

Cardiac rehabilitation using telemedicine: the need for tele cardiac rehabilitation

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DOI: [10.31083/j.rcm.2020.04.201](https://doi.org/10.31083/j.rcm.2020.04.201)

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Cardiac Rehabilitation programs have shown to improve outcomes. The COVID-19 pandemic has posed barriers to these programs. A virtual platform might be a good solution to these challenges. Tele Cardiac Rehabilitation and remote patient monitoring provide an excellent alternative practical solution.

Keywords

COVID-19; tele cardiac rehabilitation; remote patient monitoring

1. What is tele cardiac rehabilitation (TCR)

Cardiac rehabilitation (CR) is a multidisciplinary, evidence-based intervention shown to improve health outcomes and quality of life when used as secondary prevention. CR includes cardiac risk factor modification, educational counseling, behavioral interventions, psychosocial assessment, and exercise training. Historically, patients receive CR in supervised, group-based classes conducted in an outpatient setting over several weeks.

Tele Cardiac rehabilitation (TCR) is a part of telehealth that uses telecommunication technologies such as smartphone applications (Fig. 1), wearables, and video consultations to offer remote CR services. TCR delivers CR digitally using live video (synchronous), meaning the patient is being observed in real-time or using remote patient monitoring (RPM), which is asynchronous, meaning data exchange can occur at different times. Patients exercise independently and receive coaching via a smartphone application and telephone calls (Frederix et al., 2019).

CR participation rates are low, just 24.4% of eligible Medicare population and not timely since only 24.3% of those patients start CR within 21 days, and only 26.9% complete CR within the year. To reach the CDC's Million Hearts Cardiac Rehabilitation Collaborative's goal to increase CR utilization by 70% by 2022, many disparities and geographic variations will need to be overcome (Ritchey et al., 2020).

2. COVID-19 accelerates the demand for TCR

The incredible strain of COVID-19 on CR with lockdowns, reduced scale in hospitals for other diseases, and the need for social distancing has accelerated the need for TCR to improve utilization rates and improve access to CR. Patients with heart disease have a higher mortality rate from COVID-19 infection, and they must practice social distancing to lower their risk of contracting

COVID-19. The need for TCR has never been more critical (Vishwanath et al., 2020).

A recent case series of "telemedicine home-based CR" show that since the COVID-19 pandemic, most CR facilities stopped during the national lockdown and now are functioning at reduced capacity and working off tremendous backlogs (Berry et al., 2020).

On October 14 2020, CMS expanded telehealth coverage to include home-based CR delivered thru telemedicine to increase access to CR for patients during a time of reduced capacity as a temporary addition as part of the response to the COVID-19 Public Health Emergency. This new payment model facilitates physicians and hospitals embracing TCR (Kuehn, 2020).

3. Increasing the supply of cardiac rehabilitation and access

While CR improves survival after AMI (Heran et al., 2011), enhances functional capacity and quality of life for older adults, (Fleg et al., 2013; Listerman et al., 2011) leads to a 45-47% reduction in all-cause mortality in patients after percutaneous coronary interventions (Goel et al., 2011), and improves adherence to medications for secondary prevention (Shah et al., 2009), most eligible patients do not attend it.

Also, registered CR programs can serve only 37% of the 1.25 million US patients who are potential enrollees every year (Pack et al., 2014).

