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Dr. Aaron Johnston MD; Dr. Amanda Bell MD MSc; Dr. Kristy Penner MD; Dr. Trushar Patel PhD, DSc; Ms. Grace Perez

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Dr. Aaron Johnston MD; Dr. Amanda Bell MD MSc; Dr. Kristy Penner MD; Dr. Trushar Patel PhD, DSc; Ms. Grace Perez

Abstract

Background

Regional Medical Campuses (RMCs) are an established part of the Distributed Medical Education (DME) landscape in Canada. Combined model RMCs, offering both preclinical and clinical education have shown promising results in producing physicians who work in rural and regional settings and are currently a key avenue of expansion of medical training in Canada. Existing literature suggests that new RMCs carefully consider the communities and health systems they are a part of, and lessons learned from comparable RMCs as part of their development.

Methods

We identified 4 specific domains of interest for comparing RMCs across Canada based on important elements identified in existing literature: Community, Organization, Hospitals, and Physicians. We searched high quality, publicly accessible data sources for information relevant to these domains, aggregated relevant information, and used statistical techniques to understand the range of settings for existing and proposed RMCs in Canada.

Results

We found that Canadian RMCs have been deployed into a wide variety of small to medium size urban settings and have a variety of organizational profiles. RMCs were associated with 1 to 3 large hospitals, but the size of these associate hospitals also varied greatly. We found that the environments of proposed RMCs differed somewhat from existing RMCs and included examples of novel organizational constructs, settings with smaller urban population sizes, smaller hospitals, and settings with smaller and decreasing physician workforce.

Discussion

The combined model RMC has proven to be a robust construct across Canada, deployed in a wide variety of different settings. Our data shows that the settings and structure of proposed new RMCs are somewhat different than existing RMCs. While the robust nature of the RMC model suggests that deployment into new settings is reasonable, the data also clearly shows areas that may be opportunities and challenges for each of these new, proposed, settings.

Dr. Aaron Johnston MD; aaron.johnston2@ucalgary.ca Distributed Learning and Rural Initiatives, Cumming School of Medicine, University of Calgary, Heritage Medical Research Building, Foothills Campus, 3330 Hospital Drive NW, Calgary, Alberta, Canada T2N 4Z6

Dr. Amanda Bell MD MSc; bellam@mcmaster.ca Niagara Regional Campus, Michael G. DeGroot School of Medicine, McMaster University, 1812 Sir Isaac Brock Way, St. Catharines, Ontario, Canada L2S 3A1

Dr. Kristy Penner MD; kristy.penner@ucalgary.ca Department of Family Medicine, Cumming School of Medicine, University of Calgary, Crowsnest Medical Clinic, PO Box 1080, 1, 11001-20th Ave. Blairmore, Alberta, Canada, T0K

Dr. Trushar Patel PhD, DSc; trushar.patel@uleth.ca Alberta RNA Research and Training Institute, Department of Chemistry and Biochemistry, University of Lethbridge, Lethbridge, Alberta, Canada, T1K 3M

Ms. Grace Perez; grace.perez@ucalgary.ca Distributed Learning and Rural Initiatives, Cumming School of Medicine, University of Calgary, Heritage Medical Research Building, Foothills Campus, 3330 Hospital Drive NW, Calgary, Alberta, Canada T2N 4Z6

Corresponding author: Dr. Aaron Johnston MD; aaron.johnston2@ucalgary.ca Distributed Learning and Rural Initiatives, Cumming School of Medicine, University of Calgary, Heritage Medical Research Building, Foothills Campus, 3330 Hospital Drive NW, Calgary, Alberta, Canada T2N 4Z6



Conclusion

There is a wealth of publicly accessible data available about Canadian communities and health systems, which can be compiled into domains of interest for RMCs. Our study establishes a baseline data set for Canadian RMCs that will be useful for those contemplating future implementations. Proposed RMCs may be able to use this data to predict both challenges and opportunities, as well as to identify existing RMCs with similar profiles, where information exchange may be of highest value.

Keywords: Regional Medical Campus, Medical Education, Distributed Medical Education

Introduction

Distributed Medical Education (DME) is an integral part of the medical education landscape in Canada and has been deployed in a variety of forms to meet local needs.¹ Regional Medical Campuses (RMCs) are now a well-established model of medical education and are well-integrated into Canada's medical education landscape. Support of physician workforce and healthcare access in rural and regional settings is a central driver of the ongoing development of RMCs.²

A typology of RMCs has been developed and includes 4 distinct types of campuses based on the elements of education offered at a particular RMC. The Basic Science Model offers elements of preclinical curriculum, the Clinical Model offers elements of clinical training, the Longitudinal Model offers basic science or clinical training in the context of a single longitudinal placement, and a Combined Model offers elements of both basic sciences and clinical training in place at the RMC.³ DME in Canada exists in many forms including preclinical experiences, clinical experiences such as Longitudinal Integrated Clerkships (LICs), and the combined model RMCs which offer the breadth of basic science, and clinical training. Undergraduate Medical Education (UME) programming at a regional campus site. In Canada 11 of the 17 medical schools have a total of 15 Combined model RMCs offering the breadth of UME at a regional site, and 1 school, The Northern Ontario School of Medicine, has a unique 2-campus model.

