



Original Article

Participant Exercise-Session Attendance in Community-Based, Bridging, and Hospital-Based Cardiac Rehabilitation: A Retrospective Case-Control Study

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ABSTRACT

Background: A paucity of studies have investigated participant attendance in community-based and hybrid cardiac rehabilitation programs in the Canadian setting. We compared exercise-session attendance of community-based, bridging (hospital plus community-based), and hospital-based participants who attended a high-volume cardiac rehabilitation program in Alberta, Canada.

Methods: Exercise sessions attended and participant characteristics were collected and analyzed from 230 records of patients who attended cardiac rehabilitation between 2016 and 2019. Community-based ($n = 74$) and bridging ($n = 41$) program participants were age- and sex-matched in a 1:1 ratio to hospital-based participants. The number of exercise sessions attended was compared among program groups, between female and male patients, and for patients with vs without cardiac surgery. The percentage of exercise sessions attended was also compared among program groups.

RÉSUMÉ

Introduction : Peu d'études ont porté sur la participation des patients aux programmes communautaires ou hybrides de réadaptation cardiaque du Canada. Nous avons comparé la participation des patients aux séances d'entraînement en milieu communautaire, de transition (en milieu hospitalier et milieu communautaire) et en milieu hospitalier d'un programme de réadaptation cardiaque à volume élevé de l'Alberta, au Canada.

Méthodes : Nous avons collecté et analysé les données sur les séances d'entraînement suivies et les caractéristiques des participants provenant de 230 dossiers de patients qui avaient participé à la réadaptation cardiaque entre 2016 et 2019. Les participants du programme en milieu communautaire ($n = 74$) et du programme de transition ($n = 41$) ont été appariés par âge et sexe aux participants du programme en milieu hospitalier selon un ratio 1:1. Le nombre de séances d'entraînement suivies a été comparé entre les groupes du

Cardiovascular disease is a considerable public health burden.¹ Participation in cardiac rehabilitation is encouraged as a secondary prevention strategy to reduce morbidities and mortality in cardiac patients.² Cardiac rehabilitation programs employ a comprehensive approach to patient care, through

education, lifestyle assessments, medication management, group support sessions, and structured exercise training.^{3,4} Despite the known benefits of cardiac rehabilitation, program participation rates are often suboptimal.⁵

Numerous patient and system factors may influence program participation, including lack of referral, difficulties with transportation to the cardiac rehabilitation centre, the need to return to work, and patient preferences.⁶⁻¹² Cardiac rehabilitation providers seek to reduce program barriers in hope of improving uptake and subsequent health benefits to patients. To enhance accessibility and attendance, program offerings have expanded beyond those in hospital-based settings. Alternative delivery methods, such as home-based, telehealth, eHealth, and community-based programs, may help mitigate traditional centre-based limitations, and additionally, take into account patient preferences.^{13,14}

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Ethics Statement: This study was approved by the University of Alberta Health Research Ethics Board, and a waiver of patient consent was obtained. Charts were accessed through an electronic medical database, which was approved by our regional health authority.

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See page 370 for disclosure information.

Results: Bridging participants attended the greatest number of exercise sessions (median = 10.0 sessions) and demonstrated a significantly higher percentage of sessions attended (91%, 25th and 75th percentile interquartile range [IQR] = 64, 100%) than matched hospital participants (median = 6.0 sessions; 63%, 25, 75 IQR = 13, 94%; $P = 0.01$). Percentage of sessions attended did not differ for bridging and community-based participants ($P = 0.30$). Exercise-session attendance was similar for community-based participants (median = 6.0 sessions; 75%, 25, 75 IQR = 38%, 88%) vs their hospital matches (median = 6.0 sessions; 81%, 25, 75 IQR = 38%, 100%; $P \geq 0.37$), as well as for female vs male patients (median = 7.0 sessions for both sexes; $P = 0.66$), and for surgical vs nonsurgical patients (median = 7.0 sessions; $P = 0.48$). Female patients in the bridging program attended significantly more exercise sessions in the community, compared with male patients in the bridging program ($P = 0.02$).

Conclusions: Bridging participants attended the most exercise sessions overall and demonstrated a higher percentage attendance than hospital-based participants. These results suggest that a hybrid program consisting of hospital and community-based exercise was favourable for exercise-session attendance. Given modern approaches to de-medicalize cardiac rehabilitation, our findings further support the provision of community program offerings, without detriment to patient session attendance.

