Medical Policy

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Title: Cardiac Rehabilitation in the Outpatient Setting

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Populations	Interventions	Comparators	Outcomes
Individuals: • With diagnosed heart disease	Interventions of interest are: • Outpatient cardiac rehabilitation	Comparators of interest are: • Standard management without cardiac rehabilitation	Relevant outcomes include: • Overall survival • Disease-specific survival • Symptoms • Morbid events

Populations	Interventions	Comparators	Outcomes
Individuals: • With diagnosed heart disease without a second event	Interventions of interest are: • Repeat outpatient cardiac rehabilitation	Comparators of interest are: • Single course of outpatient cardiac rehabilitation	Relevant outcomes include: • Overall survival • Disease-specific survival • Symptoms • Morbid events
Individuals: • With diagnosed heart disease	Interventions of interest are: • Intensive cardiac rehabilitation with the Ornish Program for Reversing Heart Disease	Comparators of interest are: • Standard outpatient cardiac rehabilitation	Relevant outcomes include: • Overall survival • Disease-specific survival • Symptoms • Morbid events
Individuals: • With diagnosed heart disease	Interventions of interest are: • Intensive cardiac rehabilitation with the Pritikin Program	Comparators of interest are: • Standard outpatient cardiac rehabilitation	Relevant outcomes include: • Overall survival • Disease-specific survival • Symptoms • Morbid events
Individuals: • With diagnosed heart disease	Interventions of interest are: • Intensive cardiac rehabilitation with the Benson-Henry Institute Program	Comparators of interest are: • Standard outpatient cardiac rehabilitation	Relevant outcomes include: • Overall survival • Disease-specific survival • Symptoms • Morbid events

DESCRIPTION

Cardiac rehabilitation refers to comprehensive medically supervised programs in the outpatient setting that aim to improve the function of patients with heart disease and prevent future cardiac events. National organizations have specified core components to be included in cardiac rehabilitation programs.

OBJECTIVE

The objective of this evidence review is to determine whether outpatient cardiac rehabilitation programs improve the net health outcome in patients with heart disease.

BACKGROUND

Heart disease is the leading cause of mortality in the United States, accounting for more than half of all deaths. Coronary artery disease is the most common cause of heart disease. In a 2020 update on heart disease and stroke statistics from the American Heart Association, it was

estimated that 605,000 Americans have a new coronary attack (first hospitalized myocardial infarction or coronary heart disease death) and 200,000 have a recurrent attack annually.[1,] Both coronary artery disease and various other disorders—structural heart disease and other genetic, metabolic, endocrine, toxic, inflammatory, and infectious causes—can lead to the clinical syndrome of heart failure, of which there are about 650,000 new cases in the United States annually.[2,] Given the burden of heart disease, preventing secondary cardiac events and treating the symptoms of heart disease and heart failure have received much attention from national organizations.

Cardiac Rehabilitation

In 1995, the U.S. Public Health Service defined cardiac rehabilitation services as, in part, "comprehensive, long-term programs involving medical evaluation, prescribed exercise, cardiac risk factor modification, education, and counseling…. [These programs] are designed to limit the physiologic and psychological effects of cardiac illness, reduce the risk for sudden death or reinfarction, control cardiac symptoms, stabilize or reverse the atherosclerotic process, and enhance the psychosocial and vocational status of selected patients." The U.S. Public Health Service recommended cardiac rehabilitation services for patients with coronary heart disease and heart failure, including those awaiting or following cardiac transplantation. A 2010 definition of cardiac rehabilitation from the European Association of Cardiovascular Prevention and Rehabilitation stated: "Cardiac rehabilitation can be viewed as the clinical application of preventive care by means of a professional multi-disciplinary integrated approach for comprehensive risk reduction and global long-term care of cardiac patients."[3,] Since the 1995 release of the U.S. Public Health Service guidelines, other societies, including in 2005 the American Heart Association[4,] and in 2010 the Heart Failure Society of America [5,] have developed guidelines on the role of cardiac rehabilitation in patient care.

REGULATORY STATUS

Not applicable.