As Canada continues to face a shortage of physicians and a maldistribution of physician workforce, skewed towards large urban centers, RMCs are increasingly seen as a way to train future physicians who will eventually work in locations and disciplines of need.⁴⁻⁶ There are currently 4 new RMCs in various stages

of planning and development across Canada and based on the success of established RMCs,^{4,7} more RMCs are likely to be considered in the future.

A conundrum, central to the development of many RMCs, is that the very problem the RMC is designed to solve - physician supply and healthcare access in a regional or rural setting - is an early barrier to the creation of the RMC. Existing literature on the establishment of RMCs recommends early feasibility assessment,⁸ and that considerations about organizational structure, local partnerships, hospital and physician resources, and community readiness be early priorities.⁹ Prior literature looking at the landscape of existing RMCs is informative but relies primarily on self-description.¹⁰ Understanding community demographics, proposed organizational structure, and existing hospital and physician resources is key in understanding whether a community has the resources required to support an RMC, but to date this has not been published in the RMC literature.

In our study, we seek to use publicly available data to describe the current landscape of existing and proposed Combined model RMCs in Canada. We use a variety of available resources to describe community profiles, organizational elements of the RMCs, primary associated hospitals, and physician demographics. We present data for both established and proposed RMCs that demonstrates how this information can be utilized to predict opportunities and challenges that combined model RMCs may face during the development stage. Although this data is a snapshot in time, its nature as publicly accessible data will allow future proposed RMCs to use similar methodology to generate comparative data about their own communities as an early step in the development process, identifying potential challenges

and existing RMC sites that may have faced similar challenges.

Methods

This study aims to focus specifically on existing and proposed combined model RMCs as these are a current focus of expansion across Canada. DME in Canada has been deployed in a variety of forms, and across a range of settings. Combined model RMCs have been deployed mainly in small and medium-sized urban settings, while clinical RMCs in the form of Longitudinal Integrated Clerkships (LICs) have been deployed mainly in small rural settings.

We did not include data on the Northern Ontario School of Medicine (NOSM), which composed as an RMC. We did not include the University of British Columbia's Fraser Medical Cohort, which would fit more clearly into a Regional Clinical Campus in Chiefetz' typology.³ We did not include proposed new medical schools being developed as stand-alone institutions.

We identified 4 specific domains of interest for comparing RMCs across Canada based on important elements identified in existing literature around the development of new RMCs: Community, Organization, Hospitals, and Physicians.^{8,9} We explored different potential information sources and selected those with high-quality, reliable and relevant, publicly available information available for all or for most Canadian RMCs settings.

Data sources for the organizational profile included Association of Faculties of Medicine of Canada data holdings¹⁰ and review of individual program websites.¹² Data source for the community profile were from Statistics Canada.¹³ Data source for the hospital profile were from the Canadian Institute for Health Information.¹⁴ Data source for the physician profile were from Scott's Directory meta data, aggregated by the Canadian Institute for Health Information.¹⁵

We grouped the RMCs according to the Canadian geographic region in which each school is located, i.e., Atlantic, Central, and West/Prairies.

For simplicity of data presentation, we present mean and standard deviation within tables. Supplementary data tabled including median and inter-quartile ranges are available.¹⁶

We evaluated the proposed RMCs by comparing their characteristics with other established RMCs, firstly, with RMCs located in the same Canadian region and secondly, with all the RMCs across Canada. To facilitate the comparisons, we described and summarized the information for each geographic region and across Canada by calculating the means, standard deviations, median and interquartile ranges (IQR) of the data distribution. We reported both means and medians to describe the average or center of the distributions. When the mean and median are far apart, it indicates distortion or imbalance in the data, and the median would be the better measure of the average. When the mean is less than the median, there could be a few data points that are uncommonly small (e.g. hospital occupancy rate), resulting in a distribution with a longer left tail (left skew). Vice versa, when the mean is greater, there could be some unusually large data points (e.g. household income) so the distribution has a longer tail to the right (right skew). To identify potentially divergent characteristics, we employed the standard statistical method for detecting outliers by calculating statistical fences for the data. The lower fence is based on a distance 1.5 times the IQR below the first quartile (Q1), while the upper fence is the distance 1.5 times from the IOR above the third quartile (Q3). A lower fence can be negative even when all the data values are strictly positive. For strictly positive data, we can consider the lower fences as zero. Characteristics of proposed RMCs that fall outside the statistical fences are denoted by single asterisk (*) as outliers within their geographic region and by double asterisks (**) as outliers across Canada. has a unique 2 campus model, but is not

Results

Organizational profile

The organizational structure of RMCs in Canada is summarized in Table 1. All campuses have a unique campus name. Yearly student intake varies between 24 and 64, with a mean of 33.3 students per year.

