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Should Canadian Medical Schools Implement a Widespread 3 Year Medical Curriculum?

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Abstract

Background: This paper addresses the potential costs and benefits of implementing a widespread 3 year medical curriculum across the country.

Methods: We used AFMC and AAMC databases as well as literature review to compare student demographics, curriculum, faculty and research, costs, effects on workforce, and competency between 3 and 4 year programs.

Results: 3 year medical programs appear similar to 4 year programs in respect to student demographics, classroom time, faculty numbers and research revenues, and competency of graduates produced. Three year programs have a shortened clerkship component of their curriculum, and may be slightly more cost effective than 4 year programs. Both curricular reform as well as classroom expansion can add more physicians to Canada's workforce, but classroom expansion appears to be a more effective solution to this problem.

Conclusions: There are potential benefits to implementing a widespread 3 year medical program, but there are also drawbacks which need to be taken into account.

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Introduction

Currently, there is extensive literature which demonstrates several worrisome trends emerging in Canadian health care. Physician shortages, increasing costs of obtaining a medical education, and decreasing proportions of graduates filling primary care residency positions are all pressing, interrelated issues.¹⁻⁸ It has been proposed that shortening the length of medical education in Canada from 4 years to 3 could help to produce more doctors while reducing the cost of training them.⁹ This may also help to reduce student debt, make Canadian medical training more accessible to students of lower socioeconomic status, and make careers in primary medicine more affordable and attractive to medical school graduates.^{10, 11}

The concept of a 3 year medical curriculum is not a novel idea. Canada currently has two 3 year medical schools, the University of Calgary and McMaster University, which have been in operation for more than 30 years. The United States also ran a large scale experiment beginning in 1969 on 18 different schools which temporarily converted to a 3 year curriculum.¹² So why is there currently so much discussion surrounding implementing a large scale 3 year curriculum in Canada? Large increases in tuition fees, as well as worsening shortages of physicians working in Canada (especially rurally) have spurred recent debates over implementing a widespread 3 year medical curriculum in Canada to counteract these problems. These high tuition fees are a relatively new phenomenon; these fees have skyrocketed over only the last few years. At the University of Toronto, for example, tuition fees increased from \$4,844 per year in 1998⁵ to \$16,207 in 2004.¹³ Current tuition fees are as high as \$18,586 per year at McMaster University. These increases have had several impacts, both on the students themselves and on our society as a whole. These high tuition fees have increased the debt load placed on graduating medical students in Canada, with currently more than 46% of Ontario medical students expecting graduating debts of between \$80,000 and \$160,000.¹⁴ These increasing costs also negatively affect the composition of entering medical classes. These financial barriers have been shown to reduce the proportion of students from lower socioeconomic backgrounds, thereby preferentially excluding students from rural areas and certain minority groups.^{3,4,5} Sadly, these are the very students who have been shown to be

more likely to work in under serviced areas with populations in need.⁴ If these trends continue, we will likely see fewer physicians working in rural practices, fewer physicians choosing primary care specialties, and less diversity in our physician workforce.^{8,15,16}

Medical school tuition, though high, does not cover the entirety of medical education costs. These costs are highly subsidized by the government, and so it is also important to examine medical education costs from the standpoint of a tax payer. Studies have shown that medical education costs can be categorized as instructional costs and total educational resource costs. Instructional costs refer to direct costs of medical teaching programs and their support, while total educational resource costs include the cost to support all faculty associated with medical programs. Depending on the category used, the cost of medical education is estimated at \$40,000-\$50,000 or \$72,000-\$93,000 per student per year, respectively. These studies have examined ways to mitigate costs of a medical degree, and have found that many initiatives, including small group learning, are ineffective, and that the most effective strategy to reduce medical education costs was to shorten the curriculum.¹⁰

The purpose of this study is to examine the advantages and disadvantages of instituting 3-year medical school curricula across Canada. In particular we considered the following variables: Demographic differences between the two types of programs, curriculum length (including classroom, clerkship, and elective time), faculty numbers and research revenues, costs (including tuition and educational costs), changes on workforce supply over time, and competency.

