



The future is now: a call for action for cardiac telerehabilitation in the COVID-19 pandemic from the secondary prevention and rehabilitation section of the European Association of Preventive Cardiology

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Received 27 April 2020; accepted 15 June 2020; online published ahead of print 3 July 2020

The role of comprehensive cardiac rehabilitation is well established in the secondary prevention of cardiovascular diseases such as coronary artery disease and heart failure. Numerous trials have demonstrated both the effectiveness as well as the cost-effectiveness of comprehensive cardiac rehabilitation in improving exercise capacity and quality of life, and in reducing cardiovascular mortality and morbidity. However, the current COVID-19 pandemic has led to closure of many cardiac rehabilitation centres in Europe resulting in many eligible patients unable to participate in the optimisation of secondary prevention and physical performance. This elicits an even louder call for alternatives such as cardiac telerehabilitation to maintain the delivery of the core components of cardiac rehabilitation to cardiovascular disease patients. The present call for action paper gives an update of recent cardiac telerehabilitation studies and provides a practical guide for the setup of a comprehensive cardiac telerehabilitation intervention during the COVID-19 pandemic. This set up could also be relevant to any cardiovascular disease patient not able to visit cardiac rehabilitation centres regularly after the COVID-19 pandemic ceases.

Keywords COVID-19 • cardiovascular disease • telerehabilitation • comprehensive cardiac rehabilitation

Cardiac rehabilitation

Cardiovascular disease (CVD) remains a leading cause of death worldwide.¹ Fortunately, premature CVD mortality has declined in most European countries due to better medical care and prevention.² Forty per cent of major coronary events occur in patients with known coronary artery disease (CAD).³ Furthermore, one-fifth of patients admitted for heart failure (HF) are rehospitalised within one year due to a HF exacerbation.⁴ The improved survival following a

cardiac event results in a growing number of patients living with a heart disease.⁵ Therefore, there is need for optimal lifelong secondary prevention.⁶ Secondary prevention for CVD consists of three pillars: guideline-directed medical therapy (GDMT), adopting a healthy lifestyle, and patient education to increase health literacy.^{5–9} The goal of GDMT is prescribed, either to obtain clinically stabilisation of patients or to add preventive medications to secondary prevention strategies.⁸ It is usually carried out in phase I; however, it can be adapted during phase II.

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Cost-effectiveness of cardiac telerehabilitation in coronary artery disease and heart failure patients: systematic review of randomized controlled trials

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Received 26 August 2020; revised 23 September 2020; editorial decision 23 September 2020; accepted 24 September 2020; online publish-ahead-of-print 23 November 2020

This systematic review aims to assess the cost-effectiveness of cardiac telerehabilitation in comparison with centre-based cardiac rehabilitation (CR). Evidence of cost-effectiveness is an important step towards implementation and reimbursement of telerehabilitation services. Electronic databases were searched for economic evaluations of telerehabilitation programmes. Only randomized controlled trials (RCTs) published in English were eligible for inclusion. Study quality and risk of bias were assessed using the Consensus Health Economic Criteria (CHEC) list. A total of eight economic evaluations met the review inclusion criteria. The total sample size consisted of 751 patients ranging from a minimum of 46 patients to a maximum of 162 patients per study. Maximal follow-up was 5 years. A total of seven of the eight included studies demonstrated that telerehabilitation could lead to similar or lower long-term costs and are thus as cost-effective as traditional centre-based CR. There is significant heterogeneity between all included telerehabilitation interventions in duration, used technology, cost included and follow-up. Based on these small short duration trials, telerehabilitation may be as cost-effective as traditional centre-based approaches. However, more assessments of the value for money of telerehabilitation in larger and longer RCTs are needed both in high- as low-income countries.