POLICY

A. Outpatient cardiac rehabilitation programs are considered **medically necessary** for patients with a history of the following conditions and procedures:
   1. An acute myocardial infarction (MI) (heart attack) within the preceding 12 months; **OR**
   2. A coronary artery bypass graft (CABG) surgery; **OR**
   3. Current stable angina pectoris; **OR**
   4. Heart valve surgery; **OR**
   5. Percutaneous transluminal coronary angioplasty (PTCA) or coronary stenting; **OR**
   6. A heart or heart-lung transplant; **OR**
   7. Compensated heart failure.

B. Repeat participation in an outpatient cardiac rehabilitation program in the absence of another qualifying cardiac event is considered **experimental / investigational**.

C. Intensive cardiac rehabilitation with the Ornish Program for Reversing Heart Disease, Pritikin Program, or Benson-Henry Institute Program is considered **experimental / investigational**.

D. Physical and/or occupational therapy are **not medically necessary** in conjunction with cardiac rehabilitation unless performed for an unrelated diagnosis.

POLICY GUIDELINES

A. Cardiac rehabilitation programs must include the following components:
   1. Physician-prescribed exercise each day cardiac rehabilitation items and services are furnished;
   2. Cardiac risk factor modification;
   3. Psychosocial assessment;
   4. Outcomes assessment; and
   5. An individualized treatment plan detailing how each of the above components are utilized.

B. Cardiac rehabilitation items and services must be furnished in a physician's office or a hospital outpatient setting.

C. All settings must have a physician immediately available and accessible for medical consultations and emergencies at all times when items and services are being furnished under the program.

D. Duration of the Program:
   A cardiac rehabilitation exercise program is eligible for coverage for 3 sessions per week up to a 12-week period (36 sessions).

E. A comprehensive evaluation may be performed before initiation of cardiac rehabilitation to evaluate the patient and determine an appropriate exercise program. In addition to a medical examination, an electrocardiogram stress test may be performed. An additional stress test may be performed at the completion of the program.

Please refer to the member's contract benefits in effect at the time of service to determine coverage or non-coverage of these services as it applies to an individual member.

RATIONALE

This evidence review has been updated regularly with searches of the PubMed database. The most recent literature update was performed through February 3, 2022.

Evidence reviews assess the clinical evidence to determine whether the use of technology improves the net health outcome. Broadly defined, health outcomes are the length of life, quality of life, and ability to function, including benefits and harms. Every clinical condition has specific outcomes that are important to patients and managing the course of that condition. Validated outcome measures are necessary to ascertain whether a condition improves or worsens and whether the magnitude of that change is clinically significant. The net health outcome is a balance of benefits and harms.

To assess whether the evidence is sufficient to draw conclusions about the net health outcome of technology, 2 domains are examined: the relevance, and the quality and credibility. To be relevant, studies must represent 1 or more intended clinical use of the technology in the intended population and compare an effective and appropriate alternative at a comparable intensity. For some conditions, the alternative will be supportive care or surveillance. The quality and credibility of the evidence depend on study design and conduct, minimizing bias and confounding that can generate incorrect findings. The randomized controlled trial (RCT) is preferred to assess efficacy; however, in some circumstances, nonrandomized studies may be adequate. RCTs are rarely large enough or long enough to capture less common adverse events and long-term effects. Other types of studies can be used for these purposes and to assess generalizability to broader clinical populations and settings of clinical practice.

OUTPATIENT CARDIAC REHABILITATION FOR HEART DISEASE

Clinical Context and Therapy Purpose

The purpose of cardiac rehabilitation in patients who have heart disease is to provide a treatment option that is an alternative to or an improvement on existing therapies.

The question addressed in this evidence review is: Does the use of cardiac rehabilitation in patients who have heart disease improve net health outcomes?

The following PICO was used to select literature to inform this review.

Populations

The relevant population of interest is patients with diagnosed heart disease.

Interventions

The treatment being considered is cardiac rehabilitation. Cardiac rehabilitation includes long-term programs that include medical evaluation, prescribed exercise, modification to reduce cardiac risks, education, and counseling.