Most campuses are centered in a single regional city, with the proposed Southern Alberta Medical Program being the only program spread across 2 regional cities. Local senior leadership is most often at the Associate Dean level, with instances of Vice-Dean occurring at French language schools in Quebec, and Senior Associate Dean occurring in Atlantic Canada. The proposed RMC at the University of Prince Edward Island Faculty of Medicine is unique in having a Dean as the senior leadership position, likely because while this location intends to start as an RMC, the goal for this program is to become a stand-alone medical school over time. There is organizational variability relating to partnerships, with some RMCs affiliated with a local partner university, some with a local health system, and others with no official local partnership.

Table 1. Organization Profile of Regional Medical Campuses, Affiliated Institutions and Student Allotment^{11,12}

Status	Canada Region	Medical School	Campus Location (City)	Campus Name	Local Leadership	Affiliated Institution	Language of Instruction	Students (Yearly)			
Established	Atlantic	Dalhousie University	Saint John	Dalhousie Medicine New Brunswick	Senior Associate Dean	University of New Brunswick	English	30			
		McGill University	Gatineau	Campus Outaouais	Vice-doyenne	Centre intégré de santé et services sociaux (CISSS) de l'Outaouais	French	24			
		McMaster University	St. Catharines	Niagara Regional Campus	Regional Assistant Dean	Brook University	English	32			
			Waterloo	Waterloo Regional Campus	Regional Assistant Dean	University of Waterloo	English	32			
		<i>School Total</i>								64	
		Queen's University	Oshawa	Queen's-Lakeridge Health MD Family Medicine Program	Assistant Dean	Lakeridge Health	French	20			
			Moncton	Centre de Formation Médicale de Nouveau Brunswick	Doyen associé	Université de Moncton	French	24			
		Central	Université de Sherbrooke	Montréal (Longueuil)	Programme de formation médicale en Montérégie	Doyen associé	None	French	24		
			Saguenay	Université de Sherbrooke-Saguenay	Doyen associé	Université du Québec à Chicoutimi	French	32			
				<i>Total</i>							
			Université Laval	Lévis	Université Laval-Lévis	Vice-doyen adjoint	None	French	30		
		West/ Prairies	Rimouski	Université Laval-Rimouski	Vice-doyenne adjointe	Université de Québec à Rimouski (UQAR)	French	24			
	<i>School Total</i>								54		
	Proposed	Atlantic	Dalhousie University	Sydney	Cape Breton Medical Campus	Senior Associate Dean	Cape Breton University	English	30		
			Memorial University	Charlottetown	University of Prince Edward Island Faculty of Medicine	Dean	University of Prince Edward Island	English	20		
		West/ Prairies	University of Alberta	Grande Prairie	Northern Alberta Medical Program	TBD	Northwestern Polytechnic	English	30		
			University of Calgary	Lethbridge	Southern Alberta Medical Program	TBD	University of Lethbridge	English	30		
		Medicine Hat									
		<i>School Total</i>								30	
		<i>Proposed RMC sub-total</i>								110	
		<i>Established RMC sub-total</i>								574	
		<i>OVERALL TOTAL</i>								684	

TBD = To be determined

Doyen/Doyenne associé = Associate Dean

Vice-doyen/doyenne = Vice Dean

Community Profile

Community profile data is summarized in Tables 2.1 and 2.2. Population centre size for current RMCs varies between 48935 and 717961 with a median of 177367. With population sizes of 30960 and 38809, proposed RMCs in Sydney, Nova Scotia and Charlottetown, Prince Edward Island, represent the smallest cities where RMCs have been deployed in Canada. Both Sydney, Nova Scotia, and Grande Prairie, Alberta have Indigenous population percentages that are higher than most other Canadian RMCs. For results that include medians and IQRs, please refer to the supplementary data.¹⁶

