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ORIGINAL ARTICLE

Expanding access to telehealth in Australian cardiac rehabilitation services: a national survey of barriers, enablers, and uptake

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Aims Cardiac rehabilitation (CR) is traditionally delivered in-person; however, the COVID-19 pandemic provided impetus for alternative offerings such as telehealth. We investigated uptake, barriers, and enablers in a national survey during the pandemic in Australia.

Methods and results We surveyed CR programmes between April and June 2021 using professional association networks. The anonymous online questionnaire addressed programme characteristics, COVID-19 impacts, and barriers to and enablers of telehealth use. Open-text responses were coded and presented as themes. In total, there were responses from 105 programmes (33% response rate). All states and geographical areas were represented. The use of every modality of telehealth care (telephone, video conferencing, text messaging, and web-based) increased significantly during and after COVID with a strong preference for telephone (85% of services). Respondents perceived video (53%) and telephone (47%) formats as safe and effective for delivering CR. The most common barriers to telehealth were difficulties conducting assessments and reduced engagement with patients. Prominent enablers were increased reach and reduced patient barriers to CR access.

Conclusion Telehealth use by CR programmes increased during the peak pandemic period. However, additional support is required to ensure that telehealth services can be maintained. There is considerable potential to increase the reach of CR by embedding telehealth into existing models of care.

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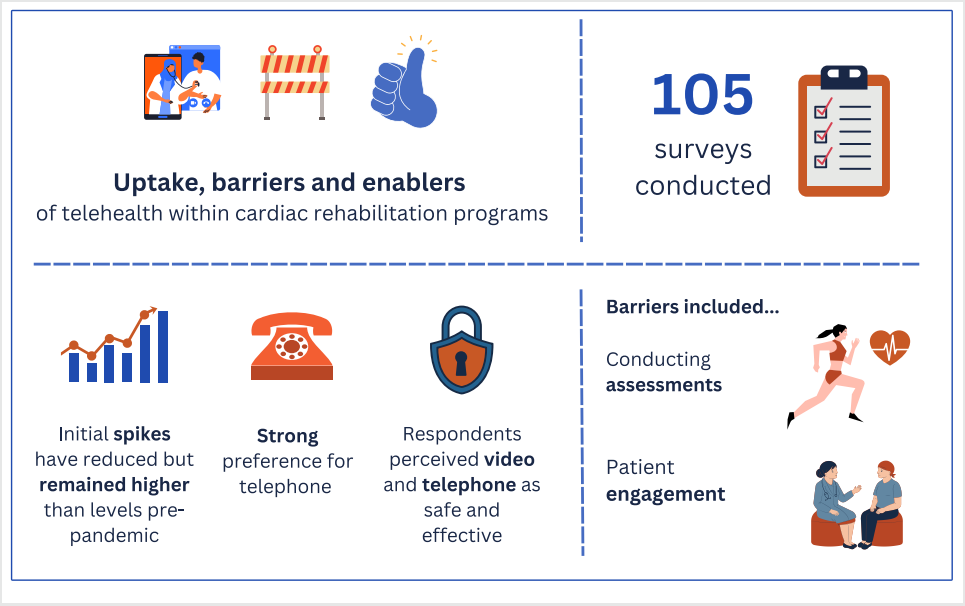
Graphical Abstract



Keywords Telehealth • Cardiac rehabilitation • SARS-CoV-2 • Health service delivery

Introduction

Telehealth delivery of cardiac rehabilitation (CR) has been advocated for decades because of the potential to improve access for hard-to-reach populations, such as those living a significant distance from available services.[1] Telehealth refers to the delivery of care at a distance using modes such as telephone, video conferencing, and web-based and mobile applications for CR.

Telehealth models of care are significantly associated with cardiovascular risk factor reduction[2] and reduced hospitalizations and cardiac events compared with usual care[3] and are well liked by patients.[4] Yet, while the efficacy of telehealth-delivered CR has been demonstrated, to date, there has been minimal translation of such modes of delivery to practice.[5,6] The COVID-19 pandemic provided a powerful push for clinicians to use alternative models of care, and there is emerging evidence that this has facilitated the rapid implementation of remote CR service delivery.[7]

Previously, we have reported on how the COVID-19 pandemic resulted in reduced CR programme delivery (70%) and/or periods of programme closure (40%). Many programmes (51.5%) reported decreased referrals and reduced participation levels (77.5%), and therefore, we felt that the programmes were inferior in quality to pre-pandemic levels.[8] In the present study, we investigate how the COVID-19 pandemic impacted the modality of CR care delivery as perceived by Australian CR providers. Specifically, we aim to determine: (i) uptake of telehealth in CR during and since the COVID-19 pandemic, (ii) perceptions of telehealth for CR, (iii) barriers to and enablers of telehealth use in CR; and (iv) the support required to integrate and sustain telehealth into CR services.