Methods

We collected clerkship duration, tuition, demographics, and faculty data for all 17 Canadian medical schools from the Association of Faculties of Canada's (AFMC) *2009 Canadian Medical Education Statistics* (volume 31). We collected classroom curriculum length data through the American Association of Medical Colleges (AAMC) online CurrMIT database. The AAMC CurrMIT database was accessed to gain information regarding classroom duration for all studied medical schools. Curriculum information was extracted from the "curriculum directory" section of this database for the 9 schools which provided online weekly breakdown of their

curricula. Curriculum durations were extracted from the "school curricula course schematic" section of the directory for the remainder of schools which provided their curriculum in a diagrammatic layout.

We performed statistical analyses to compare student demographics, curriculum, faculty and research, and tuition between the two types of programs. All comparisons were done using the independent samples t-test, adjusted for inequality of variance as needed based on the Levene's Test. Due to the relatively small sample size, all results were confirmed with the non-parametric Mann-Whitney U test.

We used literature estimates of instructional and total educational costs to determine the cost savings of a 3 year program. Since costs were shown to be associated with curriculum length, the cost savings were determined by reducing total cost estimates proportionately to the reduced curriculum of the 3 year programs. We then produced a range of potential savings.

Using AFMC class size data, we compared the number of new physicians that would be produced by implementing a widespread 3 year curriculum in Canada to the number of physicians that would be produced by expanding class sizes. We explored the results of changing 50% and 100% of 4 year medical schools in Canada to a 3 year program, as well as the results of increasing class sizes by 10% and 20%. These results were then graphed.

Finally, we performed a primary literature review to compare key indicators of physician competency and success. We included in our analysis articles from primary sources and surveys in the English language from 1978 until 2009. This information was collected using Ovid Medline (17 sources).

Results

Student Demographics

Student populations in the 4 year and 3 year Canadian medical schools tended to be fairly similar. Class sizes were not found to be significantly different between 4 and 3 year programs (154.7 vs. 187.0, $p = 0.11$). The percentage of females enrolled was almost identical between the two types of curricula, with the 4 year schools enrolling an average of 56.5% of their classes as female and the 3 years enrolling 57.1% ($p = 0.93$).

Attrition rates from the programs were also similar, averaging 2.4 vs. 2.0 for 4 year compared to 3 year programs ($p = 0.44$). No significant differences were seen in age distribution of registered applicants between the 4 vs. 3 year programs, for applicants <20 yrs (9.6% vs. 0%, $p = 0.54$), applicants 20-22 yrs (42.3% vs. 41.7%, $p = 0.93$), applicants 23-26 yrs (35.9% vs. 43.2%, $p = 0.52$), or applicants >26 yrs (12.3% vs. 15.1%, $p = 0.66$).

Curriculum

When curriculum differences were compared between the 3 and 4 year schools in Canada, we found several interesting results. Mean overall curriculum length for the 4 year medical schools in Canada was significantly longer than the 3 year programs, at 141.4 weeks compared to 129.5 ($p < 0.001$). When we looked at curricular components individually, we found that there was no significant difference in the total classroom curriculum lengths between the 3 vs. 4 year programs (72.1 vs. 71.0 weeks, $p = 0.78$). However, clerkship duration was found to be significantly longer for the 4 year programs, averaging 69.2 weeks compared to 58.5 ($p < 0.05$). With regards to clinical elective time, we found no significant differences between elective time during clerkship between the 4 vs. 3 year schools (15.8 vs. 13.5 weeks, $p = 0.52$).

Faculty and Research

Our data showed that the numbers of part time, full time, and total faculty members at 4 year and 3 medical programs in Canada were not statistically different, and that both types of schools generated similar research revenues. On average, there were 674.3 vs. 575.5 full time faculty members ($p = 0.84$), 1274.1 vs. 1287.5 part time faculty members ($p = 0.95$), and 1948.4 vs. 1863.0 total faculty ($p = 0.92$) comparing the 4 year vs. 3 year programs. Biomedical and health care research revenues were not statistically different, averaging 154,641 thousand dollars for the 4 year programs versus 221,200 thousand dollars for the 3 year ones ($p = 0.56$).

