Ensuring cardiac rehabilitation access for the majority of those in need: A call to action for Canada

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ABSTRACT

Cardiac rehabilitation (CR) is proven model of secondary prevention. Indicated cardiac conditions for CR are well-established, and participation of these patient groups results in significantly lower mortality and morbidity when compared to usual care.

There are approximately 170 CR programs in Canada, and this varies widely by province. There is grossly insufficient capacity to treat all indicated patients in Canada, and beyond. Density of CR services is about half what is observed in the United States, at 1 program per 208,823 inhabitants, or 1 program per 7,779 cardiac patients.

Despite the Canadian Cardiovascular Society target of 85% referral of indicated cardiac inpatients, significantly fewer patients are referred to CR. Moreover, certain patient groups, such as women, ethnocultural minorities and those of low socioeconomic status are less likely to access CR, despite greater need due to poorer outcomes. CR appears to be reaching a healthier population, who are perhaps more adherent to secondary prevention recommendations, and hence in less need of the limited CR spots available.

The reasons for CR under-utilization are well-established, and include factors at the patient, referring provider, CR program and health system-levels. A Cochrane review has established some effective interventions to increase CR utilization, and these must be implemented more broadly. We must advocate for CR reimbursement. Finally, we must re-allocate our CR resources to patients in the greatest need. This may involve risk stratification, with subsequent allocation of lower-risk patients to a more widely-available, lower-cost, and effective alternative model of CR.

Summary

Cardiac rehabilitation (CR) works, in Canada and beyond. CR is under-used, particularly by those who need it most. Strategies to increase CR use have been established, but they must be widely implemented. CR capacity needs to be greatly increased, and this can potentially be achieved by greater CR reimbursement, as well as more efficient approaches to patient stratification and program model allocation. We must establish lower-cost models of delivery for lower-risk patients.

Cardiovascular disease (CVD) is among the most incident and prevalent health conditions globally, and is a major cause of morbidity.[1] This is arguably due to globalization of the food industry (i.e., processed foods) and technological advances leading to sedentary behavior at the population-level, as well as advances in acute therapies for CVD such that many patients survive an initial cardiac event.[2] Thus, there are many people living with CVD, which negatively impacts their quality and quantity of life. A proven model of care to mitigate this is cardiac rehabilitation (CR).

CR is an outpatient chronic disease management program comprised of approximately 5 core components, namely risk factor assessment and management, structured exercise training, nutrition counselling, patient education, and psychosocial counselling.[3] These components are delivered by an inter-professional team of healthcare providers. As per Canadian Cardiovascular Society policy,[4] patients with myocardial infarction, chronic stable angina or heart failure, as well as following revascularization, cardiac transplantation or ventricular assist device implantation, should be referred to CR (i.e., patients who “need” CR).

The benefits of CR are well-established. The latest Cochrane review demonstrated 26% reduction in cardiovascular mortality and 18% reductions in re-hospitalization compared to controls.[5] Myocardial infarction was also reduced significantly after 3 years. Population-based, observational Canadian data also establishes the benefits of CR participation. Data from Ontario showed CR participation was associated with 50% mortality reductions when compared to population-matched controls.[6] Data from Alberta showed that patients who complete CR have significantly lower mortality compared to those who do not, specifically 64% lower in women and

49% lower in men.[7] Moreover, CR is demonstrated as cost-effective,[8] and “good value for money”, although more research on the economics of CR is needed. Given the well-established evidence of benefit, CR is a Class I Level A recommendation in cardiovascular clinical practice guidelines.[9]

Cardiac Rehabilitation in Canada

There are approximately 170 CR programs in Canada, with no programs in the North.[10,11] The availability of programs varies widely by province (Table 1), arguably due to differing reimbursement policies. For example, Ontario has the most programs. CR services were reimbursed by the Ministry of Health and Long-Term Care during a pilot project[12] (however funding is now rolled into global hospital budgets, where it is left to the discretion of hospitals to provide CR services or not). In contrast, CR is not reimbursed in Quebec where they only have 17 programs; patients need workplace health insurance to cover participation costs.