Keywords

Heart failure • Ischaemic heart disease • Telerehabilitation • Acute coronary artery disease • Cost-effectiveness • Cost-utility

Introduction

Ischaemic heart disease (IHD) and heart failure (HF) are the most important causes of death in most European countries.¹ Next to a high mortality, they are also associated with a high number of recurrent events, rehospitalizations and negative impact on quality of life.² Ischaemic heart disease and HF also have a significant impact on healthcare budgets.¹ The high rate of recurrent disease leads to the need of self-management or secondary prevention programmes. The first step of secondary prevention is often cardiac rehabilitation (CR).³ The effectiveness and cost-effectiveness of CR in reducing morbidity and mortality along with increasing quality of life and

psychological well-being are well-established.^{4–6} A recent position paper by Ambrosetti et al.⁷ defined the following core components of CR: patient assessment, management and control of cardiovascular risk factors, physical activity counselling, prescription of exercise training, dietary advice, psychosocial management, and vocational support. Unfortunately, the EUROASPIRE surveys demonstrated that only few of the eligible patients participate in CR.⁸ Important barriers for participation are often lower health literacy or transport, familial, vocational, and schedule constraints.^{9,10} Telerehabilitation or home-based CR are suggested as solutions for these patients. Telerehabilitation is defined as the use of digital innovations such as smartphone applications, smartwatches, and teleconsultations to

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Research

JAMA Cardiology | Brief Report

Effectiveness of Home-Based Mobile Guided Cardiac Rehabilitation as Alternative Strategy for Nonparticipation in Clinic-Based Cardiac Rehabilitation Among Elderly Patients in Europe A Randomized Clinical Trial

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 Supplemental content

IMPORTANCE Although nonparticipation in cardiac rehabilitation is known to increase cardiovascular mortality and hospital readmissions, more than half of patients with coronary artery disease in Europe are not participating in cardiac rehabilitation.

OBJECTIVE To assess whether a 6-month guided mobile cardiac rehabilitation (MCR) program is an effective therapy for elderly patients who decline participation in cardiac rehabilitation.

DESIGN, SETTING, AND PARTICIPANTS Patients were enrolled in this parallel multicenter randomized clinical trial from November 11, 2015, to January 3, 2018, and follow-up was completed on January 17, 2019, in a secondary care system with 6 cardiac institutions across 5 European countries. Researchers assessing primary outcome were masked for group assignment. A total of 4236 patients were identified with a recent diagnosis of acute coronary syndrome, coronary revascularization, or surgical or percutaneous treatment for valvular disease, or documented coronary artery disease, of whom 996 declined to start cardiac rehabilitation. Subsequently, 179 patients who met the inclusion and exclusion criteria consented to participate in the European Study on Effectiveness and Sustainability of Current Cardiac Rehabilitation Programmes in the Elderly trial. Data were analyzed from January 21 to October 11, 2019.

INTERVENTIONS Six months of home-based cardiac rehabilitation with telemonitoring and coaching based on motivational interviewing was used to stimulate patients to reach exercise goals. Control patients did not receive any form of cardiac rehabilitation throughout the study period.

MAIN OUTCOMES AND MEASURES The primary outcome parameter was peak oxygen uptake ($\text{V}_{\text{O}_2\text{peak}}$) after 6 months.

RESULTS Among 179 patients randomized (145 male [81%]; median age, 72 [range, 65-87] years), 159 (89%) were eligible for primary end point analysis. Follow-up at 1 year was completed for 151 patients (84%). Peak oxygen uptake improved in the MCR group ($n = 89$) at 6 and 12 months (1.6 [95% CI, 0.9-2.4] $\text{mL/kg}^{-1}/\text{min}^{-1}$ and 1.2 [95% CI, 0.4-2.0] $\text{mL/kg}^{-1}/\text{min}^{-1}$, respectively), whereas there was no improvement in the control group ($n = 90$) (+0.2 [95% CI, -0.4 to 0.8] $\text{mL/kg}^{-1}/\text{min}^{-1}$ and +0.1 [95% CI, -0.5 to 0.7] $\text{mL/kg}^{-1}/\text{min}^{-1}$, respectively). Changes in $\text{V}_{\text{O}_2\text{peak}}$ were greater in the MCR vs control groups at 6 months (+1.2 [95% CI, 0.2 to 2.1] $\text{mL/kg}^{-1}/\text{min}^{-1}$) and 12 months (+0.9 [95% CI, 0.05 to 1.8] $\text{mL/kg}^{-1}/\text{min}^{-1}$). The incidence of adverse events was low and did not differ between the MCR and control groups.

