

A Review of the Design and Implementation of a Hybrid Cardiac Rehabilitation Program

AN EXPANDING OPPORTUNITY FOR OPTIMIZING CARDIOVASCULAR CARE

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Purpose: This review describes the considerations for the design and implementation of a hybrid cardiac rehabilitation (HYCR) program, a patient-individualized combination of facility-based cardiac rehabilitation (FBCR) with virtual cardiac rehabilitation (CR) and/or remote CR.

Review Methods: To help meet the goal of the Millions Hearts Initiative to increase CR participation to 70% by 2022, a targeted review of the literature was conducted to identify studies pertinent to the practical design and implementation of an HYCR program. Areas focused upon included the current use of HYCR, exercise programming considerations (eligibility and safety, exercise prescription, and patient monitoring), program assessments and outcomes, patient education, step-by-step instructions for billing and insurance reimbursement, patient and provider engagement strategies, and special considerations.

Summary: A FBCR is the first choice for patient participation in CR, as it is supported by an extensive evidence base demonstrating effectiveness in decreasing cardiac and overall mortality, as well as improving functional capacity and quality of life. However, to attain the CR participation rate goal of 70% set by the Million Hearts Initiative, CR programming will need to be expanded beyond the confines of FBCR. In particular, HYCR programs will be necessary to supplement FBCR and will be particularly useful for the many patients with geographic or work-related barriers to participation in an FBCR program. Research is ongoing and needed to develop optimal programming for HYCR.

Key Words: exercise prescription • reimbursement • telehealth

The clinical benefits of facility-based cardiac rehabilitation (FBCR) after an acute cardiac event are

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well-established from randomized clinical trials.¹⁻³ Yet, participation in the United States for FBCR remains low and ranges from 29% in older cardiac rehabilitation (CR)-eligible Medicare beneficiaries⁴ to $\geq 34\%$ in a broader age range of patients after a myocardial infarction or coronary revascularization.⁵⁻⁷ The barriers to participation are many and include the absence of CR programs in many geographic regions, transportation issues, financial limitations, work constraints, and dependent care responsibilities.⁸

The Million Hearts Initiative of the Centers for Disease Control and Prevention and the Centers for Medicare & Medicaid Services has as its goal to increase CR participation to 70% by 2022.⁹ Beyond making improvements in the referral and enrollment of CR-eligible patients, this process will require “broadening of the current facility-based model ...” and “include the use of a hybrid model with on-site coordination of home programs and mobile monitoring technologies.”^{9,10} Although a growing amount of research has been carried out on the components and results of new delivery models such as hybrid CR (HYCR),¹⁰⁻¹⁴ the development of such should not be to supplant FBCR. Whenever possible, the first choice for CR remains FBCR¹⁰; however, this is not always possible. Therefore, an effective alternative option to FBCR is imperative.

This review describes the considerations for the design and implementation of an HYCR program, a patient-individualized combination of (a) FBCR with (b) virtual CR and/or remote CR. In this model the virtual component represents the synchronous (ie, two-way real-time) supervision of a patient while exercising using audiovisual technology, during which program-related education can be provided. A remote component can be included in a manner that is asynchronous (i., independent) of exercise supervision, often used to communicate disease management education and/or collect patient data via telephone or another technology application.

CURRENT USE OF HYBRID CR IN CLINICAL PRACTICE

Traditional outpatient FBCR is delivered in a hospital facility or physician office where patients and CR staff are in the same location, exercise is directly observed by staff, and education and counseling occur in-person (Figure 1A). Conversely, virtual communication platforms are now widely available, making it possible for patients and CR staff to interact directly, even when they are not in the same location. A CR patient can exercise in the community (eg, home) and be in synchronous audiovisual communication with CR staff in another location (Figure 1B). The HYCR model discussed herein differs from remote-only CR because in