Community-based cardiac rehabilitation is increasingly utilized for patients at low to moderate risk who are in earlier recovery (eg, 4-6 weeks after an acute cardiac event),¹⁵ and community programs have demonstrated effectiveness similar to that of hospital-based programs in improving cardiovascular disease risk factors.¹⁶ As exercise is a modifiable health behaviour, offering cardiac rehabilitation exercise sessions in a community setting may help reframe exercise as a lifestyle modification, as opposed to an isolated hospital treatment, and thereby facilitate exercise maintenance post-program.¹⁷ Recognizing the utility of community rehabilitation settings, hybrid program types have increasingly been employed. Bridging programs may transition rehabilitation from hospital-based facilities into community settings (eg, fitness centres) where physical activity and exercise can continue after program completion.¹⁸ Such hybrid programs can provide greater flexibility for cardiac patients whilst improving health outcomes.¹⁹ Although program strategies and offerings are expanding, there is a dearth of research investigating community-based and bridging cardiac rehabilitation programs in the early post-recovery stages, in Canadian fitness centres in particular.

Alberta has a strong history of outpatient hospital-based cardiac rehabilitation. Program providers have more recently expanded program offerings, utilizing community fitness

programme, entre les patientes et les patients, et entre les patients qui avaient subi ou non une chirurgie cardiaque. Le pourcentage des séances d'entraînement suivies a aussi été comparé entre les groupes du programme.

Résultats : Les participants du programme de transition ont assisté au plus grand nombre de séances d'entraînement (médiane = 10,0 séances) et ont démontré un pourcentage significativement plus élevé de séances suivies (91 %, 25^e et 75^e percentile [25, 75] intervalle interquartile [IIQ] = 64, 100 %) que les participants appariés du programme en milieu hospitalier (médiane = 6,0 séances; 63 %, 25, 75 IIQ = 13, 94 %; $P = 0,01$). Le pourcentage de séances suivies ne différait pas entre les participants du programme de transition et les participants du programme en milieu communautaire ($P = 0,30$). La participation aux séances d'entraînement était similaire entre les participants du programme en milieu communautaire (médiane = 6,0 séances; 75 %, 25, 75 IIQ = 38 %, 88 %) et les participants appariés du programme en milieu hospitalier (médiane = 6,0 séances; 81 %, 25, 75 IIQ = 38 %, 100 %; $P \geq 0,37$), de même qu'entre les patientes et les patients (médiane = 7,0 séances pour les deux sexes; $P = 0,66$), et les patients opérés et les patients non opérés (médiane = 7,0 séances; $P = 0,48$). Les patientes du programme de transition ont participé à un nombre plus important de séances d'entraînement en milieu communautaire que les patients du programme de transition ($P = 0,02$).

Conclusions : Les participants du programme de transition ont dans l'ensemble assisté à la plupart des séances d'entraînement et ont démontré un pourcentage plus élevé de participation que les participants du programme en milieu hospitalier. Ces résultats indiquent qu'un programme hybride qui consiste en un entraînement en milieu hospitalier et en milieu communautaire favorisait la participation aux séances d'entraînement. Compte tenu des approches contemporaines de démedicalisation de la réadaptation cardiaque, nos conclusions justifient d'autant plus la mise à disposition de programmes en milieu communautaire, et ce, sans compromettre la participation des patients aux séances.

centres for phase II cardiac rehabilitation. Studies conducted in the United Kingdom have reported similar attendance rates and health outcomes for community-based vs hospital-based participants,^{20,21} although no known studies have compared attendance rates of participants in these program types in the Canadian setting. Further, the uptake of cardiac rehabilitation in the Alberta-based community program has not been previously investigated, and the utility of community-based exercise in the capital region is therefore unclear.

An observed dose-response relationship between cardiac rehabilitation session attendance and patient outcomes indicates that each exercise session attended is associated with a 1% decrease in mortality.²² Additionally, exercise-only programs can reduce the risk of major adverse cardiac events, cardiovascular and all-cause hospitalizations, and cardiovascular mortality.²³ Notwithstanding, the number of exercise sessions offered varies greatly across different cardiac rehabilitation programs, ranging from 7 to > 30 sessions.^{21,22,24-27} Some studies have reported reduced mortality in patients who attend more than 25 or 36 total program sessions;^{25,26,28} however, the proportion of exercise-specific sessions included in cardiac rehabilitation programs is often unclear.