Financial Costs of a Medical Degree

Data on medical education costs indicate that these costs are directly related to net medical curriculum.¹⁰ We therefore estimate total costs of medical education by comparing total weeks of training and expressing costs as a proportion of the curricula. Low end instructional cost estimates total \$146,000 per student

for 3 year vs. \$160,000 per student for 4 year program, a difference of \$14,000. High end total educational costs expressed as a proportion of average curricula give us a cost range of \$340,693 per student for 3 year vs. \$372,000 per student for 4 year programs over the duration of the program, or a cost savings of \$31,307. Therefore, we can expect savings in costs of a 3 year program over the duration of the program would be between \$14,000 and \$31,307 per student. Tuition is another important factor in assessing the costs of medical education in Canada. Tuition was not significantly different between the 4 and 3 year programs. 4 year program students paid on average \$12,426 while 3 year students paid \$16,486 ($p=0.11$).

Workforce Supply

The 2008/09 data for class size for students in a 4 year program in Canada totals 2,321 students. Total class size for all medical schools in Canada equals 2,695. Therefore, if 50% or 100% of 4 year medical schools in Canada converted to a 3 year program, 1161 or 2321 new residents respectively would be added to first year residency programs. As seen in Figure 1, after 6 years, as many doctors are produced by simply expanding class sizes by 10% or 20% as are by converting 50% or 100%, respectively of medical schools in Canada to a 3 year curriculum. After 6 years, the increased class size

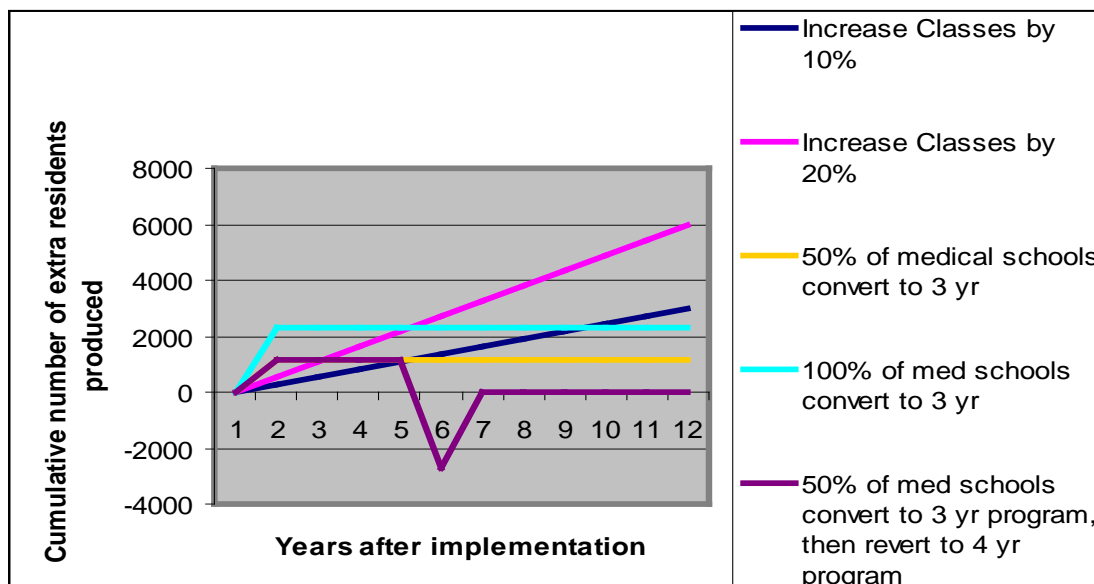
method continues to add more physicians into the system, whereas the 3 year programs do not. After 11 years, more doctors will be produced by expanding class sizes by 10% than would be produced by switching every medical school in the country to a 3 year program.

Competency

Measuring the competency of practicing physicians, as it turns out, is a complicated task. Competency can be defined in many ways, and some of these are easily measurable, while others are not. Exam scores, residency performance, and success in research and clinical career have been looked at as measures of physician competency.