Table 2.1. Regional Medical Campuses and Community Profiles¹³

Status	Canada Region	Medical School	Campus Location (City)	Population 2021	% Population Change 2016-2021	Average Age	% Post-secondary Education	% Poverty status	% Indigenous Population	Median After Tax Household Income	
Established	Atlantic	Dalhousie University	Saint John	68995	3.4	43.3	49.7	11.4	2.8	56000	
		McGill University	Gatineau	291041	5.4	40.3	60.3	5.4	4.1	69500	
		McMaster University	Niagara Falls	94415	7.2	43.9	50.8	7.5	2.7	67500	
			St. Catharines	136803	2.8	44.3	53.0	8.9	2.5	65000	
		Queen's University	Waterloo	121436	15.7	39.2	64.6	11.9	1.3	82000	
			Oshawa	175383	10	40.3	51.3	7.8	3.1	78000	
		Central	Université de Sherbrooke	Montréal (Longueuil)	254483	6.1	41.7	60.6	7.0	1.3	62000
				Saguenay	144723	-0.8	45.1	64.1	5.5	3.8	60000
			Université Laval	Lévis	149683	4.4	42.9	67.3	3.4	1.3	71000
				Rimouski	48935	0.6	45.6	65.0	5.3	1.7	58000
			Université de Montréal	Trois-Rivières	139163	3.5	45.8	60.8	7.1	1.9	53600
			University of Toronto	Mississauga	717961	-0.5	41.1	61.5	9.0	0.5	89000
	West/ Prairies	University of Western Ontario	Windsor	229680	5.7	41.4	50.0	10.8	2.9	63600	
			Kelowna	144576	13.5	43.4	58.0	10.2	5.6	73500	
		University of British Columbia	Prince George	76708	3.7	40.0	49.0	7.3	15.3	77500	
			Victoria	91867	7.1	45.2	67.9	13.2	5.0	60000	
		University of Saskatchewan	Regina	226404	5.3	39.0	54.9	8.9	10.4	76500	
		Proposed	Atlantic	Dalhousie University	Sydney	30960	2.6	45.2	52.5*	9.1*	7.6*
	Memorial University			Charlottetown	38809	7.5	42.4	62.1	13.6	2.0	58000
	West/ Prairies		University of Alberta	Grande Prairie	64141	1.5	35.0	48.6	6.4	11.7	88000
			University of Calgary	Lethbridge	99406	6.1	40.2	53.3	8.9	6.6	73000
	Medicine Hat			63271	0	42.7	48.5	8.2	5.2	69500	

† This data is reported for the region of Cape Breton, which includes Sydney, NS

Table 2.2. Regional Medical Campuses and Community Profiles - Comparison of Distributions

Community Metrics	Atlantic/Central				West/Prairies				OVERALL Established Mean (SD)
	Established Mean (SD)	Proposed		Established Mean (SD)	Proposed				
Medical School	9	Dalhousie Univ	Memorial Univ	2	Univ Alberta	Univ Calgary		11	
Regional Medical Campus	13	Cape Breton Medical Campus	Univ PEI Faculty of Medicine	4	Northern AB Medical Program	Southern AB Medical Program		17	
Affiliated Institution	10	Cape Breton Univ	Univ PEI	3	Northwestern Polytechnic	Univ Lethbridge		13	
Campus Location	14	Sydney	Charlottetown	4	Grande Prairie	Lethbridge Regional Hospital	Medicine Hat	18	
Affiliated Hospital	16	Cape Breton Healthcare Complex	Queen Elizabeth Hospital	5	Grande Prairie Regional Hospital	Chinook Regional Hospital	Medicine Hat Regional Hospital	21	
Population 2021	183504 (167415)	30960	38809	134889 (67589)	64141	98406	63271	177367 (150947)	
Population Change 2016-2021 (%)	5.3 (4.5)	2.6	7.5	7.4 (4.3)	1.5	6.1	0	5.6 (4.5)	
Average Age	42.6 (2.1)	45.2	42.4	41.9 (4.3)	35	40.2	42.7	42.5 (2.2)	
Post-secondary Education (%)	58.2 (6.3)	52.5	62.1	57.4 (7.9)	48.6	53.3	48.5	58.0 (6.4)	
Poverty status (%)	7.6 (2.6)	9.1	13.6	9.9 (2.5)	6.4	8.9	8.2	8.1 (2.7)	
Indigenous population (%)	2.3 (1.0)	7.6*	2	9.1 (4.8)	11.7**	6.6	5.2	3.8 (3.6)	
Median After Tax Household Income	66657 (10118)	55000	58000	71675 (8097)	88000	73000	69500	67817 (9739)	

* Outlier within region

** Outlier across Canada

Hospital Profile

Hospital Data is presented in Tables 3.1 and 3.2 for primary RMC hospital sites. All hospitals are in CIHI's Teaching Hospital, or Large Community Hospital categories. Hospital bed size for existing RMCs varies greatly from 159 to 1117 with a mean bed count of 501 beds. The proposed hospital sites in Charlottetown, Lethbridge, and Medicine Hat are smaller than many existing RMCs for hospital bed size, while the hospital in Grande Prairie will be the smallest hospital bed size in a Canadian RMC implementation at 138 beds. For results that include medians and IQRs, please refer to the supplementary data.¹⁶