Comparators

The comparator of interest is standard management without cardiac rehabilitation. The following practices are currently being used to manage heart disease: medication, surgery, and medical devices.

Outcomes
The general outcomes of interest are overall survival (OS), disease-specific survival, symptoms, and morbid events.

Once diagnosed with heart disease, a patient will require lifelong monitoring by a cardiologist.

Study Selection Criteria
Methodologically credible studies were selected using the following principles:

1. To assess efficacy outcomes, comparative controlled prospective trials were sought, with a preference for RCTs.
2. In the absence of such trials, comparative observational studies were sought, with a preference for prospective studies.
3. To assess long-term outcomes and adverse events, single-arm studies that capture longer periods of follow-up and/or larger populations were sought.
4. Studies with duplicative or overlapping populations were excluded.

REVIEW OF EVIDENCE

Systematic Reviews
Oldridge (2012) identified 6 independent meta-analyses published since 2000 that reported outcomes from 71 RCTs (N=13,824) following cardiac rehabilitation interventions.[6,] The RCTs included in the meta-analyses enrolled patients with myocardial infarction, coronary heart disease, angina, percutaneous coronary intervention (PCI), and/or coronary artery bypass graft (CABG). The RCTs compared cardiac rehabilitation programs (exercise-only and/or comprehensive rehabilitation) with usual care. Cardiac rehabilitation was associated with a statistically significant ($p<.05$) reduction in all-cause mortality in 4 of the 5 meta-analyses that reported this outcome. In the pooled analysis, cardiac rehabilitation was associated with an 18.5% mean reduction in all-cause mortality. Also, cardiac rehabilitation was associated with a statistically significant reduction in cardiac mortality in 3 of the 4 meta-analyses that reported disease-specific mortality as an outcome.

Two of the meta-analyses on cardiac rehabilitation were Cochrane reviews. One included patients with coronary heart disease.[7,] and the other focused on patients with systolic heart failure.[8,] Both addressed exercise-based cardiac rehabilitation programs (exercise alone or as part of a comprehensive program). Anderson et al (2016) updated a 2011 Cochrane review addressing exercise-based cardiac rehabilitation for individuals with coronary heart disease.[7,9,] Reviewers included RCTs of exercise-based interventions with at least 6 months of follow-up compared with no-exercise controls in patients with myocardial infarction, CABG, or PCI , or with angina pectoris or coronary artery disease. The updated review included 63 RCTs (N=14,486), of which 16 trials had been published since the 2011 update. Reviewers reported that the overall risk of bias was unclear, although the quality of reporting improved with more recent trials. Due to the nature of the intervention, patients were not blinded to the treatment group in any of the studies, but 16 (25%) of 62 studies reported details of blinded assessment of study outcomes. In the pooled analysis, cardiac rehabilitation was not significantly associated with overall mortality. However, among 27 studies, cardiac rehabilitation was significantly associated with reduced cardiovascular mortality (292/3850 for cardiac rehabilitation subjects vs. 375/3,619 for control subjects; relative risk [RR] 0.74; 95% confidence interval [CI], 0.64 to 0.86). Rates of myocardial infarction, CABG, and PCI were not significantly associated with receiving cardiac rehabilitation.

