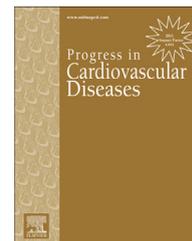


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Cardiac Rehabilitation Series: Canada

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ABSTRACT

Cardiovascular disease is among the leading causes of mortality and morbidity in Canada. Cardiac rehabilitation (CR) has a long robust history here, and there are established clinical practice guidelines. While the effectiveness of CR in the Canadian context is clear, only 34% of eligible patients participate, and strategies to increase access for under-represented groups (e.g., women, ethnic minority groups) are not yet universally applied. Identified CR barriers include lack of referral and physician recommendation, travel and distance, and low perceived need. Indeed there is now a national policy position recommending systematic inpatient referral to CR in Canada. Recent development of 30 CR quality indicators and the burgeoning national CR registry will enable further measurement and improvement of the quality of CR care in Canada. Finally, the Canadian Association of CR is one of the founding members of the International Council of Cardiovascular Prevention and Rehabilitation, to promote CR globally.

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Cardiovascular disease incidence and prevalence in Canada

Cardiovascular disease (CVD) is a leading cause of morbidity and mortality in Canada; the effects of which are seen across all segments of the population. In 2009, diseases of the heart were the second leading cause of death in Canada,¹ representing 20.7% of all deaths, and an age-adjusted death rate of 146.1 per 100,000. In men, the rate varied between 3.9 per 100,000 to 3,645.8 per 100,000, and in women, it ranged from 2.4 per 100,000 to 3,082.8 per 100,000 in those aged 25–34 and 85 years or greater, respectively.

With regard to morbidity, CVD (ICD-9: 390–459; ICD-10-CA: 100–199) accounted for 15.8% of all hospitalizations in 2005–6.² Similar to declines observed in mortality rates, a dramatic decrease in the rate of CVD hospitalization has also

been observed in Canada.³ Between 2000 and 2005, age-standardized discharge rates for circulatory disease decreased from 8.6 per 100,000 to 8.0 per 100,000 Canadians, in both men and women alike.² More recent self-report data from 2011–2012 estimate that 4.8% of the Canadian population (12 y+) and almost 1 in 5 older adults (i.e., ≥65 years) have a history of coronary heart disease (Fig 1). During the same year, the age-standardized rate of acute myocardial infarction was 205 per 100,000 (Fig 2).

Regional and demographic variations in CVD have also been shown, owing in part to differences in risk factors and patterns of hospitalization and treatment. For example, data from the 2007 Canadian Community Health Survey indicates that self-reported heart disease varied between 2.7% in the Northwest Territories and 6.4% in Nova Scotia,⁴ with higher prevalence in the east, and lower prevalence in the west and north of Canada. In 2005,

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Abbreviations and Acronyms
CACR = Canadian Association for Cardiac Rehabilitation
CCRR = Canadian Cardiac Rehab Registry
CCS = Canadian Cardiovascular Society
CR = cardiac rehabilitation
CVD = cardiovascular disease
ICCPR = International Council of Cardiovascular Prevention and Rehabilitation
QI = quality indicator

hospitalizations for circulatory conditions varied considerably in both men and women. In men, rates exceeded 1,500 per 100,000 in Saskatchewan and the Northwest Territories, to a low of 387 per 100,000 in Nunavut.² For women, rates were highest in New Brunswick (1,032 per 100,000) and British Columbia (609 per 100,000), and lowest in Nunavut (449 per 100,000).²

Beyond the above noted age and sex differences, significant ethnic (and time-in-country) variation in CVD has also been observed, with a particularly high prevalence of CVD amongst South Asians, and a relatively low prevalence in those of Chinese descent.⁵ Indeed it is now well-accepted that Canadians of South Asian, African-Caribbean and Aboriginal origin represent a high-risk segment of the population, with rates of CVD morbidity and mortality 2 to 3 times that of their counterparts of European-origin.^{6,7}

Current cardiac rehabilitation delivery model

In Canada, there is a long and robust history of cardiac rehabilitation (CR). In the 1970s, Dr. Terry Kavanagh began to explore the benefits of exercise and rehabilitation post-myocardial infarction.⁸ Establishing appropriate exercise prescriptions would elicit an improvement in aerobic capacity and maintain safety of patients.^{9,10} In the 1980s, a CR program was established at the Toronto Rehabilitation Institute, which could accommodate as many as 1,800 outpatients weekly, and was widely-regarded as the largest and most prestigious CR center in the world.