Table 3.1. Regional Medical Campuses and Affiliated Hospital Profiles¹⁴

Status	Canada Region	Medical School	Health Region	Affiliated Hospital	Type	Occupancy Rate (%)	Acute Care Beds	Acute Care Stay	Ave Hospital Stay	ED Visits	Admission thru ED
Established	Atlantic	Dalhousie University	Zone 2 (Saint John Area)	Saint John Regional Hospital	Teaching	86.1	383	1197	7.9	43940	43.7
			McGill University	Outaouais Region	CISSS de 'Outaouais' Gatineau Hospital	Community Large	67.7	610	21821	7.7	138065
		McMaster University	Waterloo Wellington LHN	Grand River Hospital	Community Large	99.4	314	22924	6.3	75278	41.7
	Gueth General Hospital			Community Large	NDA	197	13945	5.5	56818	53.9	
	Central	Queen's University	Central East LHN	St. Mary's General Hospital	Community Large	87.1	191	8957	7.6	58627	73.4
				Niagara Health System	Community Large	86.7	598	33060	7.2	146798	57.4
		Université de Sherbrooke	Zone 1 (Moncton Area)	Lakeridge Health	Community Large	83.3	557	35562	6.4	193560	55.6
				Dr. Georges-L. Dumont University Hospital Centre	Community Large	89.2	159	7203	9.1	29399	49.4
		Université Laval	Saguenay-Le-Saint-Jean Region	Hôpital de Chicoutimi	Community Large	62.7	647	28426	6.5	183529	56.2
				Hôpital Charles-Le Moyne	Community Large	80.9	700	36143	6.9	141553	64.6
		Université de Moncton	Bas-Saint-Laurent Region	Hôpital régional de Rimouski	Community Large	70.8	339	18908	5.8	120836	56.9
				Hôpital régional de Lévis	Community Large	86.7	474	31798	6	242962	57.6
		University of Toronto	Mauricie et Centre-du-Québec Region	Centre hospitalier affilié universitaire régional (CHAU)	Community Large	69.6	1117	49078	6.5	186094	62.3
				Credit Valley Hospital and Mississauga Hospital †	Community Large	91.7	1030	55883	6.8	214911	52.5
	University of Western Ontario	Erie St. Clair LHN	Windsor Regional Hospital	Community Large	83.3	532	29924	6.3	88732	55.4	
			Kelowna General Hospital	Teaching	NDA	365	25941	7.5	89047	57.1	
	West/Prairies	University of British Columbia	Northern Interior	University Hospital of Northern BC	Teaching	96.5	381	19940	9.7	62737	58.9
				Royal Jubilee Hospital	Teaching	97.2	194	11290	9.6	49280	51.9
University of Saskatchewan		South Vancouver Island Health Region	Victoria General Hospital	Teaching	95.0	325	20543	6.6	66375	49.4	
	Regina Qu'Appelle Health Region		Teaching	74.9	377	25608	6	56152	40.4		
Proposed	Atlantic	Dalhousie University	Eastern Zone	Cape Breton Healthcare Complex	Community Large	85.8	360	11633	11.3	41601	61.9
			Health PEI	Queen Elizabeth Hospital	Community Large	88.2	243	8776	8.3	42013	56.1
	West/Prairies	University of Alberta	North Zone	Grande Prairie Regional Hospital	Community Large	85.0	138	9389	6.3	51682	45.3
			South Zone	Chinook Regional Hospital	Community Large	82.7	222	13769	7	64709	50.6
	Medicine Hat Regional Hospital	Community Large	70.5	145	9666	6.6	39214	56.5			

†Aggregate data reported for these hospitals
NDA = No data available

Table 3.2. Regional Medical Campuses and Affiliated Hospital Profiles – Comparison of Distributions

Hospital Metrics	Atlantic/Central			West/Prairies			OVERALL
	Established Mean (SD)	Proposed		Established Mean (SD)	Proposed		
Medical School	9	Dalhousie Univ	Memorial Univ	2	Univ Alberta	Univ Calgary	11
Regional Medical Campus	13	Cape Breton Medical Campus	Univ PEI Faculty of Medicine	4	Northern AB Medical Program	Southern AB Medical Program	17
Affiliated Institution	10	Cape Breton Univ	Univ PEI	3	Northwestern Polytechnic	Univ Lethbridge	13
Campus Location	14	Sydney	Charlottetown	4	Grande Prairie	Lethbridge	18
Affiliated Hospital	16	Cape Breton Healthcare Complex	Queen Elizabeth Hospital	5	Grande Prairie Regional Hospital	Chinook Regional Hospital	21
Occupancy Rate (%)	82.5 (10.3)	85.8	88.2	90 (10.0)	85	82.7	84.2 (10.7)
Acute Care Beds	555 (301)	360	243	328 (78)	138	222	145
Acute Care Stay (Days)	29168 (15058)	11633	8776	20865 (5930)	9389	13769	9666
Average Hospital Length of Stay	6.8 (0.9)	11.3**	8.3	7.9 (1.7)	6.3	7.0	6.6
Number ED Visits	133376 (88440)	41601	42013	64519 (14683)	51682	64709	39214
Admission thru ED	55.1 (7.7)	61.9	56.1	51.5 (7.3)	45.3	50.6	56.5