Long et al (2019) reported a Cochrane Review of studies assessing cardiac rehabilitation in patients with heart failure. A total of 44 RCTs were evaluated ,11 of which were new trials, for the effects of exercise-based cardiac rehabilitation on adults with heart failure (5,783 total participants).[10,] A single trial, Exercise Based Cardiac Rehabilitation for Adults WithHeart Failure (HF-ACTION), contributed almost half of the patients (with results reported in 18 publications); most other studies were small and single-center. All studies had 6 months or longer follow-up and did not include a formal exercise training intervention as a comparator. The primary outcomes reported were mortality, hospital admission, and health-related quality of life (HRQoL). The overall risk of bias was assessed as being low or unclear, and results were downgraded using the GRADE tool for all outcomes except one. Results showed that cardiac rehabilitation had little effect on all-cause mortality over ≤1 year of follow-up (27 trials, 2,596 participants: cardiac rehabilitation 5.1% vs. control 5.8%; low-quality evidence). However, cardiac rehabilitation may make a difference in the long-term (>1 year of follow-up; 6 trials, 2,845 participants: cardiac rehabilitation 17.2% vs. control 19.6%; high-quality evidence). Mortality related to heart failure was not consistently reported in the studies. Chances of avoiding hospital admission for any cause within 12 months of follow-up were better with cardiac rehabilitation (21 trials, 2,182 participants: cardiac rehabilitation 16.5% vs. control 23.7%; moderate-quality evidence). Cardiac rehabilitation may also reduce short-term heart failure-related hospital admission (14 trials, 1,114 participants: cardiac rehabilitation 7.1% vs. control 11.1%; RR 0.59, 95% CI, 0.42 to 0.84; p=. 003), but the evidence was rated low quality. HRQoL was reported by 29 trials, most of which used the Minnesota Living With Heart Failure questionnaire; however, other tools were also used among the 29 trials that reported validated HRQoL measures. For exercise-based cardiac rehabilitation, no trials reported lower HRQoL scores with cardiac rehabilitation than with control, and all but 1 reported on results at ≥6 months follow-up. The pooled results from all measures used showed a clinically important improvement (a 5-point difference on the Minnesota Living With Heart Failure with exercise at up to 12 months follow-up, but the evidence was of very low quality. Compared with the 2014 review, this version included more women, older patients, participants with heart failure with preserved ejection fraction in recent trials, and more trials of cardiac rehabilitation in a home-based setting ;this version may be more valid and applicable.

Table 1. Systematic Review Characteristics

Study	Dates	Trials	Participants	N (Range)	Design
Davies et al (2010)[8,]	1995-2008	29	All adults with chronic systolic HF	3,647 (20 to 2,331)	RCT
Oldridge (2012)[6,]	2000-2011	71	Patients with MI, CHD, angina, PCI, and/or CABG	13,824 (6,111 to 10,794)	RCT
Anderson et al (2016)[7,]	1975-2014	63	Patients with MI, angina pectoris, CAD, or who underwent CABG or PCI	14,486 (25 to 3,184)	RCT

Study	Dates	Trials	Participants	N (Range)	Design
Long et al (2019) [10,]	1995-2018	44	Patients with HF	5,783 (19 to 2,331)	RCT

CABG: coronary artery bypass graft; CAD: coronary artery disease; CHD: coronary heart disease; HF: heart failure; MI: myocardial infarction; PCI: percutaneous coronary intervention; RCT: randomized controlled trial.

Table 2. Systematic Review Results

Study	All-Cause Mortality	Cardiovascular Mortality
Davies et al (2010)[8,]	13 studies (≤12 mo)	NR
Difference in pooled mortality, fixed-effect RR	1.02	NR
95% CI	0.70 to 1.51	NR
p-value	.90	NR
Oldridge (2012)[6,]	6 studies	6 studies
Reduction, mean %	18.50	29.4
p-value	<.05	NR
Range, %	NR	20 to 43
Anderson et al (2016)[7,]	47 studies; N=12,455 participants	27 studies; N=7,469 participants
RR	0.96	0.74
95% CI	0.88 to 1.04	0.64 to 0.86
Long et al (2019) [10,]	2,845 participants, 6 studies	(studies did not consistently report deaths due to heart failure)
RR	0.88	NR
95 % (CI)	0.75 to 1.02	NR

CI: confidence interval; NR: not reported; RR: relative risk.

Randomized Controlled Trials

Findings of a large, multicenter RCT from the United Kingdom, which evaluated the effectiveness of cardiac rehabilitation in a "real-life" setting, were published by West et al (2012).[11,] Called the Rehabilitation After Myocardial Infarction Trial (RAMIT), the study included patients from 14 centers with established multifactorial cardiac rehabilitation programs (including exercise, education, and counseling), involved more than 1 discipline, and provided an intervention lasting a minimum of 10 hours. A total of 1,813 patients were randomized: 903 to cardiac rehabilitation and 910 to a control condition. Vital status was obtained at 2 years for 99.9% (all but 1 patient) and at 7 to 9 years for 99.4% of patients. By 2 years, 166 patients had died: 82 in the cardiac rehabilitation group and 84 in the control group. The between-group difference in mortality at 2 years (the primary study outcome) was not statistically significant (RR 0.98; 95% CI, 0.74 to 1.30). After 7 to 9 years, 488 patients had died, 245 in the cardiac rehabilitation group and 243 in the control group (RR 0.99; 95% CI, 0.85 to 1.15). In addition, at 1 year, cardiovascular morbidity did not differ significantly between groups. For a combined endpoint including death, nonfatal myocardial infarction, stroke, or revascularization, the RR was 0.96 (95% CI, 0.88 to