Today there are approximately 220 CR programs in Canada, providing services to more than 50,000 new patients annually (personal communication, Stacey Grocholski, Executive Director Canadian Association of Cardiac Rehabilitation, March 4, 2013). According to the online directories of CR programs (Table 1), the province of Ontario has the greatest number of programs. Provinces with minimal CR capacity include Quebec, and Newfoundland and Labrador (with only 1 program). There are no known programs in the Northwest Territories, Yukon, or Nunavut. Funding for CR programs varies widely by province, as set by the provincial Ministries of Health. While this provincial variation is likely due to different population densities, it is perceived that funding for CR is inadequate in most provinces and almost negligible in some others.

The Canadian Association for Cardiac Rehabilitation (CACR) is the national leader in cardiovascular disease prevention and rehabilitation (Table 1). Their mission is the enhancement and maintenance of cardiovascular health of Canadians through CR practice, research and advocacy. There are also regional CR networks, namely the Canadian Rehabilitation Network of Ontario (Table 1), and the Atlantic Cardiac Rehabilitation Network (Table 1), which includes Cardiac Rehab New Brunswick. The latter network offers an online continuing education course for professionals and students involved in CR (Table 1). CACR, as well as these networks, hold annual meetings to promote the exchange of information, professional education, and to foster research. CACR has published three editions of its clinical practice guidelines, in 1999,¹¹ 2004¹² and finally in 2009.¹³

Practice

The core components of CR are published in the Canadian Guidelines for Cardiac Rehabilitation and Cardiovascular Disease Prevention, 3rd Edition in Chapter 11.¹³ They are: [1] systematic patient referral processes, [2] patient assessments, [3] health behavior interventions and risk factor modification, [4] adaptations of program models to improve accessibility,

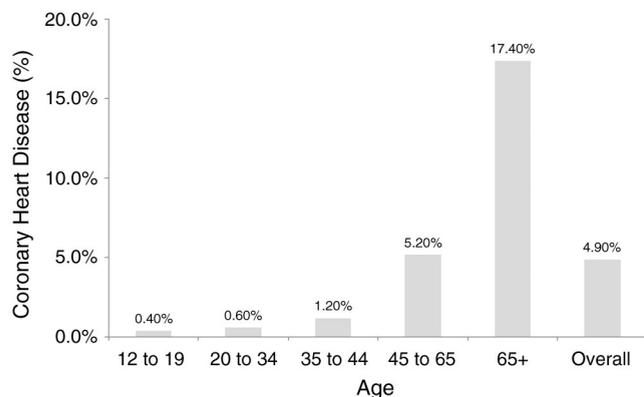


Fig. 1 – Prevalence of self-reported coronary heart disease in Canada, 2011-12.

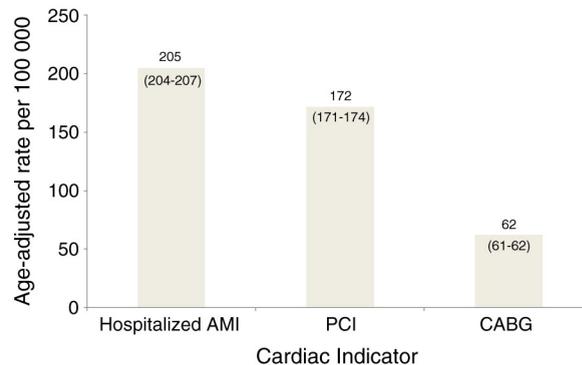


Fig. 2 – Age-standardized rate of hospitalization and revascularization procedures in Canada, 2011-12.

Table 1 – Key websites.

Organization	Website
Canadian Association of Cardiac Rehabilitation (CACR)	http://www.cacr.ca/information_for_public/program_directory.cfm
Cardiac Health Foundation of Canada (CHFC)	http://cardiachealth.ca/index.php?o=locate-rehab-centre
Cardiac Rehabilitation Network of Ontario (CRNO)	www.crno.ca
Atlantic Cardiac Rehab Network (ACRN)	http://www.cacr.ca/resources/Networks.cfm
Cardiac Rehab New Brunswick (CRNB)	http://www.crnbc-rnbc.ca/en/tutorials.aspx
The Canadianized Heart Manual	http://www.impactbc.ca/what-we-do/projects/the-heart-manual
CR4HER Trial	http://clinicaltrials.gov/ct2/show/NCT01019135?term=cardiac+rehabilitation&rank=7
Cardiac Rehabilitation Barriers Scale (CRBS)	http://www.yorku.ca/sgrace/crbarriersscale.html
Heart Wise Exercise	www.heartwiseexercise.ca/
Canadian Cardiovascular Society – CR Quality Indicators	http://ddqi.ccs.ca/index.php/quality-indicators/cardiac-rehabilitation-secondary-prevention-quality-indicators-chapter http://ddqi.ccs.ca/images/QICRSP/CCS_CR_QIs_v8_webconsult_E.pdf
Canadian Cardiac Rehabilitation Registry (CCRR)	www.cacr.ca/resources/registry.cfm
The International Council of Cardiovascular Prevention and Rehabilitation (ICCP)	http://globalcardiacrehab.com