CONCLUSIONS AND RELEVANCE These results suggest that a 6-month home-based MCR program for patients 65 years or older with coronary artery disease or a valvular intervention was safe and beneficial in improving $\text{V}_{\text{O}_2\text{peak}}$ when compared with no cardiac rehabilitation.

TRIAL REGISTRATION [trialregister.nl](https://www.trialregister.nl) Identifier: NL5168

JAMA Cardiol. 2021;6(4):463-468. doi:10.1001/jamacardio.2020.5218
Published online October 28, 2020. Corrected on November 25, 2020.

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Article

Cardiac Rehabilitation Based on the Walking Test and Telerehabilitation Improved Cardiorespiratory Fitness in People Diagnosed with Coronary Heart Disease during the COVID-19 Pandemic

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Citation: Batalik, L.; Konečný, V.; Dosbaba, F.; Vlazna, D.; Brat, K. Cardiac Rehabilitation Based on the Walking Test and Telerehabilitation Improved Cardiorespiratory Fitness in People Diagnosed with Coronary Heart Disease during the COVID-19 Pandemic. *Int. J. Environ. Res. Public Health* **2021**, *18*, 2241. <https://doi.org/10.3390/ijerph18052241>

Academic Editor: Ruth E. Taylor-Piliae

Received: 8 January 2021

Accepted: 19 February 2021

Published: 24 February 2021

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Abstract: This study investigated an alternative home-based cardiac telerehabilitation model in consideration of the recommendations for the COVID-19 quarantine of people diagnosed with coronary heart disease (CHD). We hypothesized that using a 200 m fast walking test (200 mFWT) and telerehabilitation would create an effective alternative cardiac rehabilitation (CR) intervention that could improve cardiorespiratory fitness. Participants ($n = 19$, mean age 60.4 ± 9.6) of the 8-week intervention performed regular physical exercise at the target heart rate zone determined by calculations based on the 200 mFWT results. In our study, the participants were supervised using telerehabilitation. A total of 84% of participants completed the 8-week intervention. No adverse events were reported during telerehabilitation. The study participants noted a significant improvement ($p < 0.001$) in cardiorespiratory fitness expressed by an 8% reduction in the walking test time ($\Delta 8.8 \pm 5.9$ s). Home-based telerehabilitation based on 200 mFWT effectively increased the cardiorespiratory fitness in people with CHD with a low to moderate cardiovascular risk. This was a novel approach in CR during the COVID-19 pandemic. As research in this area is justified, this paper may serve as an alternative method of providing healthcare during the COVID-19 pandemic and as a basis for further upcoming randomized controlled trials.

Keywords: cardiac telerehabilitation; cardiac rehabilitation; COVID-19; physical exercise; coronary heart disease; cardiorespiratory fitness; heart rate monitor

1. Introduction

Coronary heart disease (CHD) is the cause of a large proportion of all cardiovascular deaths worldwide [1]. Recommendations for secondary prevention emphasize various approaches to cardiovascular risk management [2]. Physical exercise has been consistently identified as an integral part of cardiac rehabilitation (CR) [3]. For people diagnosed with CHD, training can improve their cardiorespiratory fitness, quality of life and reduce the mortality and number of rehospitalizations [4]. Despite the recognized benefits of CR, many barriers limit the use of outpatient CR exercise programs [5].

Telerehabilitation is an alternative approach that could alleviate some of these barriers. Telerehabilitation includes providing distance rehabilitation services via information and communication technologies (ICT), such as telephone, Internet, and video conferencing [6]. This model has been successfully studied in people with various cardiopulmonary diseases and is now being promoted as a possible part of standard healthcare [7–9].