Methods

Study design

A survey of CR programmes was conducted between April and June 2021. The anonymous online questionnaire was developed using Qualtrics® software and sent to all CR programmes in Australia listed on the Australian Centre for Heart Health database ($n = 314$). In addition, the questionnaire was also cross-disseminated via the Australian Cardiovascular Health and Rehabilitation Association's (ACRA) networks, email lists, and social media communication channels with multiple reminders at state and national levels. The opportunity to win an annual subscription to ACRA or one of five AU$50 vouchers was used to incentivize participation.

Cardiac rehabilitation programmes delivering all modes were considered eligible, with no limitations to participation based on programme type, frequency, or intensity of delivery. It was requested that only one coordinator per site complete the survey.

The study was approved by the Flinders University Human Research Ethics Committee (#4153).

Measures

The questionnaire was developed through a collaboration of ACRA members including CR researchers and healthcare professionals and was tested for face validity by four additional CR coordinators (assessed for readability, plain language, format, and sequence). The final questionnaire comprised five sections: demographic characteristics of the CR programme and respondent; COVID-19 impact questions relating to three time periods (pre-COVID-19 in 2019, peak COVID-19 lockdown period from March to December 2020, and questionnaire completion date between April and June 2021); enablers and barriers to telehealth use; patient concerns and staff well-being. See Supplementary material online, *File S1* for the full

questionnaire. The survey had a median completion time of 20 min. In this study, we report on the items relating to telehealth use. The overall impact of COVID-19 on CR services has been reported elsewhere.[8]

Statistical analysis

Quantitative data

Descriptive statistics including the number and percentage (categorical variables), means and standard deviations, or medians and interquartile ranges (continuous variables) were used to calculate the sample programme and respondent demographics and characteristics. To compare differences over the three timepoints (2019, 2020, 2021), Cochran's *Q* test was used. If a significant Cochran's *Q* test was found, a *post hoc* pairwise comparison was undertaken using the McNemar test to determine the difference between the years 2019 and 2020, 2020 and 2021, and 2019 and 2021. A χ^2 statistical test was performed to investigate variations in the use of video conferencing use during the peak COVID-19 period (2020) on state, setting, rurality of service (using the Modified Monash Model—MMM), relative socio-economic advantage (using the Socio-Economic Indexes for Areas—SEIFA), and the profession of the CR coordinator. The significance level was set to $\alpha < 0.05$ for all analyses with adjustment using the Bonferroni correction for *post hoc* comparisons across the three timepoints ($\alpha = 0.017$). Data analysis was performed using the statistical software package Stata/SE 16.

Qualitative data

Free-text responses were subject to content analysis using an inductive coding strategy to develop emergent themes from the data. The qualitative analysis was conducted by two investigators (E.E.T. and B.A.) independently, who then discussed and agreed on final codes and themes. These final themes were confirmed with all authors.

Results

The final survey response rate was 33% with 105 completed surveys (from 314 active CR programmes in Australia at the time of the survey). Questionnaires where respondents had not completed more than demographic information were excluded ($n = 10$). While the majority of respondents were from Victoria and New South Wales (the most densely populated jurisdictions), all states and territories were represented (*Table 1*).

Table 1 Cardiac rehabilitation programme and coordinator characteristics of the sample

	Total (%)
Setting ($n = 105$)	
Public hospital	61 (58)
Private hospital	9 (9)
Community health centres and other	35 (33)
Multiple sites ($n = 105$)	
Yes	31 (30)
State/territory ($n = 100$)	
Victoria	39 (39)
New South Wales	24 (24)
Other states	37 (37)
Rurality (MMM) ($n = 97$)	
MM1 (metropolitan)	50 (52)
MM2 (regional centre)/MM3 (large rural town)	18 (18)
MM4–MM7 (small rural town to very remote)	29 (30)
SEIFA of CR programme location (using IRSAD, split into quintiles) ($n = 97$)	
1–3 (low)	29 (30)
4–6 (medium)	26 (27)
7–10 (high)	42 (43)
Respondent role ($n = 104$)	
Coordinator	80 (77)
CR team member	20 (19)
Other	4 (4)
Respondent profession ($n = 104$)	
Nursing	89 (85)
Physiotherapy	8 (8)
Exercise physiology	6 (6)
Dietetics	1 (1)

MMM, Modified Monash Model; SEIFA, Socio-Economic Indexes for Areas; IRSAD, Index of Relative Socio-Economic Advantage and Disadvantage.