Considering the impact of exercise-only cardiac rehabilitation and the lack of Alberta-based investigation of patient

attendance across various program types, the primary objective of this study was to determine program exercise-session attendance of community-based (COMM) and bridging (BRIDGE) participants who completed cardiac rehabilitation provided by a high-volume program in Alberta, Canada, and to compare the level of attendance to that of hospital-based (HOSP) participants. Second, we sought to describe the characteristics of participants, and explore the attendance rates of female vs male patients, and surgical vs nonsurgical patients. We hypothesized that COMM and BRIDGE participants would demonstrate a similar or greater level of exercise-session attendance, compared to that of HOSP participants.

Materials and Methods

Study design

This study was a retrospective case-matched chart review and included charts of women and men over the age of 18 years. All patients attended phase II cardiac rehabilitation provided by a high-volume cardiac rehabilitation program located in a large urban centre. Although the cardiac rehabilitation program was comprehensive in nature and offered other program session types (eg, occupational therapy, social work, pharmacy consultation), we collected attendance data only for exercise sessions, as we recognize the graded relationship between exercise and mortality risk. Additionally, exercise sessions were the primary session type offered in the community fitness centres, and the utility and uptake of community-based exercise in this population and setting were unknown.

Program format

Patients recovering from a recent cardiac event and/or procedure were referred to the program and attended an initial intake visit with a nurse and completed a physical assessment (ie, a graded exercise test) prior to attending program exercise sessions. Program exercise sessions were conducted at 2 hospitals (hospital-based program) and 2 public fitness centres (community-based program). HOSP participants attended outpatient cardiac rehabilitation sessions within 1 of the 2 urban hospital complexes. The setting of the community-based program was 2 municipal fitness centres; participants in this program attended sessions at 1 of the 2 centre locations, completing their exercise sessions in the same facility as the local public. All exercise sessions in both the hospital and the community locations were supervised by cardiac rehabilitation program staff, which included clinical exercise physiologists who were certified through the Canadian Society for Exercise Physiology or the American College of Sports Medicine, each with 5 to 30 years of experience. A registered nurse employed by the cardiac rehabilitation program periodically supplemented exercise-session supervision in the hospital and community settings.

The community and hospital-based programs were offered once per week over a period of 8 weeks. Some patients chose to attend *both* the hospital and community-based exercise sessions; these patients were considered “bridging”/BRIDGE participants and met the inclusion criteria for community-based exercise. BRIDGE participants could have attended

up to 8 exercise sessions in the hospital, followed by 3 additional sessions in the community setting, as the first 3 fitness-centre admissions were provided at no cost. Although BRIDGE participants may have transitioned to the community-based sessions prior to completing 8 hospital-based sessions, the total possible number of exercise sessions in the bridging program was 11, thereby exceeding the 8-week program duration provided in either the hospital or community setting alone.

Program exercise sessions in all locations were 60 minutes in length and included a 5-10-minute warm-up followed by 20-40 minutes of aerobic exercise and a 5-10-minute cool-down. Aerobic exercise was completed at a moderate intensity, guided by individual heart rate recommendations or ratings of perceived exertion. Strength training was also incorporated, although this varied by individual need and interest. Participants were encouraged to engage in exercise outside of their weekly supervised session, to meet Canadian physical activity recommendations.²⁹

Eligibility

Patients were included if they attended one of the program types offered (community-based, bridging, or hospital-based) by the Alberta cardiac rehabilitation program between January 2016 and November 2019. Although no cardiac diagnoses were excluded, the majority of program patients had had a recent myocardial infarction or had stable angina/coronary artery disease. Both recent surgical (eg, coronary artery bypass graft, valvular and aortic repair or reconstruction) and nonsurgical (eg, percutaneous coronary intervention, medical management alone) patients were included. Patients who were referred to cardiac rehabilitation but attended no sessions (no initial intake visit and no exercise sessions) were excluded. Patients whose charts explicitly reported either short/condensed or long-term exercise with the program were excluded.