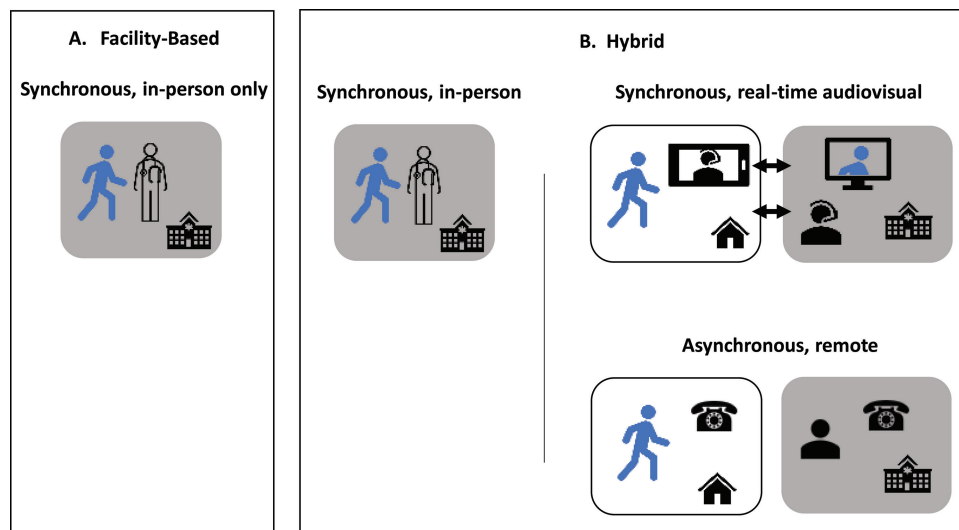


Figure 1. (A) Synchronous, in-person (facility-based) cardiac rehabilitation with patient and cardiac rehabilitation staff in the same location while the patient is exercising. (B) Hybrid cardiac rehabilitation with both in-person care and synchronous audiovisual care using communication tools while the patient is exercising, with the patient and cardiac rehabilitation staff in two different locations. Also included, as needed, are remote, asynchronous patient interactions. This figure is available in color online (www.jcrjournal.com).

remote-only CR there is typically just one, if any, FBCR visit and the patient exercises asynchronously.

Early studies using asynchronous CR and more recent studies using synchronous CR have demonstrated feasibility and reported shorter-term outcomes that are similar to traditional FBCR.¹⁰⁻²² The Veterans Administration health system, which provides asynchronous exercise and telephone counseling across 30 sites,²²⁻²⁵ recently began supplementing this program at some sites with virtual supervision during exercise. In this program exercise equipment (eg, exercise peddler) may be provided and patients use their own device or use a tablet device supplied by the Veterans Administration.^{23,25}

In the Henry Ford Health System HYCR program, patients participate in a flexible number (eg, 2-12) of FBCR visits and up to 34 virtual visits using their personal smart device.^{12,26} In 2016, individual patients connected with CR staff through a portal embedded in the electronic health record (eg, EPIC). In February 2021, this program switched to a Webex platform (Cisco)²⁷ to accommodate synchronized, group exercise classes with up to six patients/class. Preliminary screening data from an ongoing HYCR clinical trial at Henry Ford²⁸ suggest that access to the needed equipment may not be a meaningful barrier in the Detroit, Michigan area, with access to a smart device and exercise equipment at 97% and 86%, respectively.²⁹

Another example is the CR program at the University of California-San Francisco. Patients complete in-person assessments at the beginning and end of CR and most patients have 4 wk of twice-weekly FBCR sessions, followed by 8 wk of weekly synchronous exercise and motivational counseling sessions using real-time software on their own devices. Patients supplement their synchronous exercise sessions with asynchronous exercise and group education and mental health visits that occur through an audiovisual means. With the coronavirus disease-2019 (COVID-19) pandemic, many CR programs have begun to deliver CR using new models. A recent survey found that 38% of programs were offering some form of home or innovative delivery of CR during the pandemic, but it is unclear how many of these programs implemented virtual HYCR.³⁰

EXERCISE PROGRAMMING

The implementation of the virtual exercise component of HYCR involves several issues to consider, a few of which are addressed here.