1.07). In discussing the study's negative findings, trialists noted that medical management of heart disease had improved over time, and patients in the control group might have had better outcomes than in earlier RCTs on this topic. Moreover, an editorial accompanying the publication of the trial's findings emphasized that RAMIT was not an efficacy trial, but rather, a trial evaluating the effectiveness of actual cardiac rehabilitation programs in the United Kingdom. [12,] Finally, these results might in part reflect the degree to which clinically-based cardiac rehabilitation programs in the United Kingdom differ from the treatment protocols used in RCTs based in research settings.

A concern raised by the negative findings in the RAMIT trial is that most of the RCTs evaluating cardiac rehabilitation were conducted in an earlier era of heart disease management and might not be relevant to current care. However, RAMIT's results, along with 15 additional RCTs reported since a 2011 Cochrane review, were included in the updated 2016 Cochrane review, which found improvements in cardiovascular mortality associated with exercise-based cardiac rehabilitation.

Pandey et al (2017) evaluated endurance exercise training as part of a cardiac rehabilitation program in a population of heart failure patients stratified by ejection fraction.[13,] Participants had heart failure with preserved ejection fraction or reduced ejection fraction, were 65 years of age or older, and had participated in a 16-week exercise program that intensified from 40% to 50% of heart rate reserve in the first 2 weeks to 60% to 70% over the ensuing weeks as part of a previously published RCT.[14,] The primary outcome for assessing change in exercise capacity was the percentage change in peak oxygen uptake (mL/kg per minute) from baseline to end of exercise training (16-week follow-up). Data on testing from 48 patients (24 reduced ejection fraction, 24 heart failure with preserved ejection fraction) were assessed. Heart failure with preserved ejection fraction patients experienced greater improvement in exercise training patients (18.7%) than reduced ejection fraction patients (-0.3%; $p<.001$) as measured by peak oxygen uptake. There was no information on subsequent hospitalization rates or clinical outcomes such as heart failure progression or mortality. This secondary analysis was used to assert the appropriateness of cardiac rehabilitation in heart failure with preserved ejection fraction patients.

Opotowsky et al (2018) compared cardiac rehabilitation to the standard of care in 28 subjects (mean age: 41.1 years) with moderate to severe congenital heart disease.[15,] Cardiac rehabilitation was associated with a significant increase in peak oxygen consumption with no associated adverse events. There was also a nonsignificant improvement in peak work rate with cardiac rehabilitation as compared to standard of care ($p=.16$) and a significant improvement in self-assessment of overall health ($p<.04$). However, the study was limited by its small sample size and short-term follow-up.

Snoek et al (2020) evaluated 6 months of home-based mobile guided cardiac rehabilitation versus standard of care in 179 elderly subjects (mean age: 72 years) with a recent diagnosis of cardiovascular disease.[16,] The primary outcome measure was peak oxygen uptake after 6 months. Results revealed that changes in peak oxygen uptake were greater in the cardiac rehabilitation group as compared to the control at both 6 and 12 months. The overall incidence of adverse events was low and did not differ between groups. A limitation of the study was that the authors used home-based mobile guided cardiac rehabilitation as an alternative to exercise-based cardiac rehabilitation and not for comprehensive cardiac rehabilitation, because the authors did not include all core components of cardiac rehabilitation in their intervention. Tables 2 and 3 provide a summary of key RCT characteristics and results.