* Outlier within region
** Outlier across Canada

Physician Profile

Physician data is presented in Tables 4.1, 4.2, 4.3, and 4.4. This data as collected by geographic zone and includes the area surrounding each RMC. Existing RMCs had a mean of 124.6 Family Physicians and 108.2 Specialist Physicians per 100K population. Of the proposed RMCs only the Cape Breton Medical Campus had more Family Physicians/100K than the mean, while other proposed sites were all lower. The Northern Alberta Medical Program, with only 85.7 Family Physicians/100K at the low end of all RMCs in Canada. All proposed RMC sites had less than mean values for Specialist Physicians/100K, and the Northern Alberta Medical Program at 27.6 Specialist Physicians/100K is lower than any other RMC in Canada. Over the interval from 2018-22 most RMCs experienced growth in both Family Physicians and Specialists. Proposed RMCs in Alberta, the Northern and Southern Medical Programs, saw decreases in both Family and Specialist Physicians over the same interval. The proposed Alberta programs also had fewer female Family and Specialist Physicians than existing RMCs. For results that include medians and IQRs, please refer to the supplementary data.¹⁶

Table 4.1.1. Regional Medical Campuses and Profiles of Family Physicians Practicing in the Community¹⁵

Status	Canada Region	Medical School	Campus Location (City)	Total FP 2018	Total FP 2022	%Change 2018-22	# per 100K Popn 2022	Average Age 2022	Female FP 2022	Canada Trained 2022	
Established	Atlantic	Dalhousie University	Saint John	210	219	4.3%	120	53.0	43%	71	
		McGill University	Galneau	448	505	12.7%	123	50.6	56%	81	
		McMaster University	Niagara Falls and St. Catharines & Waterloo	1554	1614	3.9%	104	49.6	46%	61	
	Central	Queen's University	Oshawa	1458	1520	4.3%	87	49.8	44%	6	
		Moncton	308	321	4.2%	132	48.4	63%	81		
		Université de Sherbrooke	Montréal (Longueuil)	1417	1575	11.2%	107	50.3	62%	91	
		Saguenay	395	435	10.1%	154	48.4	61%	91		
		Université Laval	Lévis	457	487	6.6%	110	50.8	58%	91	
		Rimouski	290	321	10.7%	160	48.9	65%	91		
		Université de Montréal	Trois-Rivières	624	666	6.7%	123	47.1	61%	91	
		University of Toronto	Mississauga	1283	1414	10.2%	109	50.0	48%	5	
		University of Western Ontario	Windsor	616	635	3.1%	93	48.7	39%	51	
		West/Prairies	University of British Columbia	Prince George	233	242	3.9%	159	46.6	42%	51
			University of Saskatchewan	Victoria	737	819	11.1%	186	50.3	49%	71
		Proposed	Atlantic	Dalhousie University	Sydney	196	207	5.6%	129	50.7	46%
Memorial University	Charlottetown			174	193	10.9%	113	50.6	42%	81	
West/Prairies	University of Alberta		Grande Prairie	411	392	-4.6%	86	46.7	37%	31	
	University of Calgary		Lethbridge and Medicine Hat & ...	373	320	-14.2%	102	47.9	35%	51	

⁵ Aggregate data reported for these communities

Table 4.1.2. Regional Medical Campuses and Profiles of Specialist Physicians Practicing in the Community ¹⁵

Status	Canada Region	Medical School	Campus Location (City)	Total SP 2018	Total SP 2022	%Change 2018-22	# per 100K Popn 2022	Ave Age 2022	Female SP 2022	Canada Trained 2022	
Established	Atlantic	Dalhousie University	Saint John	247	287	16.2%	158	51.9	30%	68%	
		McGill University	Galneau	253	272	7.5%	67	50.5	43%	86%	
		McMaster University	Niagara Falls and St. Catharines & Waterloo	1912	2022	5.8%	130	49.0	38%	68%	
	Central	Queen's University	Oshawa	597	657	10.1%	73	49.5	37%	70%	
		Moncton	286	382	33.6%	157	48.8	40%	77%		
		Université de Sherbrooke	Montréal (Longueuil)	1079	1134	5.1%	77	48.2	52%	91%	
		Saguenay	307	326	6.2%	115	46.3	46%	98%		
		Université Laval	Lévis	383	415	8.4%	93	47.7	51%	98%	
		Rimouski	236	238	0.8%	119	47.8	47%	95%		
		Université de Montréal	Trois-Rivières	475	506	6.5%	94	47.6	47%	95%	
		University of Toronto	Mississauga	1013	1233	21.7%	95	48.3	38%	69%	
		University of Western Ontario	Windsor	453	489	8.5%	69	52.5	26%	51%	
		West/Prairies	University of British Columbia	Prince George	468	555	18.6%	131	48.7	33%	81%
			University of Saskatchewan	Victoria	331	352	6.3%	113	49.9	34%	54%
		Proposed	Atlantic	Dalhousie University	Sydney	153	153	0.0%	95	51.5	35%
Memorial University	Charlottetown			131	160	22.1%	94	49.8	32%	80%	
West/Prairies	University of Alberta		Grande Prairie	128	126	-1.6%	28	50.8	26%	37%	
	University of Calgary	Lethbridge and Medicine Hat & ...	235	227	-3.4%	72	49.9	23%	55%		