Patient Eligibility and Safety

There are a few patients for whom purposeful physical activity or unsupervised exercise at home should be avoided or requires caution, such as those receiving continuous inotropic support, those having recently received a mechanical support device, and those who are symptomatic at very low workloads (≤ 2 metabolic equivalents of task). Otherwise, most patients with stable cardiovascular disease should be able to exercise on their own at a lower risk of complication.^{11,13,25,31-33} The Heart Failure: A Controlled Trial Investigating Outcomes of Exercise Training trial assessed the safety of exercise training in 2331 stable outpatients with chronic heart failure (mean ejection fraction 25%) and used a model of initially FBCR followed by home-based CR. Results showed that during or within 3 hr after exercise there was no significant difference between the exercise and usual care groups for the rate of hospitalization (1.9 vs 3.2%, respectively) or death (0.4 vs 0.4%, respectively),³⁴ and there was no significant difference in implantable cardioverter defibrillator shocks between the two study groups (HR = 0.9; 95% CI, 0.7-1.2).³⁵ Meta-analyses and other controlled trials investigating hybrid, virtual, or remote CR also report favorable safety data.^{11,13,25,31,32,36-38}

To further ensure safety, patients can complete a symptom-limited exercise test before or soon after starting HYCR as a means to screen for significant arrhythmia, symptoms, or electrocardiogram evidence of myocardial ischemia. Additionally, patients should be screened for other safety concerns, including risk for falling and their ability to exercise independently. Finally, before a patient starts exercising at home, it is important to mutually agree upon an emergency plan and have the patient demonstrate to staff knowledge of such by repeating the details of the plan. At the beginning of each synchronized audiovisual CR session, staff should confirm the patient emergency contact information and location.

Table 1

Summary of the Key Characteristics for Prescribing Exercise for Synchronized Audiovisual or Remote Cardiac Rehabilitation

	Aerobic/Cardiorespiratory	Resistance Training
Type of activity	Whole-body, rhythmic exercise such as stationary cycling, treadmill walking, and seated rowing. To ensure an optimal synchronous audiovisual view/connection, the mode of exercise should provide a safe and stable location for the smart device.	<ul style="list-style-type: none"> Resistance bands/tubing exercises Body weight exercises such as sit-to-stand, wall push-up, wall sit, ¼-depth double-legged squats
Format	Moderate continuous training and, in selected patients, include one to two sessions of higher intensity interval training each week. Ratio of minutes for work to recovery should be 1:1 or 1.3:1	Focus on major muscle groups of the upper and lower extremities, chest, upper back, and hips
Frequency and duration	150 min/wk	2-3 nonconsecutive d/wk
Intensity	Moderate continuous training set at RPE of 11-14 on 6-20 scale or 55-80% of HRR. In selected patients who tolerate moderate continuous training, consider higher intensity interval training <ul style="list-style-type: none"> Set work interval between 85% and 95% of HRR or an RPE of 13-16 Set recovery interval between 60% and 75% of HRR or an RPE of 11-13 	<ul style="list-style-type: none"> Perform one to three sets of 10-15 repetitions of each exercise, without limiting fatigue Set intensity at an RPE of 11-13
Progression	Target a 0.5 increase in exercise training metabolic equivalent of task workload every 2-3 wk	First increase repetitions then sets. Once at two sets of 15 repetitions, increase resistance by the smallest possible increment (eg, progress to next level of resistance)

Abbreviations: HRR, heart rate reserve; RPE, rating of perceived exertion.

Exercise Prescription

Regardless of whether a synchronous, asynchronous, or combined model is employed, exercise volume should progress patients to 150 min/wk of moderate-intensity exercise.³⁹ A summary of the exercise prescription is provided in Table 1,³⁹⁻⁴² which should also include resistance training (eg, bands or tubing) to minimize sarcopenia.³⁹ One concern about home-based exercise is whether patients comply with the heart rate and/or rating of perceived exertion range that is prescribed. Keteyian et al¹² addressed this issue and showed exercise intensity was performed as prescribed, with no significant difference observed for either training method when comparing virtual or remote CR to FBCR. If a synchronous audiovisual connection is employed, the mode of exercise used by the patient should ensure a stable location for their smart device, one that provides an optimal visual view and audiovisual connection.

PATIENT MONITORING

Patient monitoring can occur synchronously using a HIPAA (Health Insurance Portability and Accountability Act)-compliant commercial system (eg, Webex [Cisco]²⁷) or an application routed through an electronic health record (Zoom [Zoom Video Communications, Inc] or Vidyio [Vidyio, Inc]).^{12,26} Cardiac rehabilitation programs are encouraged to contact the virtual care or telehealth department in their institution for assistance. As mentioned earlier, an asynchronous component can be included as well, one that transmits data from a wearable device or uses data entered by the patient into a compatible platform that is viewed by CR staff at a different time.^{43,44} Presently unknown is whether or not Medicare will extend or cancel and then reinstate coverage for virtual synchronized CR after the COVID-19 public health emergency (PHE) is ended. As coverage policies from Medicare and other third-party payers evolve over time for CR, it will be important for programs to pursue synchronous and/or asynchronous strategies that first provide the highest value of care, as well as help maintain financial solvency.