Patients had the option to attend exercise sessions in either the hospital or the community, or both (bridging). Stable patients who were symptom-free or who had no new symptoms since surgery, as applicable, and other minimally symptomatic cardiac patients, such as those who had recently undergone valvular surgery and those with heart failure, also qualified. Patients with stable coronary artery disease and those who met the inclusion criteria but had either a positive stress test upon initial assessment or existing comorbidities (chronic obstructive pulmonary disease with supplemental oxygen or forced expiratory volume in 1 second < 70%, receiving ongoing dialysis, peripheral vascular disease, diabetic complications, or uncontrolled hypertension) were offered the hospital-based program. The reasons that eligible patients chose to participate in hospital and/or community-based sessions were not recorded, although factors such as free parking and travel distance to the community fitness centre likely contributed in part to patient decision-making in this regard.^{12,21,30}

COMM participants were identified as those who completed their program exercise sessions at a local fitness centre only. BRIDGE participants were those who initially attended exercise sessions in a hospital, then transitioned to complete their exercise sessions in a fitness centre. COMM

and BRIDGE participants were age- and sex-matched at random to HOSP participants who attended cardiac rehabilitation over the same time period. HOSP participants were those who completed their program exercise sessions at a local hospital only. We used a 1:1 matching ratio; one COMM participant was matched to one HOSP participant of the same age and sex (C-HOSP). BRIDGE participants were also age- and sex-matched to HOSP participants (B-HOSP; see [Supplemental Table S1](#)).

This study was approved by the University of Alberta Health Research Ethics Board, and a waiver of patient consent was obtained. Charts were accessed through an electronic medical database, which was approved by our regional health authority.

Data collection

One author (S.N.) collected chart data if the eligibility criteria were met. Relevant variables included age, sex, body mass index (BMI), cardiac condition or event, cardiac surgery, comorbidities, smoking history, and exercise-session attendance. Patient cardiac conditions/events were categorized into 1 of 4 groups, as follows: (i) coronary artery disease; (ii) valvular, aortic, arrhythmia conditions; (iii) heart failure; and (iv) congenital heart disease. Cardiac surgery was categorized as either “yes” or “no.” Diabetes, hypertension, obesity, and dyslipidemia were listed as comorbidities; 4 was considered the maximum number of comorbidities for each patient. Smoking history was categorized as either “never” or “current/former.”

The number of program exercise sessions attended and the location(s) of attendance (community and/or hospital) were collected for each patient. As the bridging program may have provided a greater number of exercise sessions for participants, attendance was also analyzed as a percentage of the total number of offered sessions. To determine percentage of exercise sessions attended, the reported number of sessions attended was divided by the total number of sessions offered (8 sessions for COMM and HOSP participants; 11 sessions for BRIDGE participants). Program exercise-session attendance was explicitly documented as a distinct visit type within the electronic medical database, and all charts contained complete data for this variable.

Statistical analysis

No sample size calculations were completed, as our sample included all eligible COMM and BRIDGE participants from the time of community program inception (January 2016) to November 2019. Descriptive statistics were completed for baseline characteristics. χ^2 tests were used to determine any difference between groups at baseline, including differences in the proportion of cardiac conditions/events and surgeries between groups. A Fisher’s exact test was used to compare the proportion of cardiac conditions/events in cases in which < 5 patients were in a particular category and program group. After the data distribution was determined to be non-normal, the Wilcoxon signed rank test was used to compare the number of exercise sessions attended as well as the percentage of total offered sessions attended, for the COMM vs C-HOSP groups, and the BRIDGE vs B-HOSP groups, as these groups were age- and sex-matched. The Mann-Whitney *U* rank test was used for unmatched comparisons. A *P* value of < 0.05

was considered statistically significant for all tests. Statistical analyses were conducted using SPSS 27.0 (IBM Corp., Armonk, NY).

Results

A total of 230 patients were included. The mean age of participants at the time of cardiac rehabilitation program intake was 59.8 ± 12.4 years. Female patients comprised 27% of total participants ($n = 62$). The majority of individuals had a BMI in the overweight or obese range;³¹ 79 participants (34.3%) were classified as overweight (BMI = 25.0–29.9 kg/m²) and 86 (37.4%) were classified as obese (BMI ≥ 30.0 kg/m²). A total of 193 participants (83.9%) had ≥ 1 comorbidity, and 136 (59.1%) were current or former smokers. Baseline characteristics were not statistically significantly different, and the proportions of comorbidities were similar across groups ($P \geq 0.17$; see [Table 1](#)). Nevertheless, COMM and BRIDGE participants had slightly higher BMI, compared with the HOSP participants. The C-HOSP group had the greatest number of participants who were current or former smokers. A profile of cardiac conditions/events by group is shown in [Table 2](#).