The Canadian Association of Cardiovascular Prevention and Rehabilitation (CACPR)[13] is the main professional association for CR in Canada. The CACPR produces clinical practice guidelines[3] and houses the Canadian Cardiac Rehab Registry.[14] There are 3 regional associations, namely the Cardiac Rehabilitation Network of Ontario,[15] Cardiac Rehabilitation New Brunswick[16] and the Atlantic Cardiac Rehab Network.[17]

On average, Canadian CR programs offer 2 CR sessions per week (consisting generally of 1 hour of exercise and 30 minutes of education / assessment / counselling) over 5 months.[18] They treat an average of 478 patients per program per year.[18]

Cardiac Rehabilitation Capacity and Density (Supply)

There is insufficient CR capacity to treat patients who benefit from these services, and hence are indicated to receive it in clinical practice guidelines. For instance,[19] data from Ontario shows that in 2006/2007, there were 53,270 hospitalized in-patients indicated for CR, but capacity for only 18,087 patients, such that only 34% of patients could receive these beneficial services.[20] Ontario needs 35,183 more CR spots to treat post-hospitalized cardiac patients alone. In 2009/2010, if we consider only revascularization patients, this gap was 27,571 CR spots[21]. Clearly however, there are many more outpatients who are eligible for CR and have not received it, and therefore the unmet need is likely much higher.

Data on CR capacity at a national level is available from the Unites States.[22] All 884 American Association of Cardiovascular and Pulmonary Rehabilitation-member programs were surveyed in 2012, reporting approximately 4.5 full-time staff per program treating a median of 140 patients per year. National projections revealed that only 28% of indicated patients were served. Programs reported the degree to which they could expand capacity by extending hours and other means. National projections suggested that with maximal current program capacity 37% of indicated patients could be served, and with expanded program capacity (i.e., resources for facilities and staffing) 47% could be served.

This issue is not unique to Canada, but is a world-wide phenomenon.[23] In our review on the availability of CR globally, we showed that CR is only offered in 68% of high-income countries, and 23% of low and middle-income countries. And this does not

speak to the density of CR, namely the number of programs available for indicated patients (i.e., population density), or by land area (i.e., the geographic density).

Population Density

There are few reports of the number of CR programs in a given area in relation to the number of patients with CVD. Population density has been generally based on total population, but this is flawed as the burden of CVD varies greatly based on risk factor prevalence, genetic predisposition and socioeconomic advantage of a given region, among other factors. In our review on the density of CR globally,[23] data on the number of CR programs nationally were available in the peer-reviewed literature for few countries. The highest density was found in the United States, with 1 program per 100,000 inhabitants (with or without CVD). However, there was wide variation in CR density by state, which significantly impacted patient participation rates.[24]

Herein, we computed the number of programs in Canada based on publically-available directories of CR programs.[10,11] Given a population of 35.5 million in Canada, this equates to a density of 1 program per 208,823 inhabitants (or half that in the United States). We also computed the density of CR in Australia and the United Kingdom for comparative purposes, as they too have online directories of CR programs nationally.[25,26] The density in these countries was 1 program per 279,761 inhabitants, and 1 program per 197,553, respectively. Thus, it seems Canada has comparable density to other Commonwealth nations, and the highest CR density in the world is indeed found in the United States. The nature of their health system may explain this - private insurance companies reimburse CR services, specifically 36 sessions of

telemetry-monitored supervised exercise (although many patients have so-called “co-pays” each session).

What we can glean about population CR density among patients with CVD in Canada is shown in Table 1. In Provinces and Territories where CR exists, CR density ranges from 1 program per 34,882 CVD patients in Quebec, to 1 program per 3,623 patients in New Brunswick; this represents approximately 10-fold variation. Nationally, there is 1 program per 7,779 patients with CVD. Given the average CR program in Canada treats 478 patients[18] and there are 170 programs (Table 1), crudely in Canada there is capacity to treat 81,260 patients nationally. Given the total number of CVD patients in the country (Table 1), 1,241,240 more CR “spots” would be needed to serve all indicated patients.