Although it is uncommon for the monitoring of real-time electrocardiogram waveforms to change patient care,^{45,46}

some studies involving home or virtual CR incorporated this approach^{11,14,46} but many did not.^{12,25,36,43,44} Many virtual or remote delivery programs use a chest strap or wrist-worn device to track heart rate and help patients and staff monitor exercise intensity.^{12,13,36,43,44}

PROGRAM ASSESSMENTS AND OUTCOMES

To be equally effective, an HYCR program must include all recommended core components of traditional FBCR.⁴⁷ This includes an assessment prior to starting the program and after CR is completed. In HYCR, preferably the initial patient assessment is completed via an in-facility visit but it may be completed over the telephone or with video conferencing. In addition, updating individualized treatment plans is best accomplished during weekly or biweekly FBCR visits.

Other assessments to consider before starting CR that can become program outcome measurements may include functional capacity from an exercise stress test or 6-min walk test; body weight and waist circumference; blood pressure; and questionnaires for mood, nutrition, and physical activity habits.⁴⁸ In HYCR, these measurements can be completed at the CR facility during program initiation and at scheduled intervals thereafter. Alternately, for patients unable to attend a session much of this data can be gathered from the patient electronic health record, collected using self-reported questionnaires or measured by the patient at home if they have the means to do so (eg, self-measured blood pressure monitoring and body weight). The most challenging will be the assessment of functional capacity, which is more easily measured during an in-facility visit.

Comparison of patient data before and after completion of HYCR can also become part of aggregate program data on multiple patients, providing a snapshot of reportable program outcomes; data that can then be used to drive quality improvement strategies across the recommended domains of care (ie, clinical, behavioral, health, and service).⁴⁸ Finally, several studies have compared program outcomes between HYCR and FBCR,^{10,11,13,14} focusing

mainly on functional capacity and quality of life and generally demonstrate noninferiority between both program models. However, much future research is needed that compares HYCR to FBCR for equivalency across the other important topics of risk factor management, behavioral health, and physical activity and nutrition habits.²¹

PATIENT EDUCATION

Although much of the risk factor benefit and almost all of the functional gains ascribed to CR are garnered through its exercise component, the other core components of CR (ie, nutrition, tobacco and physical activity counseling; disease-specific education) cannot be diminished or set aside because the patient chooses HYCR.²¹ To that end, all HYCR programs must address disease-specific self-care (eg, medications and healthy dietary habits) and relevant behavioral and risk factor education. To accomplish this, a variety of commercial and clinician-centric models have been deployed for use in both the synchronous and asynchronous settings.^{10,12,24,26,44,49}

Educational presentations can be incorporated during synchronous virtual sessions and allow the opportunity for patient participation. Screen sharing of PowerPoint (Microsoft) presentations or short videos to supplement the discussion can add interest and value. In the absence of scheduled audiovisual sessions, educational resources and material can be shared with patients through a patient portal or secure email for asynchronous viewing. Use of asynchronous strategies may also provide patients with increased flexibility regarding the day and time to participate in the educational sessions. If a commercial application is being used to supplement the HYCR program, educational material is often included in that application and can be tailored to the individual needs of the patients. Table 2 summarizes several available options for providing patient education with HYCR.

If individual asynchronous or synchronous audiovisual conferencing sessions are being employed, verification of understanding content can be accomplished at that time. If audio-only group sessions are being provided, or the patient attends the CR center at scheduled intervals, consider following up with individuals via telephone or audiovisual conferencing to clarify information and answer questions.

BILLING AND INSURANCE REIMBURSEMENT

Cardiac rehabilitation services are typically provided in FBCR under Hospital Outpatient Prospective Payment System regulations. Although there are professional (ie, physician) billing codes for temporary telehealth services during

the PHE that include CR delivered in a physician office setting, these telehealth codes are not applicable for hospital-based CR programs. Hospital (ie, facility)-based CR programs are able to bill for virtual CR services that are: (a) delivered by multidisciplinary, qualified clinical staff and (b) billed only using a “UB-04” hospital (not professional) claim form. Hospital-based CR services do not have a professional billing component.