A total of 63 participants (27.4%) underwent surgery for their cardiac condition; the COMM and BRIDGE groups had the highest proportions of patients who had undergone cardiac surgery, although this variable did not reach statistical significance ($P = 0.23$; see [Table 2](#)). Notably, the C-HOSP group had the lowest proportion of patients with valvular/aortic/arrhythmia cardiac diagnoses ($P < 0.01$), and the C-HOSP group had the highest proportion (though this difference did not reach statistical significance) of heart failure patients, compared with the other groups ($P = 0.28$). Overall, coronary artery disease was the most prevalent cardiac condition, and most patients were referred to the cardiac rehabilitation program after a myocardial infarction (see [Table 2](#)).

Exercise-session attendance

For all participants combined, the median level of exercise-session attendance was 7.0 sessions (interquartile range [IQR; given in all cases as 25th and 75th percentile, respectively] = 3.0, 8.0 sessions). Only 14 participants (6.1%) who attended an initial intake visit attended no subsequent exercise sessions. There was no significant difference between COMM and C-HOSP participants for number of exercise sessions attended ($P = 0.49$). BRIDGE participants attended significantly more sessions than both B-HOSP participants ($P < 0.001$) and COMM participants ($P < 0.001$). As shown in [Table 3](#), BRIDGE participants attended a greater percentage of sessions (91%; IQR = 64%, 100%), compared with B-HOSP participants (63%; IQR = 13%, 94%; $P = 0.01$). There was no significant difference in percentage of sessions attended between the COMM participant (75%; IQR = 38%, 88%) and C-HOSP participant (81%; IQR = 38%, 100%) groups ($P = 0.37$). Although BRIDGE participants attended significantly more exercise sessions than COMM participants, no significant differences were detected between the COMM and BRIDGE participant groups in percentage of sessions attended ($P = 0.30$).

Both female and male patients attended a median of 7.0 exercise sessions (female patients: IQR = 5.0, 8.0 sessions;

Table 1. Participant baseline characteristics

	COMM (n = 74)	C-HOSP (n = 74)	BRIDGE (n = 41)	B-HOSP (n = 41)	P
Age, y	60.7 ± 12.3	60.7 ± 12.3	58.1 ± 12.6	58.1 ± 12.6	0.49
Age, y, minimum–maximum	21–85	21–85	28–80	28–80	
Age by decade, y					
20–29	2 (2.7)	2 (2.7)	2 (4.9)	2 (4.9)	
30–39	—	—	2 (4.9)	2 (4.9)	
40–49	10 (13.5)	10 (13.5)	5 (12.2)	5 (12.2)	
50–59	19 (25.7)	19 (25.7)	12 (29.3)	12 (29.3)	
60–69	26 (35.1)	26 (35.1)	10 (24.4)	10 (24.4)	
70–79	14 (18.9)	14 (18.9)	9 (22.0)	9 (22.0)	
80–89	3 (4.1)	3 (4.1)	1 (2.4)	1 (2.4)	
Sex					0.95
Female	19 (25.7)	19 (25.7)	12 (29.3)	12 (29.3)	
Male	55 (74.3)	55 (74.3)	29 (70.7)	29 (70.7)	
BMI,* kg/m ²	30.3 ± 5.1 (n = 66)	28.9 ± 5.1 (n = 65)	30.7 ± 9.1 (n = 38)	29.7 ± 6.8 (n = 38)	0.56
≤ 24.9	9 (13.6)	15 (20.3)	9 (23.7)	9 (23.7)	
25.0–29.9	29 (43.9)	23 (31.1)	15 (39.5)	12 (31.6)	
30.0–34.9	15 (22.7)	20 (27.0)	8 (21.1)	9 (23.7)	
35.0–39.9	11 (16.7)	5 (6.8)	2 (5.3)	6 (15.8)	
≥ 40.0	2 (3.0)	2 (2.7)	4 (10.5)	2 (5.3)	
Comorbidities					0.99
0	13 (17.6)	10 (13.5)	7 (17.1)	7 (17.1)	
1–2	37 (50.0)	39 (52.7)	20 (48.8)	20 (48.8)	
3–4	24 (32.4)	25 (33.8)	14 (34.1)	14 (34.1)	
Diabetes	23 (31.1)	25 (33.8)	13 (31.7)	11 (26.8)	0.70
Hypertension	40 (54.1)	39 (52.7)	24 (58.5)	20 (48.8)	0.83
Obesity	30 (40.5)	29 (39.2)	15 (36.6)	17 (41.5)	0.92
Dyslipidemia	46 (62.2)	49 (66.2)	29 (70.7)	27 (65.9)	0.75
Smoking status					0.17
Never	31 (41.9)	24 (32.4)	19 (46.3)	20 (48.8)	
Current/former	43 (58.1)	50 (67.6)	22 (53.7)	21 (51.2)	