Geographic Density

The only national data on the geographic density of CR to our knowledge stems from the United States. The mean geographic density there was 1 program per 1282 square miles (equivalent to 3320 square kilometers; sq. km). Density varied from 1 program per 20 sq. miles (52 sq. km) in Washington, DC, to 1 per 81,707 sq. mile (211,620 sq km) in Alaska. There was no significant association between number of programs and land area per state.

Estimates of geographic CR density in Canada and by province are shown in Table 1. Overall density was 1 program per 58,773 sq. km nationally. It is not informative to compare this density with the United States, given the low population density in Canada’s north and the greater geographic distribution of patients along the American border. However, again we observe significant variation in CR density by

province, with 1 program per 5,660 sq. km in Prince Edward Island to 1 program per 202,606 sq. km in Newfoundland. Data from the Ontario CR pilot project, where the residence of indicated discharged patients was cross-referenced to CR program location, 66% of patients resided within a 30-minute drive time of a CR program (considered acceptable and accessible).[12] The optimal siting of CR programs based on density of indicated population and geography has yet to be established, but should be used to inform establishment of programs in under-served areas. Moreover, these estimates must take into consideration program capacity for unsupervised models of care, for patients at geographic distance from any centre.

Before moving to consider CR need or demand, the complexity of ascertaining CR supply should be addressed. First, CR supply is not merely a function of “spots”, but a function of program resources for facilities, and human resources. With budget cuts, programs may be forced to reduce the number of sessions offered in their program (i.e., dose) to continue to serve the expected patient volumes. As programs modify the number of visits and length of programs, what is defined as one CR “spot” becomes a moving target. Second, we also know that not every indicated and referred patient wants to come to CR,[27] and some patients with an eligible CVD condition have contraindications to exercise or other legitimate barriers to program participation (clinical or otherwise). Moreover, many patients who initiate CR do not complete the program, and hence use a full “spot”. Ultimately, we do not truly know how much CR we need, but have some compelling, consistent evidence that we need more.

Cardiac Rehabilitation Under-Use (Need or Demand)

The second major issue in CR use is the proportion of indicated patients being referred to available spots, and ultimately participating. It is the Canadian Cardiovascular Society position that 85% of indicated patients should be referred to CR, as in-patients, and that 70% of patients enroll.[4] Moreover, the Canadian Cardiovascular Society quality indicators for CR include in-patient referral and enrolment.[28] Unfortunately CR referral rates are not known in Canada, nor are enrolment and participation rates. Data from Ontario shows 52% of revascularization patients are referred,[29] and from Alberta suggests 39% referral among patients with at least single-vessel disease upon cardiac catheterization.[7] Clearly, these rates of referral are much lower than targets.

The most comprehensive data on CR utilization rates comes from the United States and the United Kingdom. In the former, 56% of indicated patients are referred to CR before discharge,[30] and 19% attend ≥1 session.[31] In the United Kingdom,[32] 82% are referred, and 49% attend the initial assessment. Thirty-three percent initiate the CR program of exercise and other core components, with a mean program duration of 9 weeks. Only 12% ultimately complete the British Association of Cardiovascular Prevention and Rehabilitation-minimum standard of at least 8 weeks of CR.[33]

Finally, it is well-established that there are certain patient populations who are even less likely to access CR.[34,24] This includes women,[35,36,37] those of low socioeconomic status,[38] rural patients and ethnocultural minorities,[39] who arguably have greater need for CR due to greater CVD burden and poorer CVD outcomes. This suggests that the patients who do participate in CR may be those who generally have better outcomes than those who do not. Thus, it is not unreasonable to conclude that

CR may be “reaching” a self-selected, healthier population, who perhaps are more adherent to secondary prevention recommendations overall (i.e., CR referral, evidence-based medications, abstinence from smoking).[40]

In summary, both CR supply and demand are incompletely understood, but insufficient. The CR referral clinical practice guideline recommendation is sorely implemented when compared to other recommendations for this population.[41] In our meta-analyses reporting sex differences in CR utilization indicators, we report overall rates of 45% referral,[35] 40% enrolment (i.e., in ≥1 CR session),[36] and 70% adherence to prescribed sessions among those enrolling.[37]