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Research

JAMA Cardiology | Original Investigation

Effects of a 9-Week Hybrid Comprehensive Telerehabilitation Program on Long-term Outcomes in Patients With Heart Failure

The Telerehabilitation in Heart Failure Patients (TELEREH-HF) Randomized Clinical Trial

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 Supplemental content

IMPORTANCE Guidelines recommend exercise training as a component of heart failure management. There are large disparities in access to rehabilitation, and introducing hybrid comprehensive telerehabilitation (HCTR) consisting of remote monitoring of training at patients' homes might be an appealing alternative.

OBJECTIVE To assess whether potential improvements in quality-of-life outcomes after a 9-week HCTR intervention in patients with heart failure translate into improvement in clinical outcomes during extended 12 to 24 months of follow-up, compared with usual care.

DESIGN, SETTING, AND PARTICIPANTS The Telerehabilitation in Heart Failure Patients (TELEREH-HF) trial is a multicenter, prospective, open-label, parallel-group randomized clinical trial that enrolled 850 patients with heart failure up to 6 months after a cardiovascular hospitalization with New York Heart Association levels I, II, or III and left ventricular ejection fraction of 40% or less. Patients from 5 centers in Poland were randomized 1:1 to HCTR plus usual care or usual care only and followed up for 14 to 26 months after randomization.

INTERVENTIONS During the first 9 weeks, patients underwent either an HCTR program (1 week in hospital and 8 weeks at home) or usual care with observation. The HCTR intervention encompassed telecare, telerehabilitation, and remote monitoring of implantable devices. No intervention occurred in the remaining study period.

MAIN OUTCOMES AND MEASURES The percentage of days alive and out of the hospital from randomization through the end of follow-up at 14 to 26 months.

RESULTS A total of 850 patients were enrolled, with 425 randomized to the HCTR group (377 male patients [88.7%]; mean [SD] age, 62.6 [10.8] years) and 425 randomized to usual care (376 male patients [88.5%]; mean [SD] age, 62.2 [10.2] years). The HCTR intervention did not extend the percentage of days alive and out of the hospital. The mean (SD) days were 91.9 (19.3) days in the HCTR group vs 92.8 (18.3) days in the usual-care group, with the probability that HCTR extends days alive and out of the hospital equal to 0.49 (95% CI, 0.46-0.53; $P = .74$) vs usual care. During follow-up, 54 patients died in the HCTR arm and 52 in the usual-care arm, with mortality rates at 26 months of 12.5% vs 12.4%, respectively (hazard ratio, 1.03 [95% CI, 0.70-1.51]). There were also no differences in hospitalization rates (hazard ratio, 0.94 [95% CI, 0.79-1.13]). The HCTR intervention was effective at 9 weeks, significantly improving peak oxygen consumption (0.95 [95% CI, 0.65-1.26] mL/kg/min vs 0.00 [95% CI, -0.31 to 0.30] mL/kg/min; $P < .001$) and quality of life (Medical Outcome Survey Short Form-36 questionnaire score, 1.58 [95% CI, 0.74-2.42] vs 0.00 [95% CI, -0.84 to 0.84]; $P = .008$), and it was well tolerated, with no serious adverse events during exercise.

CONCLUSIONS AND RELEVANCE In this trial, the positive effects of a 9-week program of HCTR in patients with heart failure did not lead to the increase in percentage of days alive and out of the hospital and did not reduce mortality and hospitalization over a follow-up period of 14 to 26 months.

TRIAL REGISTRATION ClinicalTrials.gov Identifier: NCT02523560

JAMA Cardiol. doi:10.1001/jamacardio.2019.5006
Published online November 17, 2019.

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European Journal of Physical and Rehabilitation Medicine
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ARTICLE ONLINE FIRST

This provisional PDF corresponds to the article as it appeared upon acceptance.

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The final version may contain major or minor changes.