Data are reported as number (%), or mean ± standard deviation, or as noted.

BMI, body mass index. B-HOSP, hospital-based participants age- and sex-matched to BRIDGE participants; BRIDGE, bridging participants; C-HOSP, hospital-based participants age- and sex-matched to COMM participants; COMM, community-based participants.

*Missing data, applicable *n* values are reported.

male patients: IQR = 3.0, 8.0 sessions); no significant differences in attendance were observed between sexes overall ($P = 0.66$). In subanalyses considering program location and sex, attendance did not differ significantly between female and male COMM participants ($P = 0.57$), or between female and male HOSP participants ($P = 0.93$). Although no significant differences were demonstrated between female and male BRIDGE participants for exercise-session attendance overall ($P = 0.10$), female BRIDGE participants attended significantly more community-based sessions, compared with male BRIDGE participants ($P = 0.02$).

Surgical and nonsurgical participants attended a median of 7.0 exercise sessions (surgical: IQR = 4.0, 8.0 sessions;

nonsurgical: IQR = 3.0, 8.0 sessions), with no significant difference in attendance detected ($P = 0.48$).

Discussion

Our results demonstrate that participants in the BRIDGE (hospital plus community) group attended significantly more sessions than the COMM and B-HOSP participants. However, in regard to percentage of available exercise sessions attended, no significant differences in attendance were seen between BRIDGE and COMM participants. These findings strengthen the conjecture that community-based and hybrid pathways lead to similar or greater attendance when compared

Table 2. Cardiac condition/event and surgery by group

Cardiac condition/event*	COMM (n = 74)	C-HOSP (n = 74)	BRIDGE (n = 41)	B-HOSP (n = 41)	P
Coronary artery disease	57 (77.0)	60 (81.1)	28 (68.3)	28 (68.3)	0.31
Myocardial infarction†	39 (68)	42 (70)	20 (72)	18 (64)	0.94
Valvular/aortic/arrhythmia	12 (16.1)	1 (1.4)	8 (19.5)	9 (22)	< 0.01‡
Heart failure	3 (4.1)	9 (12.2)	2 (4.9)	2 (4.9)	0.28‡
Congenital	2 (2.7)	4 (5.4)	2 (4.9)	2 (4.9)	0.84‡
Underwent cardiac surgery	23 (31.1)	15 (20.3)	15 (36.6)	10 (24.4)	0.23

Data reported as number of patients (%), unless otherwise indicated.

B-HOSP, hospital-based participants age- and sex-matched to BRIDGE participants; BRIDGE, bridging participants; C-HOSP, hospital-based participants age- and sex-matched to COMM participants; COMM, community-based participants.

*One individual in the BRIDGE group had no condition specified.

†Myocardial infarctions within coronary artery disease category.

‡Fisher's exact test used, as number of participants in a group was < 5.