In a large retrospective study performed on several US medical schools which temporarily converted to a 3 year medical program during the 1970s, analysts found that test scores and board exam marks did not vary between 3 and 4 year medical school students. In fact, some of the 3 year programs saw an increase in exam scores for certain subjects. However, there was a subjective bias against these students from several residency program directors. These directors stated that graduates from the 3 year medical programs lacked the depth of knowledge and maturity possessed by graduates from the 4 year programs.¹² These biases, however, do not seem to be supported by Canadian literature.

Figure 1. Number of new doctors working in Canada after either switching 50% or 100% of medical schools to a 3 year program compared to those produced by increasing enrollment across the country by 10% or 20%.



Recent literature on graduates from Canadian medical universities that has focused on test scores, residency success, and other predictors of physician performance tends to be positive.¹⁸⁻²¹ Studies show that graduates from one of the 3 year Canadian medical schools are as or more likely to be involved in research and academic positions compared to their four year counterparts.¹⁸ Prior observations also showed that these students perform on par or better than other graduates across the country, both on their licensing examinations and in their postgraduate training.^{19,20}

These graduates also rate similarly on self, coworker, and public scoring assessments rating professionalism, competence, psychosocial management, communication, and accessibility.²¹

Discussion

Medical education in Canada is under intense review. Medical schools are no longer producing enough physicians to care for our country's primary health needs, and the profession's diversity is being threatened. Rising costs of a medical education are changing the demographics of entering classes, and more and more students are graduating with mortgage sized debts. By using Canadian 3 year medical programs, we are able to examine the costs and benefits to implementing curricular changes to try and address these problems. Our findings showed that for most variables studied, 3 year programs and 4 year programs are fairly similar. Both programs had similar student demographics, classroom curriculum, faculty number and research revenues, as well as equally competent graduates produced. These programs differed in total clerkship time and costs, with 3 year programs having significantly less clerkship material and lower educational and tuition costs. We also found that though switching to a 3 year program would produce new residents initially, more doctors would be produced in the long term through classroom expansion. These variables are discussed in detail individually below.

Student demographics of 3 year and 4 year programs in Canada are similar. Class sizes were not significantly different between the programs, suggesting that both programs can accommodate similar numbers of students. The proportion of females in both types of programs was nearly identical, suggesting that there is no bias for or against women in one type of program

compared to the other. Attrition rates were also similar, alleviating fears that the 3 year schools may cause increased burnout and dropout rates during training. However, it should be noted that our research only reflects one year's data, and so it is difficult to make assumptions based on this small sample size. We found no statistically significant differences between age categories at 4 vs. 3 year schools, suggesting that age biases are not different between programs. Our data suggests that 3 and 4 year programs appeal to similar demographics of applicants, and do not bias against any group of students that we have examined.

Curriculum comparisons showed that 3 year programs were significantly shorter than 4 year programs, despite teaching during time when other schools have summer holidays. The 3 year schools appear to run approximately 12 weeks shorter than the 4 year programs. Most of this difference in curriculum is due to shorter clerkship exposure for students in the 3 year programs. Otherwise, classroom teaching and clerkship elective times were similar. This is reassuring, as it alleviates fears that a 3 year program forces students to miss out on basic teaching and elective opportunities. Though shortened total curriculum does not appear to affect competency, it forces these students to make earlier career decisions with less clerkship exposure than students in a 4 year program. It is unclear whether this has any impact on physician burnout rates, retirement age, or job satisfaction.

A potential downside to the 3 year programs is reduced holiday time over the summer. All of the 4 year medical schools in Canada give students time off during the summers following their first and second years of medical school. This time, while not used for formal classroom material, can be used by the students to earn money, gain research experience, travel, study, strengthen family and personal relationships, or do observerships in order to discover their medical likes and dislikes. It is unclear whether this time off may be important in the development of student's personality, and these extra factors should be studied further.

Faculty supporting both types of programs were similar, suggesting that the two types of programs require similar numbers of faculty to run. This implies that costs associated with faculty would also be similar for both types of programs. It is uncertain to what extent a change in curriculum would be disruptive to faculty and how it would affect their working schedules, and this is

an area that needs to be examined further. We also see that both types of programs generate similar biomedical and health care research revenues. This suggests that both types of programs are conducive to research, and foster students and faculty to partake in research at similar levels.