Long-term exercise effects after cardiac telerehabilitation in patients with coronary artery disease: 1-year follow-up results of the randomized study

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European Journal of Physical and Rehabilitation Medicine 2021 Feb 23

DOI: 10.23736/S1973-9087.21.06853-3

Article type: Original Article

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Article first published online: February 23, 2021

Manuscript accepted: February 18, 2021

Manuscript revised: January 18, 2021

Manuscript received: October 16, 2020

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ACTA CARDIOLOGICA
<https://doi.org/10.1080/00015385.2020.1786625>



ORIGINAL SCIENTIFIC PAPER



Use of cardiac telerehabilitation during COVID-19 pandemic in Belgium

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ABSTRACT

Background: The COVID-19 pandemic has forced many cardiac rehabilitation centres to focus more on the remote delivery of cardiac rehabilitation (CR) components. This increased focus and the lessons learned from this period could enhance the implementation of telerehabilitation and increase the participation in CR in Belgium.

Methods: We conducted a survey between April and May 2020 about the implementation of telerehabilitation services during the COVID-19 pandemic. The electronic questionnaire was sent via email to the heads of 42 Belgian CR centres. Three reminders via email were sent during the study period.

Results: 27 CR centres (64%) returned completed questionnaires after three mailings. 52% of the CR centres provided remote CR services during the lockdown due to the COVID-19 pandemic. All CR centres that provided remote CR services delivered exercise training. The most used medium to deliver the CR components were online videos (71%) followed by online information on the website (64%) and emails (64%).

Conclusion: It is interesting that the COVID-19 pandemic has encouraged many CR centres to implement remote delivery of CR components. This can help to speed up the research and implementation of telerehabilitation in daily clinical practice. The COVID-19 pandemic could be the push for a large multicentre implementation study that could prove that telerehabilitation is feasible and effective in the Belgian setting.

ARTICLE HISTORY

Received 4 June 2020
 Revised 17 June 2020
 Accepted 18 June 2020

KEYWORDS

COVID-19; cardiovascular disease; telerehabilitation; Belgium

Introduction

Cardiovascular disease (CVD) remains the leading cause of mortality (27%) in Belgium, although the relative importance of CVD mortality in Belgium decreased steadily from 36% in 1998 probably due to better medical care and prevention [1,2]. Both primary prevention and secondary prevention are crucial pillars in reducing the morbidity and mortality of CVD, especially with the rising prevalence of obesity and diabetes and the fact that 40% of major coronary events occur in patients with manifest coronary artery disease (CAD) [3,4]. Comprehensive cardiac rehabilitation (CR) is an important part of the secondary prevention of CVD and therefore a class IA recommendation by the European Society Cardiology [4]. Core components of CR are patient assessment, management and control of cardiovascular risk factors, physical activity counselling, prescription of exercise training, dietary advice, psychosocial management and vocational support [5]. The surge capacity due to the COVID-19 pandemic led

to the shutdown of all non-urgent medical services such as CR in Belgium. Therefore, centres had to develop remote and innovative ways to deliver the core components of CR because a delay in the start of CR after a cardiac event is associated with less improvement in cardiopulmonary fitness, and poorer uptake, attendance and completion rates of CR programmes [6,7].

The remote delivery of CR can even remain important after the reopening of the CR centres because many CR centres will have reduced capacity after reopening to enable strict social distancing. Remote delivery of CR and telerehabilitation has already been studied in small- and medium-sized studies and most of these papers concluded that home-based CR or telerehabilitation was equally effective in improving clinical and health-related quality of life outcomes [8,9]. Telerehabilitation could possibly play a role in improving the participation rates of CR in Belgium by overcoming frequent barriers such as lack of access to