CR programs can bill Medicare for virtual outpatient CR during the PHE when provided by clinical staff using synchronous telecommunications technology. This option is available under the Hospitals without Walls waiver,⁵⁰ which is scheduled to remain in effect for the entirety of 2021. As discussed earlier, plans for reimbursement from Medicare and other third-party payers are evolving such that coverage for virtual synchronized CR after the PHE is currently unclear.

This section focuses on the regulations and process needed to bill and be reimbursed for virtual CR sessions delivered to Medicare beneficiaries as part of an HYCR program. Much of the information addressed may also be useful for billing other third-party insurers who agree to cover virtual CR.

VIRTUAL DIRECT SUPERVISION BY PHYSICIAN

For the duration of the PHE, the Centers for Medicare & Medicaid Services policy has expanded the definition of direct supervision to allow a virtual presence using audiovisual, synchronous communication technology.⁵¹ The presence or observation of CR by the supervising physician via interactive audiovisual technology is not required throughout the performance of the procedure; however, the supervising physician must be immediately available throughout the session. This means the physician responsible for the direct supervision of CR is not required to be at any specific physical location or within any determined distance or response time to the program.

BILLING FOR THE VIRTUAL DELIVERY OF CARDIAC REHABILITATION

Figure 2 is adapted from Medicare to illustrate the underlying premises that allow for the hospital outpatient billing of virtual CR services.⁵² Additionally, Table 3 outlines the steps associated with billing for synchronized, virtual CR sessions delivered via audiovisual communications technology.⁵²⁻⁵⁴ Again, CR staff are encouraged to meet with the telehealth or virtual care department at their institution for assistance with billing for virtual CR using synchronous audiovisual technology.

Finally, it is important to note that the rules found in the Medicare CR provision (42 CFR 410.49) and supplemental

Table 2

Options for Delivery of Patient Education Materials in Hybrid Cardiac Rehabilitation

Delivery Option	Special Considerations
Education provided during scheduled facility-based cardiac rehabilitation sessions	Individualized discussion of relevant information Patients attend group education sessions, as available during scheduled cardiac rehabilitation sessions
Education provided 1:1 or during group setting (in conjunction with synchronous, virtual exercise sessions, or asynchronous remote visits)	Real-time presentation/discussion Utilize screen share for PowerPoint presentation and audiovisual viewing interaction; individualized or group discussion of relevant topics Schedule separate phone or audiovisual conferencing to follow up and address any individual issues or questions
Make supplementary educational material available to patients with or without virtual or remote cardiac rehabilitation sessions ¹⁰	Send educational materials and links of educational websites to patients via email or patient portal Utilize free patient education material available through health systems and professional organizations Utilize educational libraries and materials available through commercial, proprietary mobile applications Schedule phone or audiovisual conferencing to follow up and address any individual issues or questions

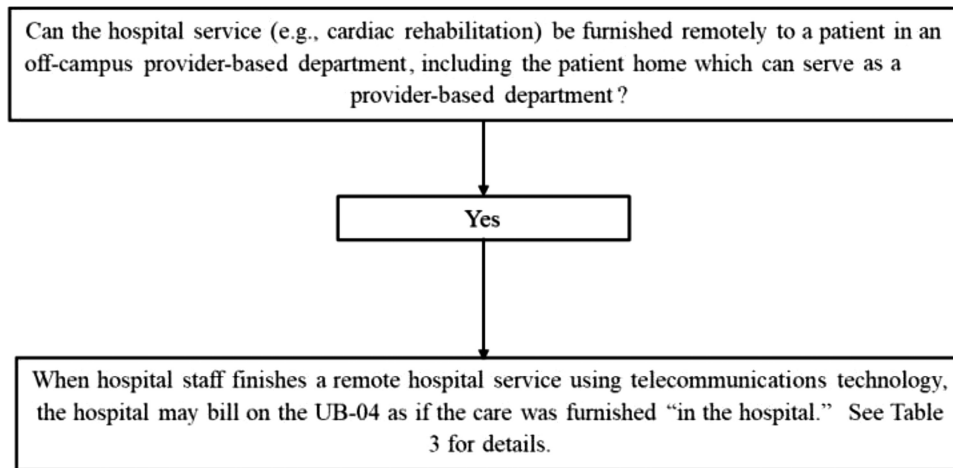


Figure 2. Schematic adapted from Medicare to illustrate the underlying premises that allow for hospital billing of synchronous virtual audiovisual cardiac rehabilitation services. Adapted from Ref. 52.

billing manuals remain applicable to HYCR sessions. This includes key issues such as an individual treatment plan signed by a physician every 30 d, a qualifying diagnosis, physician-prescribed exercise, outcome assessments, education and counseling, some exercise each day, and a CR session that is ≥ 31 min in duration.