Table 3. Exercise-session attendance (number and percentage of sessions) by group

Exercise-session attendance	COMM (n = 74)	C-HOSP (n = 74)	BRIDGE (n = 41)	B-HOSP (n = 41)	P
Total attended, n	6.0 (3.0–7.0)	6.0 (3.0–8.0)	10.0 (7.0–11.0)	6.0 (1.5–8.0)	0.49*
Community sessions attended, n	6.0 (3.0–7.0)	—	3.0 (2.0–3.0)	—	< 0.001 ^{†,§}
Hospital sessions attended, n	—	6.0 (3.0–8.0)	8.0 (4.0–8.0)	6.0 (1.5–8.0)	< 0.001 ^{†,§}
Total potential sessions attended, %	75 (38–88)	81 (38–100)	91 (64–100)	63 (13–94)	0.37* 0.01 ^{†,§} 0.30 [‡]

Data are presented as median number of exercise sessions attended (with 25th, 75th percentile interquartile range), unless otherwise indicated.

B-HOSP, hospital-based participants age- and sex-matched to BRIDGE participants; BRIDGE, bridging participants; C-HOSP, hospital-based participants age- and sex-matched to COMM participants; COMM, community-based participants.

* Denotes the between-group comparison for COMM and C-HOSP (Wilcoxon test).

† Denotes the between-group comparison for BRIDGE and B-HOSP (Wilcoxon test).

‡ Denotes the between-group comparison for COMM and BRIDGE (Mann-Whitney U test).

§ Statistically significant difference between groups.

to hospital-only exercise. As previous literature has shown a clear dose–response relationship between greater cardiac rehabilitation exercise-session attendance and reduced risk of mortality,²² and as BRIDGE participants exhibited the greatest attendance overall, this program may be the best option for cardiac patients.

To date, community-based cardiac rehabilitation programs have been utilized primarily for long-term exercise maintenance.³² Thus, this study adds to the paucity of literature investigating cardiac rehabilitation offered in Canadian community-based settings earlier in recovery. Additionally, our results provide program providers with further evidence supporting the de-medicalization of cardiac rehabilitation and encouragement in considering community-based sessions as standard program offerings. Although our results cannot affirm that bridging and community-based programs should be offered as usual care for all cardiac patients (eg, high-risk patients who require close monitoring), these findings align with those of other studies demonstrating the utility of hybrid cardiac rehabilitation delivery models for eligible patients in other Canadian health regions.³³

This study also serves as a comprehensive analysis of community and bridging participants and is strengthened by including all eligible records since the inception of the Alberta-based community program. Further, this study is the first to describe the characteristics and cardiac conditions of community-based and bridging participants in this high-volume cardiac rehabilitation program. Study findings illustrate that patients of diverse ages and cardiac profiles may opt for community or bridging program types when provided the choice. Additionally, our results indicate that all cardiac conditions were represented in the community and bridging programs, thereby demonstrating the utility of community-based cardiac rehabilitation for a wide range of patients. Interesting to note is that the highest proportions of surgical patients were seen in the COMM and BRIDGE groups, albeit the differences between groups did not reach statistical significance.

Similar to findings in other studies,^{34,35} female patients represented less than 30% of all cardiac rehabilitation participants; however, establishing the proportion of female to male patients referred to cardiac rehabilitation vs those eligible was beyond the scope of this investigation. Despite mixed evidence regarding attendance rates of female vs male patients, and various cardiac rehabilitation studies reporting higher

attendance rates in male patients, compared with female patients,^{34,36} we found that attendance did not differ between sexes overall. We also found that female BRIDGE participants attended significantly more sessions in the community fitness centres than did male BRIDGE participants. Previous research has indicated that there are sex-specific factors for not attending cardiac rehabilitation,³⁶ including unappealing rehabilitation environments.^{6,37} Our project is based on the premise that providing alternative program choices may better meet patient preferences, which may subsequently improve attendance rates (as we found with the BRIDGE participants). BRIDGE participants also may have felt more comfortable transitioning to the community setting because the same program exercise specialists supervised sessions in both the hospital and community locations and this may have contributed to higher attendance. Given that the community and bridging programs provided the same clinical exercise expertise as the hospital-based program, with no detriment to participant attendance, these findings further support the consideration of community-based cardiac rehabilitation as a standard care approach. Cardiac rehabilitation approaches tailored to sex-specific preferences (eg, women-only programs) may further facilitate program participation.³⁸

Limitations to consider are as follows. We recorded attendance for program exercise sessions but not for other program sessions (eg, social work, medication management, and education). Thus, this study does not reflect the true comprehensive nature of the cardiac rehabilitation program; however, exercise is a primary component of cardiac rehabilitation. Exercise training yields direct and indirect benefits to cardiac patients,^{39–41} and exercise-only cardiac rehabilitation programs provide comparable benefits relative to comprehensive programs.^{23,41} Tracking program exercise-session attendance can improve insight as to participant health post-program.