Telehealth uptake

As expected, the rate of in-person care varied across timepoints ($P < 0.0001$, Supplementary material online, *Table S1*) with a significant decrease from pre-COVID (2019) to the peak COVID-19 wave of 2020 (84 to 27%, $P < 0.0001$, Supplementary material online, *Table S2*). In-person care had returned to near baseline levels at the time of the survey (78%) (*Figure 1*). Each modality of telehealth care, including telephone, video conferencing, and other technologies (e.g. text messaging or web-based), saw a significant ($P \leq 0.05$) increase in use between 2019 and 2020 (see Supplementary material online, *Table S2*). While the use of telehealth modalities reduced in 2021, their reported usage remained significantly higher than baseline levels (*Figure 1* and Supplementary material online, *Table S2*).

With regard to the format of care delivery, programmes still provided one-on-one care (although often virtually) during the COVID-19 peak, but there was a reduction in staff delivering information to groups of patients (81 to 30%, $P < 0.0001$; Supplementary material online, *Tables S3 and S4*) and patient-to-patient support (e.g. peer support) (16 to 3%, $P = 0.0004$, Supplementary material online, *Tables S3 and S4*) at this time compared with the pre-COVID-19 period.

Telehealth use

Most services (82%) used telephone to provide care during the COVID-19 peak in 2020, while 50% used video conferencing and 37% used other forms of telehealth (*Figure 1*). With regard to video conferencing, a wide range of platforms was used across services, including Zoom, Skype, Webex, Microsoft Teams, Physitrack, and bespoke platforms such as the Queensland Health Virtual Clinic.

When users of video conferencing were compared with non-video conferencing users, no differences were observed in relation to geography, area of rurality, socio-economic status, or the profession of the CR coordinator (see Supplementary material online, *Table S5*). There was a non-significant trend for services based in Victoria (an area of extended lockdowns) to report higher video conferencing usage (67%) than other jurisdictions during 2020. By comparison, 46% of services in New South Wales and 38% of services in all other states (combined) reported video conferencing in 2020 (see Supplementary material online, *Table S5*). The geographical location of respondent services is provided in *Figure 2*.

Approximately half of the respondents perceived video or telephone formats to be safe and effective for delivering CR (53 and 47% of respondents, respectively). The adequacy of video conferencing