Reasons for Under-Use of CR

The reasons why CR is under-utilized have been well-established, and include factors at the patient, referring provider, program, and health system-levels. At the patient-level, barriers include logistical factors such as distance, transportation barriers and time constraints, as well as lack of awareness and perceived need.[42] Barriers at the provider-level include lack of awareness of the benefits of CR, site locations and how to refer, referral norms, patient safety concerns, and perceptions that patients lack motivation to participate in CR or awareness that they lack means to pay for CR or reside too far from any program.[43,44]

Explanatory factors at the program-level were considered above, namely lack of resources to offer sufficient spaces for new patients, due to insufficient financial, human and other infrastructure resources (e.g., space, equipment). Finally, at the health system-level, reasons for under-use include the lack of reimbursement of CR services by government or private health insurance companies, a low degree of CR program

integration with acute cardiology services (and hence a low degree of automation of referral from these settings), and capacity constraints.[45]

On a final note, the barriers at each of these levels often intersect. For example, due to lack of funding, programs lack capacity, which leads to longer wait times for patients. These longer wait times are associated with lower enrolment rates,[46] among other negative consequences such as emotional distress, greater left ventricular remodeling, and poorer gains in functional capacity - all outcomes which may result in higher morbidity and mortality.[47,48,49] In Canada, despite a target of 30 days,[50,28] the median wait time is 64 days from referral to CR program start (mean ± SD, 80.0 ± 62.8 days), with no significant difference by indication.[51] Wait times by Canadian province are shown in Table 2.

Before turning to strategies to tackle CR under-use, a summary of the challenges in the area is warranted. CR, as a delivery model, only engages a fraction of the entire indicated population. When considering CR from a population health perspective, this is a rather narrow-reaching model of care. Moreover, due to unconscious bias among patients and providers, most patients who ultimately gain access to CR are likely those who are socially-advantaged and would follow secondary prevention recommendations, so ultimately would have positive outcomes. Finally, we know there are not enough spots to provide CR services to all patients in need.

Known, Effective Strategies to Increase CR Use

In a Presidential Advisory from the American Heart Association, methods to facilitate referral and enrolment in CR were offered.[52] A Cochrane review has since

been published summarizing the high-quality trials of interventions to increase CR enrolment and adherence.[53] In summary, in 8 of 10 trials interventions designed to increase enrolment were successful. These included structured healthcare provider-led contacts, early appointments after discharge, motivational letters and gender-specific programs. Three of 8 trials of interventions designed to increase adherence were successful. These included self-monitoring of activity, action planning and tailored counselling by CR staff.

Although not tested in a randomized trial, it is the position of the Canadian Cardiovascular Society that in-patients be automatically referred to CR prior to discharge, and that this referral be augmented by a patient discussion at the bedside and provision of motivational written communication regarding CR.[4] It has been demonstrated that such systematic approaches can ensure that more, including under-served, patients access CR.[54]

What Other Approaches Should be Tried?

As alluded to earlier, it is likely that reimbursement policies impact availability and use of CR.[55] Some of the highest rates of CR use in the world stem from countries where CR is reimbursed by government or private insurance companies. CR is only reimbursed in a minority of provinces in Canada, and we must continue to advocate for national coverage.

Other than such policy initiatives, potential interventions to increase CR access for all patients in need should be tested. It is our contention that we must focus our CR resources on patients in the greatest need – not necessarily patients who show up at our programs. This would involve: (1) systematic identification of all patients in need, (2)

a comprehensive stratification approach, and then (3) allocation of patients to CR program models matched to their risk strata. We would argue that the first can be achieved via proven systematic referral strategies from the inpatient setting,[56] applied on a population-wide basis.

With regard to the second element, we need to identify which indicated CVD patients are at the highest risk of mortality (acute risk during exercise or 5-year?), re-hospitalization and / or poor quality of life. These are the patients who should receive the scantly-available fully comprehensive and supervised CR “spots”, because we do not have such spots for all patients in need. However, we need more research to understand which patients are at greater risk. For example, it could be the frail, elderly woman with heart failure and low functional capacity, or it could be the robust young male who underwent a short-stay percutaneous coronary intervention; this likely also depends on which risk outcome we are considering. The currently-recommended /used risk stratification tools at CR intake include the Duke Treadmill Score,[57] Framingham risk score,[58] and the American[59] and British Associations[60] of CR risk stratification tools. These are generally not used to allocate patients to program models, however. We need to understand whether these tools will achieve our aims to identify patients at greatest CR need, whether the stratification approach to model allocation can be implemented routinely in practice, or whether another set of factors should be considered.