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REVIEW

Open Access

Cardiac rehabilitation via telerehabilitation
in COVID-19 pandemic situationDian M. Sari^{1*} and Laurentia C. G. Wijaya²**Abstract****Background:** Adherence to medication and lifestyle changes are very important in the secondary prevention of cardiovascular disease. One of the ways is by doing a cardiac rehabilitation program.**Main body of the abstract:** Cardiac rehabilitation program is divided into three phases. The cardiac rehabilitation program's implementation, especially the second phase, center-based cardiac rehabilitation (CBCR), has many barriers not to participate optimally. Therefore, the third phase, known as home-based cardiac rehabilitation (HBCR), can become a substitute or addition to CBCR. On the other hand, this phase is also an essential part of the patients' functional capacity. During the coronavirus disease-2019 pandemic, HBCR has become the leading solution in the cardiac rehabilitation program's sustainability. Innovation is needed in its implementation, such as telerehabilitation. So, the cardiac rehabilitation program can be implemented by patients and monitored by health care providers continuously.**Short conclusion:** Physicians play an essential role in motivating patients and encouraging their family members to commit to a sustainable CR program with telerehabilitation to facilitate its implementation.**Keywords:** Cardiac rehabilitation, Coronavirus disease-2019 pandemic, Home-based exercise, Telerehabilitation**Background: cardiac rehabilitation**

Cardiac rehabilitation (CR) is a comprehensive intervention for secondary prevention of cardiovascular disease (CVD) [1–3]. The 2016 European guidelines on CVD prevention in clinical practice emphasize that medication adherence and lifestyle changes are essential in secondary preventions of CVD, which can be increased and improved through CR programs; therefore, reducing the incidence of recurrent heart disease and the risk of death [2]. This program's ultimate goal is to prevent cardiac-related disease recurrence, lower the risk of other cardiac events, such as arrhythmias or heart failure (HF), and improve patients' mental health status and quality of life cardiac-related diseases [3].

The cardiac rehabilitation program focuses on risk assessment and management [4]. This program

implements a preventive lifestyle to control risk factors of cardiac diseases, such as obesity, hypertension, diabetes, and dyslipidemia. Cardiac rehabilitation includes medical evaluation; physical exercise, controlling nutritional intake, lipid levels, and blood pressure (BP); planning programs to reduce cigarette smoking and alcohol consumption; stress management; modified individualized lifestyle consultation; tailored targeted pharmacological therapy; patient education; and psychological counseling [1, 3]. The CR program components are aerobic training, strength/resistance exercise, flexibility, posture, coordination, and balance [5–7]. Table 1 below simplifies the predictors to assess high-risk patients during cardiac rehabilitation [8].

This literature review aimed to promote telemedicine specifically in CR through telerehabilitation programs among physicians and encourage each family member to actively support the continuum of rehabilitation programs at home to maintain and improve patients' quality of life.

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CJC Open 3 (2021) 152–158

Original Article

Cardiac Rehabilitation in Canada During COVID-19

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ABSTRACT

Background: Cardiac rehabilitation programs (CRPs) had to change quickly in response to a shift in clinical priorities related to the coronavirus disease 2019 (COVID-19). Yet, no study has examined the effect of COVID-19 on CRPs and if there has been an adequate transition to alternative programming.

Methods: To examine the status of CRPs during the COVID-19 pandemic, a web-based questionnaire was completed by CRP managers from April 23rd to May 14th, 2020.

Results: Overall, 114 representatives of 144 CRPs (79.1% of Canadian programs) responded. Of respondents, 41.2% (n = 47) reported CRP closure; primary reasons were staff redeployment and facility closure (41% of 51 responses, for both). Redeployment occurred in open CRPs and closed CRPs (30% ± 34% and 47% ± 38% of employees, respectively; P = 0.05) and reduced hours in 17.8% ± 31% and 22.5% ± 33% for remaining employees; P = 0.56. Of open CRPs, 84.8% accepted referrals for medically high-risk patients pre-COVID-19; this level fell to only 43.5% during the COVID-19 pandemic, P <

RÉSUMÉ

Contexte : Les programmes de réadaptation cardiaques (PRC) ont dû s'adapter rapidement en réponse à un changement des priorités cliniques liées à la maladie à coronavirus 2019 (COVID-19). Pourtant, aucune étude n'a examiné l'effet du COVID-19 sur les PRC et s'il y a eu une transition adéquate vers une programmation alternative.