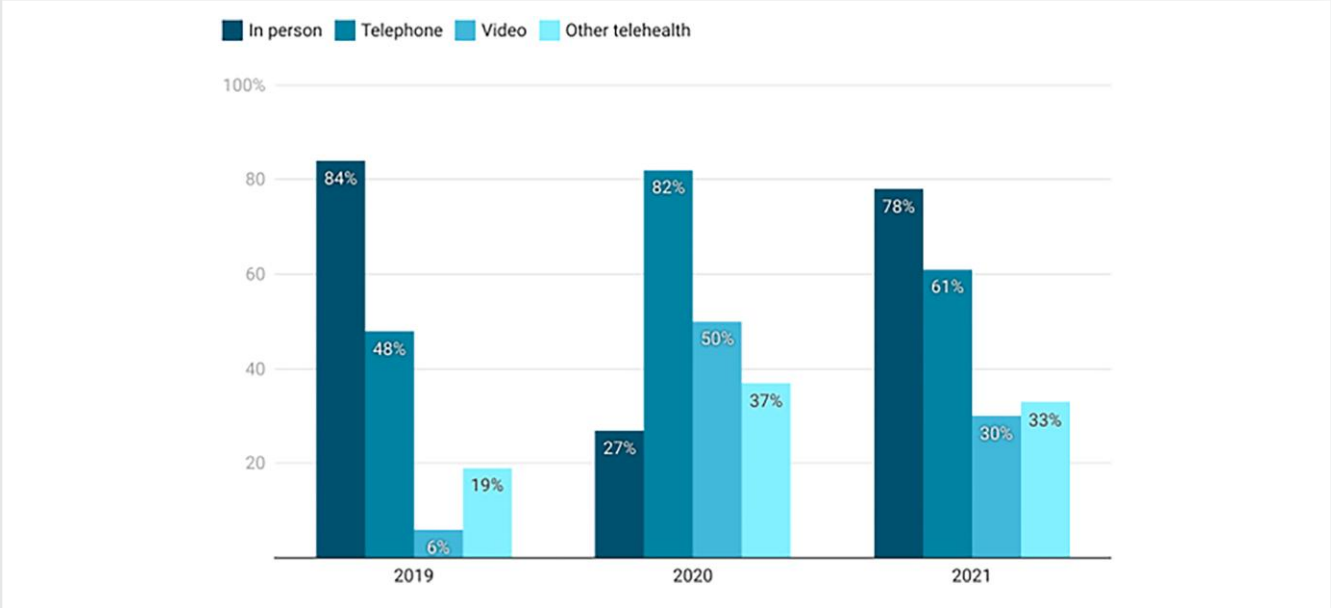


Figure 1 Change in modality of care used by Australian cardiac rehabilitation programmes between 2019, 2020, and 2021.

Figure 2 Location of included cardiac rehabilitation services (green triangles, used video conferencing during 2020; red circle, no video conferencing during 2020).

platforms varied widely, with most respondents (58.5%) reporting that they were adequate for the delivery of education and 42% reporting that they were adequate to deliver exercise.

Barriers and enablers of telehealth

When asked to select from a list of patient, provider, organizational-level, and system-level factors to using telehealth during the COVID-19 peak period, the most frequently reported staff barriers (of 86 respondents) were being unable to conduct physical examinations or measure exercise capacity remotely, and a sense of loss of personal engagement with patients (*Figure 3*). Inadequate technology (e.g. poor internet connectivity, lacking peripheral devices such as headphones/cameras), skills (and a lack of training/IT support) and limited time, or physical space were also commonly selected staff barriers. Perceived patient barriers included poor technological literacy ($n = 74$, 86%), inadequate device ($n = 68$, 79%), or internet access ($n = 60$, 69%), and a preference for in-person care ($n = 63$, 73%), and these were the most frequently reported telehealth barriers. The qualitative, free-text analysis aligned with these findings, but also offered greater insight into each telehealth barrier (presented as themes and explanatory codes in *Table 2*). However, two additional patient barriers emerged as themes in the qualitative analysis. First, many respondents reported equity concerns—with social, cultural, and economic barriers to participation in CR often exacerbated by telehealth delivery formats. Second, a discordance between staff capacity and patient preferences was perceived to be a key barrier to CR participation.

The greatest enablers of telehealth selected from the list were the ability to increase reach and reduce patient barriers to accessing CR and working for an organization that supported the use of telehealth (*Figure 4*). For example, 45% of respondents reported that the reach of their service had expanded. This meant that those patients who were in rural areas, unable to travel, returning to work, socially isolated, or who preferred home-based care were able to benefit from a virtual delivery model. Reducing disease transmission was also a significant driver for virtual care. Financial incentives, however, were not a major driver of telehealth use. A qualitative analysis of free-text responses about telehealth enablers and service role and reach ($n = 24$) also highlighted that telehealth provided new and flexible options for CR programmes to provide care to meet patient needs. Additionally, staff motivation and previous use of telehealth to deliver the components of CR were reported as enablers in these responses.

What forms of support are required for future integration of telehealth into cardiac rehabilitation practice?

Most respondents (66%) agreed that their organization had the capacity and readiness to support telehealth use. However, multiple improvements are still required to better integrate and sustain telehealth in CR practice. Based on open-ended responses, the most frequently reported areas of support required could be grouped into the six themes that follow.

Improved technological capabilities

Cardiac rehabilitation providers require access to new or updated IT hardware and peripherals such as speakers, cameras, headsets, phones, laptops, and monitors. A stable internet connection and reliable video conferencing platforms with enhanced clinical capabilities were also considered key needs moving forward.

Telehealth/IT support, education, and training

The respondents perceived that further training in telehealth and the use of video conferencing platforms is required for them to feel comfortable and confident using such technologies to deliver care. Ongoing IT support, such as setting up devices for patients and automating video conference appointment links, was also requested by many CR providers.