⁵ Aggregate data reported for these communities

Table 4.2.1. Regional Medical Campuses and Profiles of Family Physicians Practicing in the Community - Comparison of Distributions

Physician Metrics	Atlantic/Central				West/Prairies		OVERALL Established Mean (SD)
	Established Mean (SD)	Proposed		Established Mean (SD)	Proposed		
Medical School	9	Dalhousie Univ	Memorial Univ	2	Univ Alberta	Univ Calgary	11
Regional Medical Campus	13	Cape Breton Medical Campus	Univ PEI Faculty of Medicine	4	Northern AB Medical Program	Southern AB Medical Program	17
Affiliated Institution	10	Cape Breton Univ	Univ PEI	3	Northwestern Polytechnic	Univ Lethbridge	13
Campus Location	14	Sydney	Charlottetown	4	Grande Prairie	Lethbridge/Medicine Hat	18
FPs Total 2018	817 (519)	196	174	463 (221)	411	373	738 (487)
FPs Total 2022	872 (549)	207	193	519 (269)	392	320	793 (515)
FPs Change % (2022-2018)	7.0 (3.3)	5.6	10.9	10.6 (6.6)	-4.6	-14.2*	7.8 (4.3)
FPs/100K Population 2022	116.1 (21.3)	128.7	113.1	154.4 (27)	85.7	102.2	124.8 (27.3)
FPs Average Age 2022	49.4 (1.5)	50.7	50.6	49.3 (1.8)	46.7	47.9	48.4 (1.5)
FPs Female Ratio 2022 (%)	52.7 (8.8)	46.4	42.0	44.1 (3.0)	36.5	35.4	50.8 (8.6)
FPs Canada Trained 2022 (%)	77.9 (18.5)	69.4	85.0	57.5 (16.4)	34.4	55.6	75.0 (19.0)

* Outlier within region

** Outlier across Canada

Table 4.2.2. Regional Medical Campuses and Profiles of Specialist Physicians Practicing in the Community - Comparison of Distributions

Physician Metrics	Atlantic/Central				West/Prairies		OVERALL Established Mean (SD)
	Established Mean (SD)	Proposed		Established Mean (SD)	Proposed		
Medical School	9	Dalhousie Univ	Memorial Univ	2	Univ Alberta	Univ Calgary	11
Regional Medical Campus	13	Cape Breton Med Campus	Univ PEI Faculty of Medicine	4	Northern AB Medical Program	Southern AB Medical Program	17
Affiliated Institution	10	Cape Breton Univ	Univ PEI	3	Northwestern Polytechnic	Univ Lethbridge	13
Campus Location	14	Sydney	Charlottetown	4	Grande Prairie	Lethbridge/Medicine Hat	18
SPs Total 2018	735 (590)	153	131	383 (205)	128	235	657 (544)
SPs Total 2022	798 (625)	153	160	443 (256)	126	227	719 (577)
SPs Change % (2022-2018)	9.8 (8.6)	0.0	22.1*	13.4 (8.6)	-1.6	-3.4	10.6 (8.2)
SPs/100K Population 2022	103.4 (32)	95.1	93.7	125 (32)	27.6	72.5	108.2 (32)
SPs Average Age 2022	49.1 (7.4)	51.5	49.8	49.3 (0.7)	50.8	49.9	49.2 (1.5)
SPs Female Ratio 2022 (%)	38.2 (6.9)	35.3	31.9	34.8 (1.7)	27.8*	22.5*	38.2 (6.9)
SPs Canada Trained 2022 (%)	78.7 (15.0)	66.9	79.6	68.1 (14.8)	37.3	55.1	76.3 (15.2)

* Outlier within region

** Outlier across Canada

Discussion

Existing RMCs have been deployed across a wide variety of communities and health systems in Canada, from large cities like Mississauga, to smaller regional communities like Rimouski. Most RMC communities have growing populations. RMCs had a variety of affiliation arrangements with local universities, local branches of home universities, local health systems, or no formal affiliations. RMCs had between 1 and 3 primary associated hospitals, and these hospitals varied greatly in size and volume based on number of acute care beds, average occupancy, and emergency department visits. Most areas with an existing RMC showed growth of Family Physicians and Specialist Physicians over time. Existing RMCs accepted 24 to 64 students per year, per campus with a total annual intake of 566 students across all existing Canadian RMCs. Proposed RMCs will add an additional 110 students to the annual total intake.

The data also shows that the 4 proposed RMCs will have some differences from established RMCs. RMCs in Charlottetown, Prince Edward Island, and Sydney,

Nova Scotia will be in the smallest Canadian communities to host an RMC. The RMC in Charlottetown will have a different organizational structure, with a Dean as senior leader, associated with a mandate to grow beyond an RMC and into a stand-alone medical school. The Northern and Southern Alberta Medical Programs are being deployed in environments with shrinking physician populations, and smaller percentages of female physicians than existing RMCs. The Southern Alberta Medical program will use 2 primary hospitals that are further geographically separated than at any existing RMC. The Northern Alberta Medical Program will have the smallest primary associated hospital of any RMC in Canada, and physicians per 100K population that are much lower than any existing RMC, particularly for specialist physicians.