PATIENT ENGAGEMENT STRATEGIES

The engagement of patients who are eligible for CR should encompass strategies to maximize participation. However, with the implementation of HYCR, some barriers to FBCR may be less relevant, while new barriers may need to be addressed.

Most of our current understanding of patient engagement is based on a robust literature of barriers to FBCR. Our understanding of factors that reduce patient interest, participation, and completion in HYCR is much more limited, but some evidence exists already that is actionable. Schopfer et al⁵⁵ interviewed 171 patients who were eligible for CR and had a home-based program offered, yet opted to decline to participate. Despite an in-person discussion about CR at the bedside, most patients who declined felt it was not going to offer any information they did not already know and that it was not going to be helpful for their cardiovascular health. One-third of patients did not want to make any lifestyle changes that the staff explained would be involved. Unfortunately, these findings are not much different from those found by others for FBCR.^{8,56} Patient beliefs that CR will either be ineffective or that they do not need help changing behaviors continue to be important barriers and new delivery models do not appear to change this.

Another evaluation of the barriers to CR between FBCR and virtual or remote CR showed that participants in home-based programs actually reported more barriers overall compared with their FBCR counterparts.⁵⁷ Also, they noted that they were already exercising at home or at a local fitness center and a remote-based program was of little utility. To address this, it may be prudent to convey to patients that a properly operated HYCR program is delivered by experienced and certified CR professionals, in a manner that goes well beyond exercise therapy alone to include all of the core components of CR.

In addition, the lack of technical skills and/or limited access to both Wi-Fi and the devices/equipment needed to carry out virtual interactions may be a challenge for

some patients interested in HYCR using a synchronous approach. These and other like issues may contribute to the digital divide that exists, an important issue that may potentially worsen the disparity in delivering health care to underserved populations.⁵⁸

Although some of the logistical barriers associated with FBCR are removed with alternative CR models, many of the same system and personal barriers remain. However, most of these barriers are easily identifiable during discussion with the patient. Given that some referring clinicians may not have adequate time to identify and address these barriers, it may be more effective to have CR staff engage in such a discussion with eligible patients during an in-person visit (or a virtual visit if in-person is not possible); resolving patient/staff identified barriers is an important patient-centered approach to CR care. Table 4 provides a summary of common barriers to participation in HYCR, along with potential strategies by which they can be addressed.

PROVIDER ENGAGEMENT STRATEGIES

For better or worse, 2020 exposed many CR programs and patients to alternative care delivery models that often blended traditional FBCR with virtual and/or remote methods of patient care. During 2020 the TAKEheart project, funded by the Agency for Healthcare Research and Quality, provided forums for CR programs to share insights and challenges related to providing virtual or remote CR.⁵⁹ Reflecting on information from these sessions suggests three potential paths for HYCR in the future, which are if (a) implemented poorly, HYCR could harm patients and undermine existing FBCR programs; (b) done nominally because of insufficient resources (eg, staffing), HYCR could simply remain a niche option offered by only a few programs; and (c) done well, HYCR could become a complement to FBCR that meets the needs of more persons who are eligible for CR.