Given the retrospective nature of this study, we had incomplete physical fitness measures and could not compare how program type influenced physical fitness post-program. Additionally, participants were prescribed exercise 3 times per week outside of the program sessions to encourage independent activity, and although we obtained complete data for program exercise-session attendance, objective information for exercise performed outside of supervised sessions was unavailable. Hence, this limits our understanding of total exercise completed by participants in each program. Participants

also self-selected their program type/location, thereby hindering our ability to determine any causal effect of program location on attendance. However, as patient preference and location of residence partially influence the decision to attend either community vs hospital programs, it may not be practical to allocate patients to a particular program location.²¹

Despite matching COMM and BRIDGE participants to hospital-based participants of the same age and sex, participants were not matched based on cardiac condition or comorbidity profile. Further, the data were not normally distributed, and non-parametric analyses precluded our ability to compare attendance between groups while controlling/adjusting for relevant covariates. The use of alternative advanced analyses, including propensity matching, which has been gaining in popularity,⁴² may have enhanced study findings, although this was not feasible for this investigation. In lieu of this approach, a 1:1 age- and sex-matching approach was selected, as both variables were available in all patient charts and this allowed for automated matching; age and sex have also been shown to influence cardiac rehabilitation adherence.⁴³⁻⁴⁶ Notwithstanding, matching for cardiac condition/event and baseline comorbidities may have enhanced comparison of attendance between groups. Given the retrospective nature of the study, we also were unable to ascertain the specific factors that ultimately led patients to select the community or bridging programs, or assess the relationships between program location, behavioural factors (eg, exercise intention, social support), exercise-session attendance, and prolonged behaviour change/exercise maintenance. Future community-based cardiac rehabilitation studies should assess these factors to evaluate their effects on attendance and exercise maintenance following program completion.

Also of note, this investigation was completed prior to the COVID-19 pandemic and does not reflect the changes to many cardiac rehabilitation approaches required in response to the pandemic.^{47,48} Prior to COVID-19, the Alberta-based cardiac rehabilitation program consisted primarily of outpatient hospital, community, and bridging programs. Alternative home-based and virtual programs have since been offered to incoming patients, although these programs were not active at the time of this investigation. The repercussions of COVID-19 on hospital capacities and in-person program sessions will likely have impact for years to come, and program offerings will accordingly require ongoing versatility to accommodate strains to the health system while taking into account patient preferences and comfort. Notwithstanding this issue, evaluating pre-pandemic rehabilitation approaches will enhance understanding of offerings that may be worthwhile to resume post-pandemic. Subsequent waves of COVID-19 (or different health crises) may result in recurrent reductions to hospital capacities, as well as units being converted to COVID-19 units; thus, community settings may serve as one suitable alternative in lieu of hospital-based programming, and our findings further demonstrate the utility of bridging and community cardiac rehabilitation strategies in phase II patients.

Considering study findings and the utility of bridging and community-based programs, these program options may facilitate greater post-program exercise, as they provide sessions in the community in which exercise behaviours will ultimately continue. As maintaining/increasing physical

activity and exercise is a primary goal of cardiac rehabilitation, post-program and long-term activity levels are important outcomes to evaluate, and this is an area for future investigation. Although numerous factors beyond program location likely influence attendance, offering alternative cardiac rehabilitation options can provide patients with choices, which may in turn improve program accessibility and adherence.^{16,21}

Conclusions

Our findings demonstrate no significant difference in exercise-session attendance between community-based and hospital-based cardiac rehabilitation participants. However, participants who attended a hybrid program consisting of hospital and community-based exercise, which we called the bridging program, had higher attendance, compared with a hospital-matched cohort. Thus, providing the option of community-program exercise sessions to stable cardiac patients does not appear to lower attendance rates, but rather, may lead to greater attendance, particularly if a hybrid (hospital plus community-based) pathway is employed.

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Supplementary Material

To access the supplementary material accompanying this article, visit *CJC Open* at <https://www.cjopen.ca/> and at <https://doi.org/10.1016/j.cjco.2021.12.001>.