio is one of the lowest (CIHI, 2013), suggesting that there is a need for a thorough research and investigation of strategies to increase efficiency of healthcare expenditures. Furthermore, improvement of productivity of physician human resource was also beyond the scope of this article.

It is well accepted that physician shortage translates into inadequate healthcare of a population. Higher physician-to-population ratio, on the other hand, does not necessarily translate into better healthcare outcomes as

suggested by Watson and McGrail (2009), who used OECD data to assess the degree to which avoidable mortality is related to physician density. This implies that healthcare outcomes depend on other factors besides physician density, such as FP-to-specialist ratio, increased demands of an aging population, distribution of physicians throughout the country, wait times, healthcare accessibility, doctor-patient communication, intergenerational differences in physician workload and strength of primary healthcare infrastructure.

This study did not try to assess the balance between primary care providers and specialists. Current ratio of FPs to specialists in Canada is around 51/49 (CIHI, 2015). It is uncertain whether this ratio represents an optimal balance to meet the population healthcare needs. Multiple international and Canadian studies have shown that stronger primary care infrastructure improves population health outcomes (Starfield, Shi, Grover, & Macinko, 2005; Starfield, 2012). For example, an increase in the number of primary care providers is associated with reduction in total population mortality; decrease in hospitalizations, surgeries, emergency visits and readmissions; greater number of preventive care visits and earlier cancer diagnosis. Excessive specialist-to-population ratio, on the other hand, is associated with higher overall mortality and specifically mortality from heart disease and cancer; greater number of surgeries, procedures and readmissions; later cancer diagnosis and higher expenditures (Starfield et al., 2005; Starfield, 2012). Despite the proven benefits of primary care orientation, the primary care alone cannot provide adequate population healthcare needs, as ongoing care by PCPs must be complemented by specialists. Thus, further research is needed to understand what would be an ideal mix of physicians in Canada, based on population needs and availability of resources.

5. Conclusion

The nature of the physician shortage in Canada is multifactorial. Factors that most significantly contribute to the problem include past healthcare policies, changing physician and population demographics, medical student career preferences, uneven physician distribution and decline in physician productivity. It is important to acknowledge these factors and policies in order to address the issues at hand and develop successful strategies to alleviate inadequate physician supply. It is essential to understand that decisions that are made today will take at least a decade to reveal their full effect and will impact the healthcare delivery of subsequent generations of Canadians.

Competing Interests Statement

The authors declare that there are no competing or potential conflicts of interest.

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