Fully realizing the potential of HYCR will require helping programs successfully add HYCR to their existing FBCR program. This in turn requires that programs acknowledge (a) the need for a hybrid option and (b) possess the tools and support needed to implement HYCR. Although low CR participation and CR deserts are widely recognized, programs too focused on serving just those patients who are cared for in FBCR means they may have lost sight of the needs of those patients who do not engage because of travel distance, hours of operation, or health

Table 3

Step-by-Step Processes Needed for Billing Virtual Cardiac Rehabilitation Sessions Delivered via Synchronized (Real-Time) Audiovisual Communications Technology

Process Outline	Specific Items	Explanations/Definitions
<i>Step 1:</i> Determine your appropriate path for billing virtual sessions, which is based on the original (prior to PHE) program location	If program is off-campus in a <i>nonexcepted</i> location, proceed to step 4 If the program is on-campus or off-campus at an <i>excepted</i> location, proceed to step 2	Nonexcepted means a new or different address after November 2, 2015 Excepted means service was in its current location before November 2, 2015.
<i>Step 2:</i> Do you plan to maintain payment under the OPPTS?	If no, proceed to step 4 If yes, proceed to step 3	
<i>Step 3:</i> Submit the necessary information to complete the process for an Extraordinary Circumstances Relocation Request	A hospital must notify their CMS Regional Office by email with the following information: a. Hospital CMS Certification Number b. Date the services began being furnished at the new location c. Address of the original on-campus or excepted off-campus PBD d. New address(es) of the relocated PBDs This is a one-time separate process for each different outpatient service to be delivered to a beneficiary's home; for example, virtual CR would register separately from infusion home visits. Each patient's home address requires a separate submission, sent within 120 d of beginning to furnish and bill for services at the relocated PBD (patient's home in this case). Patient's home is considered a PBD of the hospital when the patient is registered as a hospital outpatient. e. A brief description of the justification for the relocation, role of relocation in hospital's operations in addressing COVID-19, and why the new PBD location is appropriate for furnishing covered outpatient service f. An attestation that the relocation(s) are not inconsistent with state's emergency preparedness or pandemic plan g. A point of contact (name, title, telephone, email) at hospital for the request	If a hospital relocates to a temporary location, which includes the beneficiary's home, the hospital has 120 d to submit the ECRR to continue receiving payment under OPPTS for CR A hospital may begin furnishing virtual CR outpatient services immediately at temporary location(s) with the "PO" modifier if the hospital submits the ECRR to the applicable CMS Regional Office within that 120-d window Email addresses to submit this request to your Regional Office are listed in the CMS frequently-asked questions instructions
<i>Step 4:</i> Select the appropriate CR procedure code(s) and modifiers Determine appropriate modifier(s) on each claim submitted for a virtual session	CPT 93798: with continuous ECG monitoring (per session) CPT 93797: without continuous ECG monitoring (per session) Modifiers: • DR (for use on all virtual claims) • PN or PO	Assumes monitoring is conducted for the entire duration of the session ECG monitoring is not a requirement for CR sessions. It is based on department policy DR indicates temporary location is "disaster-related" PN indicates this is a nonexcepted location; payment amount will be at PFS-equivalent rate. PO indicates this is an on-campus or excepted location with ECRR applied for or accepted; payment amount will be at hospital OPPTS rate

Abbreviations: CR, cardiac rehabilitation; CMS, Centers for Medicare & Medicaid Services; CPT, current procedural terminology; DR, disaster-related; ECG, electrocardiogram; ECRR, Extraordinary Circumstances Relocation Request; PHE, public health emergency; OPPTS, outpatient prospective payment system; PBD, provider-based department; PFS, physician fee schedule.

system neglect. Appreciating the needs of underserved populations and recognizing the reluctance of others to participate in FBCR increases the need for HYCR. Even CR programs that recognize the benefits that could be gained by offering HYCR still face significant implementation challenges and will need support to succeed. The TAKEheart sessions identified several issues that providers need to conduct an HYCR-type program—these include the development of a document that describes how to screen patients to determine whether HYCR is appropriate; forums to pose questions to peers/experts related to operating HYCR; and ability to use a registry to obtain data on safety and effectiveness.

SPECIAL CONSIDERATIONS

Although much is new and potentially exciting about HYCR, there are key issues that need to be considered by CR

programs as they continue to provide high-quality patient care via FBCR. To accomplish this, program operations, in addition to staff training and skill development, will likely need to be modified but this should be done in a manner that places the least amount of burden on employees and operations. Additionally, there are several other important considerations to keep in mind.