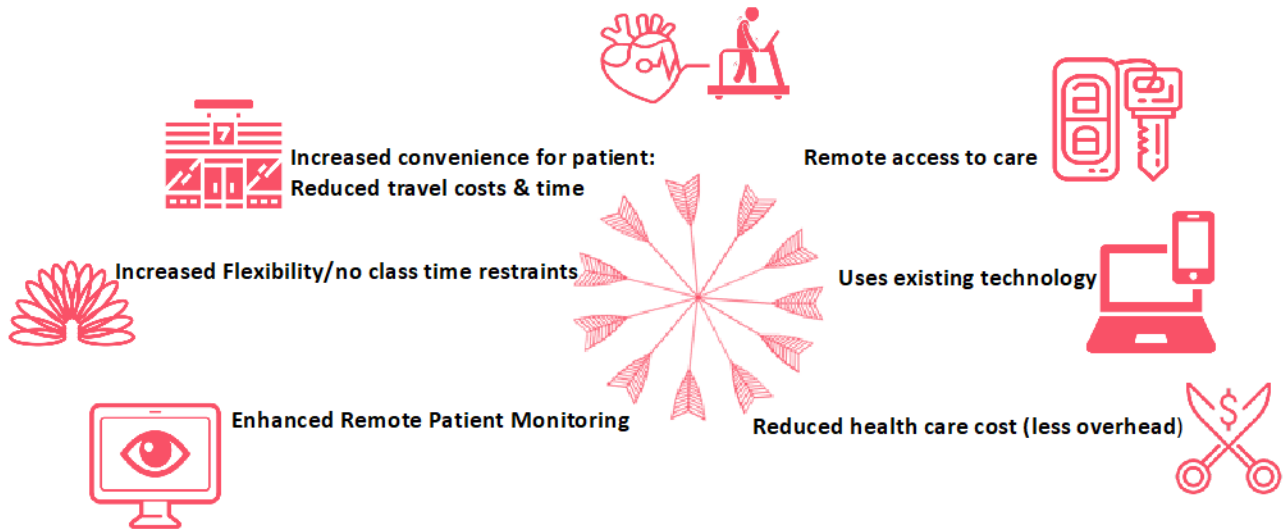
4. TCR safety

TCR is an alternative to facility-based CR thru telemedicine. A 16-week randomized control trial of TCR versus CR showed improvement in exercise capacity, cholesterol & diet quality with TCR (Lear et al., 2014). TCR is well accepted, safe, effective, with high adherence rates among heart failure patients (Piotrowicz et al., 2015).

Another study comparing TCR to center-based CR showed reduced readmissions by 30%, reduced cardiovascular mortality by 27%, and increased completion of the 7-week program by 75% of the low to moderate-risk patients enrolled (Funahashi et al., 2019).

Such examples could be scaled to expand capacity for many patients who have long waits to enter a CR program. The majority of eligible patients for TCR are low to moderate risk and have a rare adverse event rate (1/400000) per patient-hours of CR ex-

Virtual Cardiac Rehabilitation Advantages



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Fig. 1. Advantages of Virtual Cardiac Rehabilitation

ercise (Jolly et al., 2007). Higher risk patients could be the ones referred to center-based CR.

5. Barriers to TCR

The idea of TCR is not new, but at the same time, it has not really taken off. In 2017, Cochrane published a systematic review of 23 RCTs showing that tele home-based CR was similarly effective to facility-based CR (Anderson et al., 2017). In 2019, the AHA released a statement advocating for more research and demonstration projects that support TCR as an effective alternative to facility-based CR. Greater flexibility leads to better adherence in TCR for patients who are clinically low to moderate risk (Thomas et al., 2019).

Also, there are both patient-related barriers to use telehealth as a means of healthcare delivery and a lack of robust evaluation of this new delivery model, TCR (Ambrosetti et al., 2020). More than 75% of eligible patients in the United States do not participate in CR. Rates of CR referral and participation are low, especially among older adults (Beatty et al., 2014).

6. Participation

Most patients especially women, minorities, and low socioeconomic patients, do not take the first critical step to enroll after referral-possibly related to barriers such as limited or no health care coverage (cost), little follow-up, or facilitation of enrollment after referral. There may be little racial staff diversity, language barriers, and cultural beliefs that add to the patient's lack of CR participation (Rush et al., 2018). Incorporating preferences such as tai chi, dance, yoga may also improve participation (Hannan et al., 2019).