> [We require] IT and admin support for clients to help them to set up & familiarise themselves with platform—I don't have the time or knowledge to do this as a clinician. (Respondent 13)

Organizational and administration support

Delivering CR via telehealth was perceived to be time-consuming and to increase workload for many providers. The participants called for organizational support to provide additional clinical and administration staffing to sustain delivery of these services. As part of this, improvements in workflows, such as better referral and booking systems, need to be designed.

> We would need an increase in staff hours. The same staff will be expected to run the gym sessions and the telehealth model. They would require additional time for telehealth training and to establish the program. Additional time would be required to help set up each client with the platform and provide education on this. (Respondent 15)

Patient support

To better support patients, the respondents felt that additional support (e.g. training, resource kits, community support person) was required to enable both staff and patients to better use the technology and improve their digital health skills and confidence. Providing patients with access to wearable devices and home-monitoring equipment during participation was also suggested as a form of future improvement to CR delivery via telehealth. Additionally, the use of loan schemes to provide this equipment, along with internet-enabled devices, was suggested as a means of overcoming some access barriers. It was also acknowledged that more needs to be done to promote telehealth as an acceptable alternative for patients to encourage uptake.

Physical space

Access to a private, dedicated space for conducting telehealth sessions was frequently raised by providers as a key requirement moving forward.

Effective leadership

Effective and strategic leadership is also required to enable services to enhance and expand telehealth models of care. This extends to advocacy with health funds for better recognition and funding of telehealth service models.

> To integrate telehealth into existing programs [we] would require more supportive, effective leadership, expansion of already existing effective programs, less constrained and more participant friendly measures of physical activity & making CR staff more accountable for participation numbers and outcome measures. Resist the urge to make telehealth complicated, be flexible with delivery platforms and meet participants 'where they are' (Respondent 7)

Expected future telehealth use and opportunities

When asked about the expected future use of telehealth for various aspects of the service (i.e. initial assessments, exercise tests, exercise sessions, education sessions, and reassessments), the majority of respondents anticipated that in-person care would be the main mode of delivery across all aspects, with over 50% endorsement for all aspects (*Figure 5*). Video was seen as having future application for educations

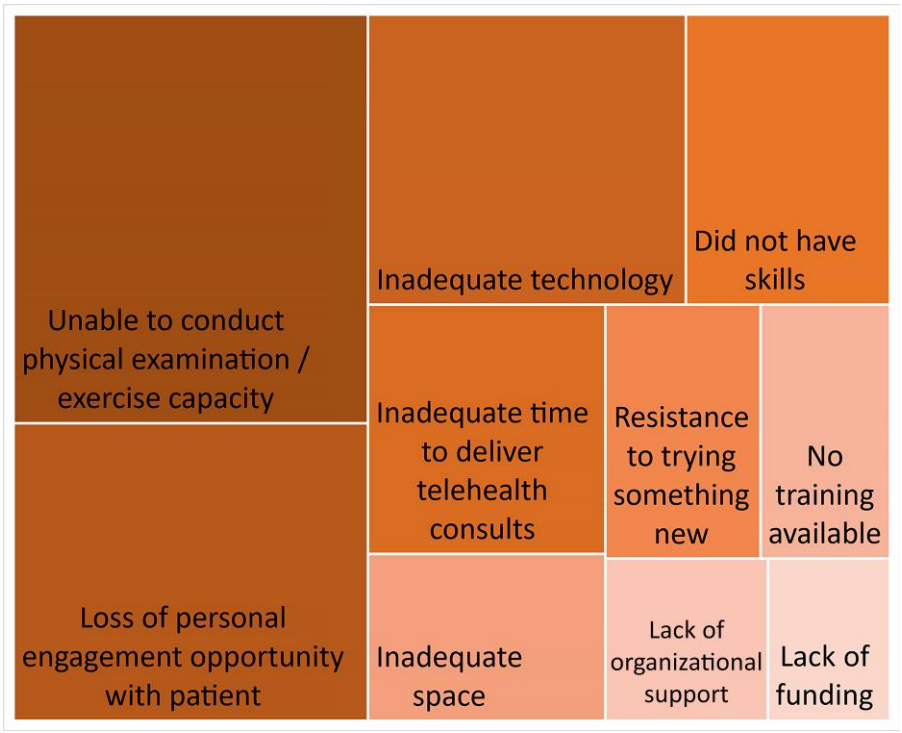


Figure 3 Barriers to telehealth use. The size of the square relates to the number of respondents who reported each factor.

sessions (17% endorsement) but not exercise sessions (2% endorsement). Telephone delivery was moderately endorsed (15–20%) for all aspects, except exercise tests (10% endorsement).