With regard to the third element, or the nature of the CR services provided, in order to serve all patients in need, without extra resources (given none are forthcoming in the current fiscal environment), lower-cost models of CR care should be provided to a

greater extent, to those identified as lower-risk. Only about 10% of CR participants in Ontario received home-based CR,[61] despite the fact that these programs are proven as equivalently efficacious as supervised programs,[62] and can be lower-cost (although this requires further study given the human resource requirements of individual case management). Indeed, recent meta-analyses have demonstrated that a variety of alternative delivery venues (such as tele-health) result in comparable mortality reductions to what is achieved with supervised models,[63] and that CR delivered in these non-supervised venues may result in significantly greater exercise than traditional programs.[64] There have now been some compelling trials of internet or mobile phone-based CR showing positive outcomes;[65,66,67,68] the reach these could achieve at low cost could enable us to serve a much greater proportion of indicated patients. Moreover, recent meta-analyses have demonstrated that shorter programs, based in general practice and staffed by generalists are as effective at reducing all-cause mortality in CVD patients than,[69,70] presumably more expensive, longer, specialized programs. More research is needed to test the costs of these proven models, focused on identifying the most effective, low cost model, as well as whether it can be delivered consistently on a national scale.

Conclusions

CR works, in Canada and beyond. CR is under-used, particularly by those who need it most, including women, ethnocultural minorities and patients of low socioeconomic status. Strategies to increase CR use have been established, but they must be widely implemented. CR capacity needs to be greatly increased, and this can

potentially be achieved by greater CR reimbursement, as well as more efficient approaches to patient risk stratification and program model allocation (in accordance with the tenets of the Canadian Cardiovascular Society's *Choosing Wisely* campaign).[71]

However, to achieve this, we need comprehensive national data on the CVD population in need of CR, rates of CR referral, enrolment and completion, the nature of the patients being referred, enrolling and completing CR versus those not, as well as their outcomes. The national CR Registry should be better exploited to achieve many of these aims. This paper serves as a call to better define and establish CR supply, need, risk-stratification, model delivery and cost in Canada, and find a more efficient way to track, evaluate, and implement an alignment between service supply and cardiovascular populations who benefit from secondary prevention strategies.

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Table 1. Density of Cardiac Rehabilitation in Canada, and by Province

Province/territory	No. CR Programs[9,10]	Area (km^2)[67]	Geographic density	No. heart disease[68]	Population Density[69]
Alberta	19	661,848	34,834	86,746	4,566
British Colombia	25	944,735	37,789	145,532	5,821
Manitoba	7	647,797	92,542	42,881	6,126
New Brunswick	11	72,908	6,628	39,852	3,623
Newfoundland	2	405,212	202,606	28,101	14,051
Northwest Territories	0	1,346,106	N/A	-	-
Nova Scotia	9	55,284	6,143	49,547	5,505
Nunavut	0	2,093,190	N/A	-	-
Ontario	72	1,076,395	14,950	519,357	7,213
Prince Edward Island	1	5,660	5,660	6,266	6,266
Quebec	17	1,542,056	90,709	593,000	34,882
Saskatchewan	7	651,036	93,005	40,172	5,739
Yukon	0	482,443	N/A	-	-
Canada	170	9,984,670	58,733	1,322,500	7,779

Abbreviations: CR, cardiac rehabilitation; No, number; N/A, not applicable; -, not available

Table 2. Cardiac Rehabilitation Wait Times in Canada, and by Province

Province/territory	Median wait time* in days (interquartile range)
British Colombia	33 (0-50)
New Brunswick	40 (0-58)
Ontario	38 (0-105)
Canada	37 (0-58)

Data is not available for other provinces or territories (CR programs do not contribute to the registry)

*from hospital discharge to initial cardiac rehabilitation visit as per national quality indicator definition.[28]
Source of data is the Canadian Cardiac Rehab Registry.