1. HYCR is not new. While new strategies and tools exist for HYCR today, it is helpful to recognize that there have been HYCR services for the past ≥20 yr.^{46,60,61} Optimal CR patient care has always included strategies to help patients carry out CR-related activities in both FBCR and elsewhere.
2. Research studies of HYCR will increase in the future, in part because home-based and hybrid models of CR became key delivery methods during the COVID-19 pandemic.⁶² This increase in investigative activity will require new, time-efficient research strategies that keep

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Table 4

Potential Strategies to Address Patient Barriers to Participation in Hybrid Cardiac Rehabilitation

Barrier	Potential Strategies to Address Barriers
Ineffective consultation	<ul style="list-style-type: none"> • Appropriately timed meeting with patient to improve understanding • Engagement of family or caregiver • Repeated contact (inpatient, outpatient, mail, email)
Lack of belief of benefits	<ul style="list-style-type: none"> • Engage other patients to share stories • Reinforce favorable evidence pertaining to secondary prevention • Engage the other providers of the patients to encourage enrollment
Lack of motivation	<ul style="list-style-type: none"> • Engagement of family or caregiver • Help patient identify others to share in their experience • Better social networking and community building • Consider patient-directed incentive model for each completed session
Lack of confidence	<ul style="list-style-type: none"> • Initially, consider a 1:1 engagement between staff and patient • Identify and resolve specific and unique concerns for sustained success • Ensure easily attainable milestones early-on during program participation
Competing priorities in life	<ul style="list-style-type: none"> • Flexible scheduling that allows short-term issues to be addressed first • Repeated contact between staff and patient to secure enrollment, after issues are addressed
Uncomfortable/unfamiliar with technology ... the digital divide	<ul style="list-style-type: none"> • Incorporate hands-on training and patient demonstration/practice sessions • Engage assistance from family member or friend • Device "sharing or borrowing" from family member

pace with the speed of innovation. Traditional research methods can take years to complete, during which time new generations of mobile health tools and strategies will be developed, potentially making the research projects obsolete even before they are completed.⁶³ Also, as the evidence base addressing HYCR grows, adjustments to the standards, practices, and resources for HYCR will need to be modified and updated in a commensurate manner. These changes must be anticipated and embraced by CR professionals, leaders, and patients in a timely manner.

3. Cardiac rehabilitation professionals can decide to deploy a synchronous-only or an asynchronous only-approach for the delivery of their CR services, or choose to engage a combination of both approaches as advanced in this review. No studies to date have directly compared synchronous versus asynchronous CR relative to clarifying differences in feasibility, impact on the digital divide, cost-effectiveness, benefits, and overall value.¹⁰
4. In the future, opportunities for the financial viability of virtual and remote HYCR will likely match the changing landscape of CR services in general, including potential coverage changes by third-party payers, potential opportunities for shared risk reimbursement models, and potential opportunities for direct contracting with health care organizations and other companies.^{10,64} It is critically important for the leaders of CR programs to be agile in their efforts to keep their programs financially viable.
5. To optimize program outcomes, the tools and strategies

that drive HYCR must continually allow for the following: (a) scalability, flexibility, customizability, and responsiveness to patient, program, and system needs; (b) optimal usability by all patients and staff; (c) integrity of program components to match high-quality, evidence-based standards; and (d) accountability for data security, patient and staff engagement, financial viability, and clinical outcomes.⁶³

6. Although the research addressing HYCR is growing, many topics of importance remain worthy of focused attention in the future, including the role and impact of HYCR in narrowing disparities and in several understudied cohorts such as women and Blacks. Also, data are needed that address the financial aspects associated with delivering HYCR because several factors such as technology and staff to patient ratios can influence program costs. Thomas et al¹⁰ recently summarized data from several studies that addressed the costs associated with home-based CR, but none directly compared HYCR to FBCR. One study showed no significant difference in costs²⁰ when comparing home-based CR to FBCR and another suggested that costs were lower with home-based CR.⁶⁵

SUMMARY

In summary, FBCR is the first choice for patient participation in CR, as it is supported by an extensive evidence base demonstrating effectiveness in decreasing cardiac and overall mortality, as well as improving functional capacity and quality of life. Yet, participation rates for FBCR are 30-40% in the United States for eligible patients. To attain the CR participation rate goal of 70%, CR programming will need to be expanded beyond the confines of FBCR. In particular, HYCR programs will be necessary to supplement FBCR and may be particularly useful for the many patients with geographic or work-related barriers to participation. Research is ongoing to develop optimal programming for HYCR and to incorporate new care delivery models into reimbursement models.

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