The future use of telehealth did not differ significantly by state and level of rurality. Free-text comments suggested that rather than integrating telehealth wholly into CR programmes, the preference was to use it as an additional tool to provide education or consultations and as a means of offering flexibility based on patient preference. However, multiple respondents reported wanting hybrid models of care in the future.

> I would expect to do initial assessment by EP [exercise physiologists] and CNS [clinical nurse specialists] face to face. Then to enable telehealth exercise and hopefully education and peer support I would like to be able to loan an iPad or similar device to clients. (Respondent 12)

Discussion

Telehealth use in CR increased because of the COVID-19 pandemic and has remained higher than pre-pandemic levels, even with the return of in-person CR programmes. Approximately half of CR services surveyed used video conferencing during the height of the pandemic, while most used the telephone for connecting remotely to patients. Most CR services believed that their organization had the capacity and readiness to continue telehealth as part of their service offerings and identified six key forms of support to enhance integration into practice, namely improved technological capabilities; IT support, education, and training; organizational and administration support; patient support; physical space; and effective leadership.

Moving forward, hybrid offerings of care (e.g. a combination of in-person and telehealth) appear to be the most feasible and palatable approach for services to incorporate telehealth. In the first instance, services appear comfortable providing an option of virtual education but show preference for facility-based care for initial assessments and exercise capacity assessment. This is appropriate, given the lack of validated and objective means of measuring functional exercise capacity.[9] For rural and remote patients, one option may be to train local health workers or general practitioners to conduct initial assessments at sites close to home. The hesitation to provide remotely delivered exercise sessions, however, does not align with current evidence showing that these can be as effective as in-person care.[10] A recent review of design and implementation elements of hybrid care[11] suggests that remote exercise could be enhanced by providing access to exercise equipment and remote monitoring devices (i.e. to measure heart rate and exercise intensity). Further, they suggest that all patients should be screened for safety concerns and have a mutually agreed emergency plan while balancing the fact that there are very few patients in which purposeful physical activity should be avoided.[11] There is a need for formulating guidelines on the use of telehealth for exercise, ensuring that any risks are mitigated and service workflows enhanced.[12,13] Overall guidance and recommendations have recently been released for Australia[14] with more in-depth exercise-specific guidelines requiring development and/or updating in many countries. Resource constraints are also a major barrier to hybrid care, which needs careful consideration. It may be more efficient for services (particularly small services) to provide centralized telehealth options to maximize limited resources.[12]

Telephone is likely to continue to play a major role in the future delivery of CR. Cardiac rehabilitation staff rely heavily on the telephone for remote delivery of CR, which has previously been observed by other allied health staff, and is likely related to the relative ease of implementation and familiarity with this modality for both staff and patients.[15] In an international survey of CR programmes covering 70 countries in mid-2020, programmes that provided alternative models

Table 2 Additional information about clinician and patient barriers to telehealth use reported in survey free-text responses ($n = 28$): barrier themes and codes

Technology barriers	Poor internet connectivity for clinicians and patients
	Lack of IT support and training for clinicians and patients
	Lack of patient technological literacy
	Steep learning curve and frequently changing IT platforms
	Lack of devices for patients, e.g. iPads, laptops
Video conferencing–specific barriers	Patients uncomfortable exercising on camera in front of others
	Lack of space for patients to exercise at home on camera
	Patients prefer phone or in-person delivery and so are less engaged with video conferencing
	Many elderly patients could not engage with video conferencing
Space barriers	Many services had lost their physical CR spaces to COVID clinics or offices
	There were often no appropriate rooms to deliver telehealth sessions
	Confidentially compromised during telehealth sessions in shared physical spaces
Organizational barriers	Lack of staffing
	Slow to offer support
	CR delivered via telehealth was 'not offered or talked down'
Time and workload barriers	The telehealth model was often delivered to smaller group sizes (compared with face-to-face groups) and so more time was needed to deliver care to the same number of patients
Social, cultural, and economic barriers	Patients from non-English-speaking backgrounds disadvantaged with difficulties using translators virtually and low technological skills
	Cost of data and devices prohibitive for some patients

of care most often used low-tech modes of delivery such as telephone or mail.[16] The enhancement of telephone-delivered services may increase the potential reach of CR (especially in low-resource settings). Text-messaging interventions have previously been shown to be effective in changing individual health behaviours[17] (at a low cost) and are potentially under-utilized in clinical services.