TCR will be a suitable alternative to the current CR model, which requires a co-pay, parking, job work lost during the times

rehab is open (Dalleck et al., 2011). Scarcity of programs in rural areas and low-income communities, distance to CR facility from patients' homes, and access to public transportation or parking become non-issues in TCR.

7. Referral

Another critical challenge is many doctors failing to refer patients to CR, which reduces depression and prevent heart attacks and deaths (Doll et al., 2015). This is even more imperative during the COVID-19 pandemic, where depression and anxiety are more prevalent (Simon et al., 2020).

Educating physicians about the CR evidence base and implementing automatic referrals from electronic health records may increase CR and TCR referrals (Grace et al., 2011).

8. Risk stratification

One challenge to doing TCR is risk stratification. One size does not fill all for all the millions of eligible CR patients and will need further customization. The AHA emphasizes TCR for patients who are clinically stable and at low to moderate risk (Thomas et al., 2019). Scaling such models could expand capacity while reserving spots in facilities for patients at higher risk.

9. RPM data, interoperability, and liability

RPM transfers measured physiological data (e.g., ECG, blood pressure (BP), etc.) from peripheral sensors (wearable or implantable devices such as implantable cardioverter-defibrillators) to a centralized platform via wireless communication networks for health care workers to make decisions. This regular tracking of vitals and monitoring during TCR allows clinicians to perform an early intervention, such as medication titration that may reduce unnecessary emergency department visits, hospitalizations, and as-

sociated costs (Watson et al., 2020).

However, there are many unanswered questions. Do the peripheral sensors devices need FDA approval? What data is relevant to take care of the patient? What physiologic information is a must-have (BP, HR, pulse oximetry versus what would be nice to have - baseline activity, mobile EKG, QOL) What clinical standards should be used for TCR and patient engagement?

Who has the liability? Should a patient with an Apple watch sign a liability waiver with Apple, the sensor/device company? Who is liable if the data fails to be transmitted from device failure? What is the liability for doctors in the (lack of) review of data transmitted outside office hours? What is interoperability with wearables? Integration into the patient electronic health record for effective utilization in the clinical process remains an unresolved issue.

10. Workflows and technical considerations

Maintaining TCR delivery is critical to prevent any adverse short-term impacts on at-risk cardiovascular populations during this COVID-19 pandemic. Rapid implementation or expansion of TCR requires a plan to allow for capacity growth. However, the initial focus should be on utilizing and re-purposing existing resources, equipment, and technology instead of complex restructuring.

The need to develop sustainable and pragmatic TCR to address the possibility of prolonged restrictions on in-person CR requires availability and efficient workflows, training, and support for all these mixes of devices and technologies. Physicians will need reliable technical support in implementing TCR and ensuring it runs smoothly and integrates into the EHR.

11. Broadband access

Access to the Internet via broadband is needed, although even phone calls are appreciated by patients. It is also imperative to ensure that TCR uses secure, HIPAA compliant technologies.

12. Outcomes of this new mode of delivery

The payors will demand outcomes for TCR that match or exceed CR for payment. Since digital evidence moves fast, we need to select cases and prove short term outcomes like weight loss and return to employment rather than hospitalizations or mortality data.

Lack of robust evaluation of this new care delivery model may be a deterrent for payors to cover TCR after the COVID-19 public health emergency is over.

13. Conclusions

TCR, accelerated by the recent COVID-19 pandemic, is an innovative health care delivery model that needs to be scaled as a solution to expand access and delivery of CR. CMS now covers TCR as part of the response to the COVID-19 Public Health Emergency.

Authors' contributions

Dr Thamman was involved in writing the article. Dr Janardhanan was involved in revision and editing.

Acknowledgements

There are no acknowledgments to disclose.

Conflict of interest

The authors declare no conflicts of interest statement.

Submitted: September 27, 2020

Revised: November 08, 2020

Accepted: December 07, 2020

Published: December 30, 2020

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