Méthodes : Pour examiner l'état des PRC durant la pandémie de COVID-19, un questionnaire en ligne a été rempli par les responsables des PRC du 23 avril au 14 mai 2020.

Résultats : Au total, 114 représentants de 144 PRC (79,1 % des programmes canadiens) y ont répondu. Parmi les répondants, 41,2 % (n = 47) ont signalé une fermeture du PRC; les principales raisons résidaient en un redéploiement du personnel ou une fermeture des installations (41 % des 51 réponses, avec une combinaison des deux). Le redéploiement a eu lieu pour les PRC ouverts et les PRC fermés (concernant 30 % ± 34 % et 47 % ± 38 % des employés, respectivement; P = 0,05) et les heures réduites pour 17,8 % ± 31 % et 22,5 % ± 33 % des employés restants; P = 0,56. Concernant les PRC

Cardiac rehabilitation programs (CRPs) provide aerobic and resistance training interventions, as well as delivery of risk-factor modification, nutrition, and psychosocial counselling and education. CRPs are effective in reducing morbidity, mortality, and hospital readmissions in patients with cardiovascular disease.¹ On March 11th, 2020, the World Health Organization declared the coronavirus

disease 2019 (COVID-19) a pandemic. The proportion of CRPs that closed in Canada or transitioned from group-based face-to-face models of care to alternative remote cardiac rehabilitation delivery strategies during the pandemic is not known.

An understanding of the state of CRPs, as well as rehabilitation delivery barriers and facilitators is important given that these services are likely to be in higher demand in subsequent phases of the pandemic. Indeed, there are reports of a reduction or delay in people seeking medical help for acute coronary syndromes and worsening heart failure symptoms, and preliminary reports of cardiac involvement during hospitalization for COVID-19.²⁻⁸ Given the mitigating effect of CR on emergency room visits, hospital admissions, and adverse patient outcomes, access and timely referral to CRPs should be a priority.^{1,9,10} In addition, it would be prudent for CRPs to be

Received for publication September 10, 2020. Accepted September 27, 2020.

Ethics Statement The research reported has adhered to the relevant ethical guidelines.

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See page 157 for disclosure information.

<https://doi.org/10.1016/j.cjco.2020.09.021>2589-790X/© 2020 Canadian Cardiovascular Society. Published by Elsevier Inc. This is an open access article under the CC BY-NC-ND license (<https://creativecommons.org/licenses/by-nc-nd/4.0/>).

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ACTA CARDIOLOGICA
<https://doi.org/10.1080/00015385.2020.1846920>



ORIGINAL SCIENTIFIC PAPER



Patient experiences and willingness-to-pay for cardiac telerehabilitation during the first surge of the COVID-19 pandemic: single-centre experience

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ABSTRACT

Background: The first surge of the ongoing COVID-19 pandemic led to a shutdown of all non-urgent medical services such as cardiac rehabilitation. Therefore, centres had to develop remote and innovative ways to deliver the core components of CR during this shutdown. This increase in usage of remote rehabilitation services provides a chance to assess patients' experiences and willingness-to-pay of remote CR sessions.

Methods: This was a prospective single-centre study. From 17 July 2020, to 19 August 2020, we conducted an anonymous survey about the patient experiences of the cardiac telerehabilitation services provided at Jessa Hospital Hasselt during the COVID-19 pandemic. A link to an electronic questionnaire was sent via email to 155 patients who were invited to participate in the cardiac telerehabilitation sessions during the closure of the rehabilitation centre due to COVID-19.

Results: Fifty-five patients (35% of all invited patients) did participate in remote CR and completed the questionnaire. The mean age of the respondents was 65.4 ± 10.5 years, 63% were male and 70% of the participants were retired. A total of 91% possessed a smartphone and all those patients used their smartphone regularly to send text messages. Ninety-four per cent of the participants were satisfied with the provided telerehabilitation sessions and 70% of the participants would be prepared to pay for these sessions like for centre-based CR sessions. Twenty per cent of patients would even prefer the telerehabilitation sessions above centre-based CR sessions.