especially for under-served populations, [5] development of self-management techniques based around individualized assessment, problem-solving, goal-setting and follow-up, [6] exercise training, [7] leisure-time activities, [8] outcomes assessment and performance measurement, [9] continuous quality improvement programs, and [10] professional development programs. A survey of programs in Canada revealed over 90% offer patient education, exercise, exercise stress testing, as well as risk identification and modification, delivered by an inter-professional team, with approximately 80% of programs also offering medical assessment by a program physician. Almost 70% of programs report screening participants for depression.

A survey of CR programs across Canada revealed that the most common model of CR is supervised site-based programs, with 70% situated in a hospital.¹⁴ Indeed, over three-quarters of CR programs are in an urban setting. The mean frequency of on-site sessions is 2–3 times/week, with a median duration of 5 months.¹⁵ With regard to care, the percentage of Canadian CR programs that had either the following professionals within their program or had an established relationship for patient referral were as follows: 94.4% registered dietitian(s), 88.9% nursing, 79.6% exercise specialists, 74.1% cardiac specialist, 66.7% psychologist, 63.0% pharmacist, 50.0% non-specialist physician, 42.6% cardiopulmonary assessment technician, 42.6% occupational therapy and 22.2% psychiatry.

Alternative models of CR delivery

A wide diversity of models and designs are needed to provide sufficiently-accessible and effective services throughout a country that is so large, multi-culturally diverse, and rural.

Accordingly, in Ontario, it is known that upwards of 70% of CR programs offer home-based CR services, and approximately 11% CR participants attend a home-based program.¹⁴ A “Canadianized” version of the validated Heart Manual¹⁶ from the United Kingdom has been developed in British

Columbia (Table 1), however it is unclear what “reach” has been achieved. Early findings on home-based CR in Canada give encouraging indications that this model can be as accessible as hospital-based services, with comparable completion rates, even when they are used by patients who live further away from cities.¹⁷ Moreover, extension of CR into the community is being promoted through the Heart Wise Exercise program (Table 1).

Women are under-represented in CR in Canada, as elsewhere.¹⁸ In 1995, the first Canadian women-only CR program was established in Toronto.¹⁹ The program adherence rate is reported to be 85%,¹⁹ although controlled evaluation has not been undertaken. A randomized controlled trial of women’s adherence to traditional site-based CR, women-only versus home-based is currently underway (Table 1).

An emerging model to deliver CR is through technology. In British Columbia, a telehealth/internet-based care system has been developed; comprised of online intake forms, one-on-one chat sessions with specialists, uploaded patient exercise logs, and online heart rate and blood pressure recordings. When compared to usual care, patients in the technology arm were found to have significantly greater improvements in risk factors and exercise capacity.²⁰ In Ontario, a system called CardioFit was developed which provides tutorials on exercise, and participants exchange email with an exercise specialist. Results of a randomized controlled trial demonstrated that the internet group had a significantly greater physical activity compared to usual care at follow-up.²¹ For a country as vast as Canada, the growth in the trial and meta-analysis evidence^{22–24} supporting remote-access or home-based programs harnessing telehealth, telephone and email/internet technology is especially significant.

Challenges with referral and attendance

In Canada, as in other developed countries, CR is vastly under-utilized, particularly when compared to other

evidence-based therapies for secondary prevention.²⁵ Unfortunately, national data on CR referral and attendance are not available. The most comprehensive data are available in 2 provinces. A province-wide CR pilot project was undertaken approximately 15 years ago, and demonstrated that only 22% of eligible patients attend CR in Ontario.²⁶ A more recent study has considered CR capacity in the province.²⁷ Results suggested that in 2006, there were 53,270 cardiac hospitalizations. However, CR service capacity was 18,087, which suggest only 34% of eligible patients could receive CR. A recent analysis of revascularization patient referral in the same province showed that 51.8% were referred to CR,²⁸ with rates of attendance unknown.