Our findings on enablers of telehealth are similar to those found previously. To facilitate the uptake of telehealth in CR, the most common suggestions internationally were providing appropriate telehealth equipment (with training on how to use), secure and private spaces to deliver telehealth sessions, and time to develop the model and enhance processes.[16] Telehealth in CR was enabled by reducing the access barriers that patients faced (e.g. access to devices, digital illiteracy, internet connectivity) and in having organizational support. Services that optimize and embed telehealth are reporting additional benefits such as being able to support growing numbers of patients without needing to increase the space required for in-person programmes and reducing CR wait times that were delayed by transportation issues for patients who have driving restrictions.[18]

We also noted equity concerns. Potentially, telehealth modalities are exacerbating social, cultural, and economic barriers to access some population groups. While cardiac telerehabilitation provides promising opportunities to improve programme participation rates (especially for rural and remote patients),[19] the telerehabilitation programmes are often not being designed with equity in mind. Commonly, cardiac telerehabilitation trials exclude people with disability, sensory impairments, cognitive impairments, and English as a second language.[20] Frequently, the included population groups are largely from metropolitan areas, under the age of 75, with English as their main language and have good digital literacy.[20] The exclusion of diverse population groups results in trials being tailored to a homogenous group of participants—arguably those who have the fewest barriers to service access. Additionally, we have not identified any studies that included cultural adaptations to ensure cultural safety for people from diverse population groups such as First Nations Peoples, who have higher rates of cardiovascular disease and multiple barriers to access.[21] Considerations as to how cardiac telerehabilitation can be adapted to support these populations are lacking.

Strengths and limitations

The primary strength of this study was the comprehensiveness of the questionnaire and breadth of the sample, with geographic representation from CR programmes across Australia. We achieved responses from ~30% of known CR services during a tumultuous period where 40% of programmes reported periods of closure and 70% were providing reduced programme delivery.[8] However, the study is limited by its reliance on self-reported rather than objectively validated data, and its cross-sectional nature, which required respondents to reflect on two previous timepoints. While we adjusted the significance level for *post hoc* comparisons (across the three timepoints) using the Bonferroni correction technique, we acknowledge that the analyses were not adjusted with respect to multiple endpoints. Therefore, the results should be interpreted as exploratory in nature. We also note that inter-rater agreement levels were not ascertained during the validation process of the survey development.

After the survey was completed, areas of New South Wales and Victoria went into further periods of extended lockdown. Therefore, it is possible that services continued to change and adapt after the survey period. Our research investigated only service provider perspectives on how the COVID-19 pandemic impacted CR. Previous research has also investigated patient perspectives and found that telerehabilitation was well received by patients during the pandemic, even in the elderly and less technologically experienced.[4]

Future direction and clinical implications

While the COVID-19 pandemic provided an impetus for CR staff to use virtual models of care, many services quickly reverted to in-person care after the pandemic. Sustained telehealth use often requires careful and graduated implementation,[22] the opposite of what occurred during the pandemic. We now need to assist CR services in the transition to telehealth including support for technological requirements as well as change to workflow and care delivery. There is considerable potential to increase the reach of CR (and thereby reduce future cardiovascular events) by embedding telehealth into existing models of care. However, this is unlikely to occur without a targeted and well-planned implementation strategy.

Telehealth provides opportunities for CR programmes to expand their participant reach and reduce barriers to service access; however,