Conclusion: Most patients believed that remote CR could be an option after the COVID-19 pandemic when it is combined with centre-based CR sessions. Patients are willing to pay the same amount for a telerehabilitation session as a centre-based CR session. This demonstrates that highly motivated patients are open to shift certain parts of CR from face-to-face interactions to digital interactions.

ARTICLE HISTORY

Received 29 August 2020;
 Revised 27 October 2020;
 Accepted 31 October 2020

KEYWORDS

COVID-19; cardiovascular disease; telerehabilitation; cardiac rehabilitation; patient experience; willingness-to-pay

Introduction

Comprehensive cardiac rehabilitation (CR) is the first and essential part of the secondary prevention of cardiovascular disease (CVD) and is therefore a class IA recommendation by the European Society of Cardiology [1,5]. Multiple studies already demonstrated the clinical effectiveness and cost-effectiveness of providing CR for coronary artery disease and heart failure patients [2–4]. CR is typically a multidisciplinary centre-based programme which consists of the following core components: patient assessment, management and control of cardiovascular risk factors, physical activity counselling, prescription of exercise training, dietary advice, psychosocial management and vocational support [5]. The first surge of the ongoing COVID-19 pandemic had a significant impact on the

daily lives of many. In many countries, a shutdown of all non-urgent medical services such as cardiac rehabilitation was issued to lower the surge capacity due to COVID-19. It is well established that a delay of the start of CR after a cardiac event is associated with less improvement in cardiopulmonary fitness and poorer uptake, attendance and completion rates of CR programmes [6,7]. Therefore, centres had to develop remote and innovative ways to deliver the core components of CR during this shutdown. The remote delivery of CR will also remain important after the reopening of the CR centres because many CR centres will have reduced capacity after reopening to enable strict social distancing. A recent study showed that approximately 50% of Belgian CR centres provided a form of remote CR sessions during COVID-19 [8].

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 Literatur Review

NO	HARI/TGL	MATERI BIMBINGAN	SARAN	TTD PEMB
1.	Selasa 01 Juni 2021	Konfirmasi Pembimbing	Melanjutkan mencari judul	
2.	Selasa 08 Juni 2021	Pengajuan Judul	ACC judul, melanjutkan BAB 1	
3.	Jumat 16 Juli 2021	Konsultasi BAB 1-3	Melanjutkan revisi Bab 1-3	
4.	Jumat 27 Agustus 2021	Pengajuan Revisi BAB 1-3 Konsultasi BAB 4 dan 5	ACC BAB 1-3 Melanjutkan Revisi Bab 4-5	
5.	Jumat 17 September 2021	Pengajuan Revisi BAB 4-5	ACC BAB 1-5 Melengkapi kelengkapan berkas ACC Ujian	
6.	Senin 20 September 2021	Mengumpulkan Kelengkapan Berkas	ACC	

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NO	HARI/TGL	MATERI BIMBINGAN	SARAN	TTD PEMB
1.	Kamis 03 Juni 2021	Konfirmasi Pembimbing Pengajuan Judul	Melanjutkan mencari judul ACC judul Melanjutkan BAB 1	
2.	Jumat 16 Juli 2021	Konsultasi BAB 1-3	Melanjutkan revisi Bab 1-3	
3.	Selasa 14 September 2021	Konsultasi revisi BAB 1-3	ACC BAB 1-3 Melanjutkan BAB 4-5	
4.	Jumat 27 Agustus 2021	Konsultasi BAB 4 dan 5	ACC BAB 1-3 Melanjutkan Revisi Bab 4-5	
5.	Sabtu 25 September 2021	Pengajuan Revisi BAB 4-5	Revisi BAB 4-5 Melengkapi kelengkapan berkas	
6.	Minggu 26 September 2021	Mengajukan Revisi BAB 4-5 Mengumpulkan Kelengkapan Berkas	ACC BAB 4-5	
7.	Senin 27 September 2021	Mengajukan berkas lengkap	ACC ujian	

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