In New Brunswick, an evaluation of CR use in 2005–06 revealed that only 8.8% of patients attended CR. Comprehensive quality improvement strategies were put into place, leading to an increased rate over a 5 year period to over 20% (Table 1). Finally, a regional analysis in Alberta suggested that of those referred to CR, half completed the program, approximately 40% did not attend, and 10% attended but did not complete the program.²⁹

The CACR and Canadian Cardiovascular Society (CCS) have jointly endorsed a national policy promoting systematic inpatient referral to CR.³⁰ It is recommended that all acute cardiac care services implement referral strategies and optimal communication with patients about CR at the bedside. The policy recommends benchmarks of 85% referral and 70% patient enrollment. Indeed, there is high-quality evidence from Canada^{31,32} and beyond demonstrating the effectiveness of universal referral policies and early CR access (i.e., through post-discharge education sessions at CR or reduced wait times), in achieving desired referral and attendance rates.

Cardiac rehabilitation barriers

One of the primary barriers to CR use is lack of physician referral.³⁰ In a survey of Canadian physicians, predominant reasons provided for not referring patients included lack of knowledge of CR locations, lack of standardized referral forms across programs, inconvenience of completing the referral, perceptions of poor program quality,³³ lack of discharge communication from previously-referred patients,³⁴ long distance to the CR program for the patient to travel, perceptions of low patient motivation, and lack of clarity regarding who in the health care team is responsible for referral.³⁵

In Canada, the Cardiac Rehabilitation Barriers Scale (Table 1) has been developed and validated. It consists of four subscales: perceived need/healthcare factors, logistical factors, work/time conflicts, and co-morbidities/functional status.³⁶ The key barriers reported by Canadian patients include: travel and distance, perceiving they did not “need” CR, perceiving they could manage their CVD independently through exercising in their own home or community, work responsibilities and other time constraints, and severe weather.

Evidence-based review supporting cardiac rehabilitation in Canada

Large meta-analyses of randomized controlled trials have shown that CR is effective.^{29,37,38} CR has been shown to improve exercise capacity, obesity indices, lipid profile, and reduce inflammation, psychological distress, among other benefits, most notably reductions in morbidity and mortality.³⁹ Observational data in Canada corroborate the benefits achieved in these trials. A study from Alberta demonstrated that participating in CR lowers risk of death, hospitalization and cardiac hospitalization by 31 to 51%.²⁹ Another more recent study by the same group demonstrated that improvements in cardiorespiratory fitness during a CR are associated with decreased mortality, in a dose–response fashion.^{40,41} Finally, a study from Ontario demonstrated that CR participation was associated with a 50% lower mortality rate (2.6% vs. 5.1%, $p < .001$) when compared to population-matched controls, with greater CR participation associated with even lower mortality.⁴²

Future directions for research and clinical practice

A pan-Canadian working group was convened in 2010 by the Canadian Cardiovascular Society to develop quality indicators (QIs) for CR and secondary prevention (Table 1). Building from the work of the American Association of Cardiovascular and Pulmonary Rehabilitation,⁴³ a set of 30 QIs has been developed, in the domains of: [1] referral, access and wait times, [2] secondary prevention assessment, risk stratification, exercise prescription, and control, [3] behavior, psychosocial health, and education, [4] discharge transition, including linkage and communication, and [5] program model delivery and structure (Table 1). A “top five” QI list has been generated, and field testing of these QIs has been undertaken. These are inpatient referral, wait times, patient education, increases in exercise capacity, and program emergency response strategies. Efforts are underway to promote uptake of the QIs, including assessment of the QIs in our national registry.

Indeed, the vision for the Canadian Cardiac Rehab Registry (CCRR; Table 1) began in 2005 by the CACR. The goals of the CCRR are to: [1] enable CR programs to benchmark performance, [2] facilitate guideline adherence and in turn, improve patient outcomes, [3] build a clinical research database to study CR programming in Canada, and [4] influence health policy. There are currently 12 sites contributing data, and 4,546 patient records in the registry. There are data quality, access and publication policies for the CCRR. The first annual research report from the registry data will report on program and patient characteristics as well as patient outcomes (under review, *Can J Cardiol*). It is hoped that in the future, the registry will be a rich data source to update the academic community in articles such as this.

Finally, the CACR was one of the founding members of the International Council of Cardiovascular Prevention and Rehabilitation (ICCP; Table 1). The Council has developed a

charter outlining their aim to establish CR as an essential service globally, and to support countries to expand CR services.⁴⁴ The ICCPR is a member of the World Heart Federation, and has, as part of its burgeoning research agenda, published a scoping review on the availability and nature of CR in low and middle-income countries.⁴⁵

Statement of Conflict of Interest

All authors declare that there are no conflicts of interest.

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