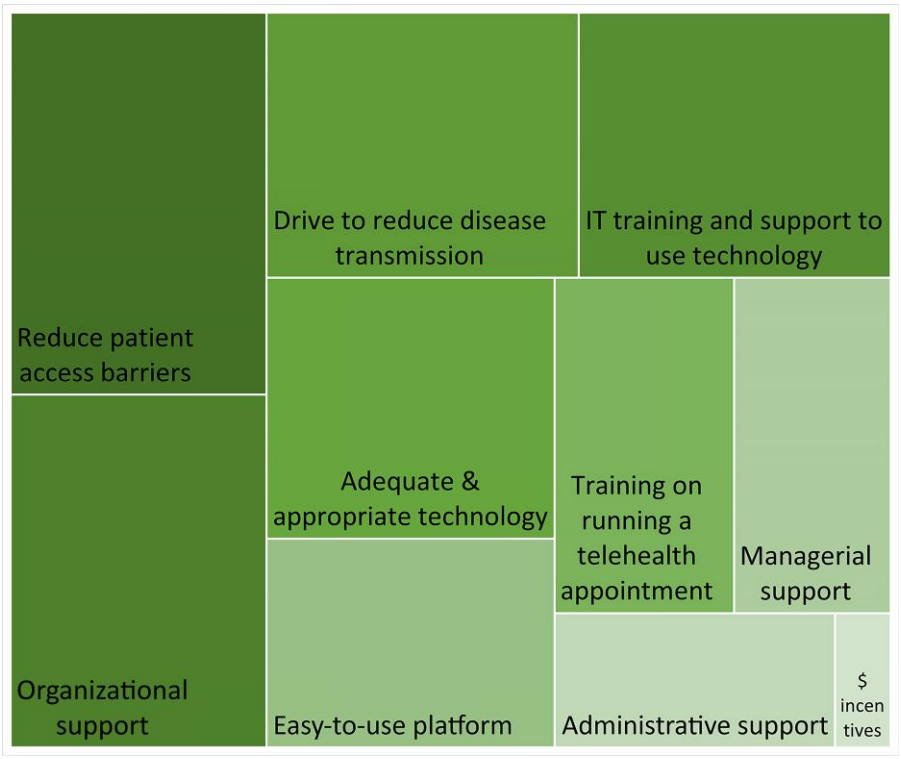


Figure 4 Enablers of telehealth use. The size of the square relates to the number of respondents who reported each factor.

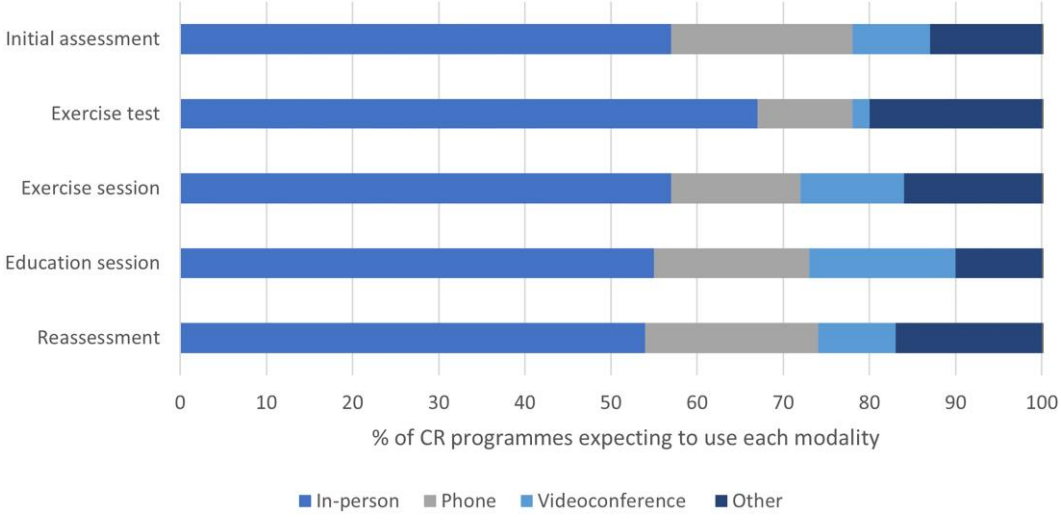


Figure 5 What aspects of care are expected to be provided via telehealth in the future?

future improvements are required to ensure that this is done in a way that provides high-quality care. For example, a greater inclusion of remote patient monitoring is required to facilitate better remote supervision of patients. Additionally, valid and reliable methods of remote exercise assessment are required to enable CR programmes to perform this activity in the virtual environment. In the interim, hybrid models of care are required that can seamlessly move between different modalities of care to support patient choice and ensure greater pandemic preparedness for the future.

Lastly, future studies need to actively consider how cardiac telerehabilitation can be used and adapted to support access to diverse population groups and strategies for inclusive participation. These strategies

need to consider the 'digital divide' and ensure that some people are not left further behind.[23,24] Whether telehealth remains business as usual beyond COVID-19 will depend in part on the experiences of CR staff through the pandemic, their willingness to adapt to telehealth, and the support that health service administrators provide to these modes of delivery in the future.

Supplementary material

Supplementary material is available at *European Heart Journal – Digital Health*.

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Conflict of interest: We acknowledge that the authors were members of either state or national ACRA committees when this research was conducted.

Data availability

The data underlying this article will be shared on reasonable request to the corresponding author.

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