Our data suggests that there may be some financial benefit to a shorter medical program. These benefits stem from the reduction in curriculum of these programs by approximately 12 weeks. Using this we were able to reflect a savings of between \$14,000 and \$31,307 per student over the duration of the program. Though these cost savings are significant, they are lower than previous estimates which suggested that 3 year programs would save a whole year's worth of educational expenses. There may also be extra costs associated with implementing new curricula across schools in Canada, which we were not able to determine. Tuition is an area where students would see savings. Three year program students pay similar tuitions to 4 year program students; however, they pay one year less. It should be noted, however, that 4 year students, while paying for 1 year more of school, are also afforded summer holiday to partake in paid work to offset their tuition. Therefore, depending on the student's level of employment, tuition costs at the 4 year programs can be offset to a varying extent. The largest financial benefit for students of a shorter program stems from the student's ability to enter the workforce a year earlier. However, no studies have been done to determine whether these students are more likely to retire earlier than their 4 year counterparts. Therefore, care should be taken before interpreting the ability to work one year earlier as a true financial gain.

With respect to our country's physician workforce, these programs, if implemented on a wide scale across the country, could significantly increase the number of residents produced. This phenomenon, however, would be a one-time benefit that would only be seen once when these programs were implemented, and would actually reverse if these programs ever switched back to 4 years. Also, switching to a 3 year program graduates 2 classes of students at the same time, who must then find and compete for residency positions. Currently, residency programs in Canada may not be able to handle this large influx of new students, and would need to be expanded before these types of changes could be made. In the long term, other initiatives such as

increasing class sizes across the country are likely to be more effective. They produce more physicians over the long term, and graduate extra students at a slower rate, diffusing the influx into residency programs. We do not have any data to compare costs of these different initiatives.

Competencies between 3 and 4 year medical students appear to be similar. The amount of time spent learning classroom material is similar between 3 and 4 year medical graduates, and differences in clerkship duration do not appear to affect post graduate success. Test scores, as well as post graduate success are similar between both groups, alleviating fears that 3 year programs impact student's learning. The reasons for these similarities likely stem from similar classroom durations for both programs. All students appear to have equal opportunities to learn class based material, giving all students in Canada similar durations for their foundation knowledge. Clerkship, though shortened in the 3 year programs, is likely less of an influence on competency since it is fairly contiguous with residency. The effects of this shortened clinical time likely become diluted over the period of these students' residency training in Canada.

Limitations

Our study has limitations that need to be addressed. Comparisons were made using all Canadian medical schools. However given that there are only 2 three year programs, we had a limited sample size with which to run statistical analyses on. For this reason, it is difficult to make statistical comparisons between programs. We had large variances in some of our data, and so it is difficult to say that the differences or similarities noted are due to the duration of the programs alone. However, our statistical analyses were run to account for the small sample size and make the best comparisons possible with the data available.

Data on medical education costs is patchy at best and difficult to interpret. Our analyses of costs of educating medical students in 3 and 4 year programs are based on the best available data. However, even the most recent literature on medical education costs are over 10 years old and are not very specific as to where these costs are derived from. Therefore, we acknowledge that these costs represent an estimate, and that actual costs would not be apparent until the programs were actually implemented.

Conclusion

In summary, 3 year medical programs appear similar to 4 year programs in respect to student demographics, classroom time, faculty numbers and research revenues, and competency of graduates produced. Three year programs have a shortened clerkship component of their curriculum, and may be slightly more cost effective than 4 year programs. Both curricular reform as well as classroom expansion can add more physicians to Canada's workforce, but classroom expansion appears to be a more effective solution to this problem.

Overall, both types of medical training are effective for producing excellent doctors in Canada. Though more work needs to be done to fully understand the effects of the different programs on career satisfaction and personal life, there do appear to be time and government cost savings in a 3 year program. Nonetheless, tuition remains high in both types of programs, and this issue needs to be addressed to prevent medicine from becoming inaccessible to certain groups. Scholarships, rural recruiting initiatives, and government funding all need to be supported as ways to cultivate a healthy diversity of medical matriculants at Canadian Universities. In the end, having a diversity of medical training options in Canada gives students choices, and allows education to be adaptable to changing health care needs.

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