The RMC model has proven to be both effective and robust in Canada, with successful deployment across a wide variety of settings and in both English and French language settings. Physician growth in settings with RMCs is reassuring that this modality of medical education continues to have a positive impact on the supply of physicians outside of large urban centers in Canada. The data also shows some of the challenges that proposed RMCs may face which may require novel solutions. From different organizational structures, increased distances between primary hospitals, and physician workforces that are shrinking, or smaller than expected for population, proposed campuses can use this data to develop strategies and plans to address these issues. Since the model is robust it seems reasonable to continue to create RMCs in new environments, but challenges should be expected and planned for. Future proposals for new RMCs can use this baseline data, as well as generate updated data using these methods, to help identify opportunities and challenges, and to identify existing campuses with similar demographics whose existing solutions may be highly valuable for RMCs in development.

Limitations

This study relies on publicly available data sources. These sources are typically not current year data, for example, the Canadian census is carried out every 4

years with the last data set being from 2021. Organizational data from program websites, particularly regarding affiliated institutions and health systems, was variably reported and it is possible that there are affiliations and partnerships that are not publicly reported and have been missed.

Some types of data we were interested in, such as information about Indigenous physicians in local regions, funding models, economic impact of RMCs, and local student and rental housing information, does not exist in a form that is publicly available or that would allow comparisons across Canada.

Conclusion

There is a wealth of publicly accessible data is available about Canadian communities and health systems, which can be compiled into domains of interest for RMCs. Our study establishes a baseline data set for Canadian RMCs that will be useful for those contemplating future implementations. The data shows that Canadian RMCs have been implemented in a wide range of communities and health systems. While it is reassuring that the RMC model is robust across different implementation environments the data does clearly outline challenges that may vary from one implementation to another. Developing an understanding of the local conditions using a data driven approach will help current and future RMC developers to identify and mitigate challenges that are particular to their localities.

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Appendix 1: Canadian RMC Websites

Medical School	Regional Campus Location (City)	Campus Name	URL
University of British Columbia	Victoria	Island Medical Program	https://imp.med.ubc.ca/
	Prince George	Northern Medical Program	https://www2.unbc.ca/northern-medical-program
	Kelowna	Southern Medical Program	https://smp.med.ubc.ca/
University of Alberta	Grande Prairie	Northern Alberta Medical Program	No current website
University of Calgary	Lethbridge	Southern Alberta Medical Program	No Current website
University of Saskatchewan	Regina	Regina Campus	https://medicine.usask.ca/regina/
University of Western Ontario	Windsor	Windsor Campus	https://www.uwindsor.ca/medicine/
University of Toronto	Mississauga	Mississauga Academy of Medicine	https://md.utoronto.ca/mississauga-academy-medicine
McMaster University	Waterloo	Waterloo Regional Campus	https://ugme.healthsci.mcmaster.ca/about-us/our-campuses/waterloo-regional-campus/
	St. Catharines	Niagara Regional Campus	https://ugme.healthsci.mcmaster.ca/about-us/our-campuses/#tab-content-niagara-regional-campus
Queen's University	Oshawa	Queen's-Lakeridge Health MD Family Medicine Program	https://meds.queensu.ca/academics/undergraduate/admissions-queens-lakeridge-health-md-family-medicine-program/about
Université Laval	Rimouski	Université Laval - UQAR	https://www.uqar.ca/etudes/etudier-a-l-uqar/programmes-d-etudes/docl
	Lévis	Université Laval - Lévis	https://www.fmed.ulaval.ca/etudes/doctorat-en-medecine
Université de Sherbrooke	Montérégie (Longueuil)	Programme de formation médicale en Montérégie	https://www.usherbrooke.ca/etudes-medecine/programmes-detudes/doctorat-en-medecine/sites-de-formation/site-monteregie
	Saguenay	Programme de formation médicale à Saguenay (PFMS)	https://www.uqac.ca/medecine/
	Moncton	Centre de Formation Médicale de Nouveau Brunswick	https://www.umoncton.ca/medecine/
Université de Montréal	Trois-Rivières	Mauricie Campus	https://medecine.umontreal.ca/faculte/installations/campus-en-mauricie/
McGill University	Gatineau	Campus Outaouais	https://www.mcgill.ca/ugme/mdcm-program/our-two-campuses/campus-outaouais/welcome
Dalhousie University	Saint John	Dalhousie Medicine New Brunswick	https://medicine.dal.ca/departments/core-units/DMNB.html
	Sydney	Cape Breton Medical Campus	https://medicine.dal.ca/departments/core-units/cbmc.html
Memorial University	Charlottetown	University of Prince Edward Island Faculty of Medicine	https://www.upei.ca/medicine