Table 3. Summary of Key Randomized Controlled Trial Characteristics

Trial	Countries	Sites	Dates	Participants	Interventions	
					Active	***Comparator***
West et al (2012); RAMIT[11,]	United Kingdom	14	1997-2000	Patients diagnosed with acute MI (N=1813)	Cardiac rehabilitation (n=903)	Control (n=910)
Pandey et al (2017)[13,]	U.S.	1	NR	Patients aged ≥ 65 with HFrEF (n=24) or HFpEF (n=24)	16-wk supervised moderate endurance exercise training (n=48)	HRrEF (n=24) vs. HFpEF (n=24)
Opotowsky et al (2018)[15,]	U.S.	1	NR	Patients aged ≥ 16 with moderate to severe congenital heart disease (N=28)	12-wk cardiac rehabilitation (n=13)	Standard of care (n=15)
Snoek et al (2020)[16,]	5 European countries	6	2015-2018	Patients aged ≥ 65 with a recent diagnosis of acute coronary syndrome, coronary revascularization, surgical or percutaneous treatment for valvular disease, or documented coronary artery disease (N=179)	6-month mobile cardiac rehabilitation (n=89)	Standard of care (n=90)

HF: heart failure; HFpEF: HF with preserved ejection fraction; HFrEF: HF with reduced ejection fraction; MI: myocardial infarction; NR: not reported; RCT: randomized controlled trial; RAMIT: Rehabilitation After Myocardial Infarction Trial.

Table 4. Summary of Key Randomized Controlled Trial Results

Study	2-yr Mortality	Readmission to Hospital for Any Cardiac Condition at 1 y	Training-Related Improvement in Vo2 peak Change
West et al (2012); RAMIT[11,]	N=1,813 participants	N=1,813 participants	NR
CR	82 patients	222 (25%)	NR
Control	84 patients	239 (26%)	NR
RR	0.98	NR	NR
95% CI	0.74 to 1.30	NR	NR

Study	2-yr Mortality	Readmission to Hospital for Any Cardiac Condition at 1 y	Training-Related Improvement in Vo2 peak Change
Pandey et al (2017)[13,]	NR	NR	N=48 participants
HFrEF	NR	NR	18.7+/-17.6
HFpEF	NR	NR	-0.3+/-15.4
p-value	NR	NR	<.001
Opotowsky et al (2018)[15,]			N=28 participants
CR	NR	NR	+2.2 mL/kg/min (compared to standard of care)
95% CI; p value	NR	NR	0.7 to 3.7; p=.002
Snoek et al (2020)[16,]			N=179 participants
CR [95% CI]	NR	NR	At 6 months: 1.6 [0.9 to 2.4] mL/kg/min At 12 months: 1.2 [0.4 to 2.0] mL/kg/min
Standard of care	NR	NR	At 6 months: 0.2 [-0.4 to 0.8] mL/kg/min At 12 months: 0.1 [-0.5 to 0.7] mL/kg/min

CI: confidence interval; CR: cardiac rehabilitation; HF: heart failure; HFpEF: HF with preserved ejection fraction; HFrEF: HF with reduced ejection fraction; NR: not reported; RCT: randomized controlled trial; RR: relative risk; Vo_2peak: peak oxygen uptake. RAMIT: Rehabilitation After Myocardial Infarction Trial.

The purpose of the limitations tables (see Tables 5 and 6) is to display notable limitations identified in each study. This information is synthesized as a summary of the body of evidence following each table and provides the conclusions on the sufficiency of the evidence supporting the position statement.

Table 5. Study Relevance Limitations

Study	Population[a]	Intervention[b]	Comparator[c]	Outcomes[d]	Follow-Up[e]
West et al (2012); RAMIT[11,]	4,5. Descriptions of diversity in study populations were not reported				1,2. Trial was closed prematurely
Pandey et al (2017)[13,]	4. Enrolled populations do not reflect relevant diversity; 81% of		2. No comparator used		1,2. Only 16 wks follow-up

Study	Population[a]	Intervention[b]	Comparator[c]	Outcomes[d]	Follow-Up[e]
	participants were White				
Opotowsky et al (2018)[15,]	4,5. Descriptions of diversity in study populations were not reported			1. Key health outcomes such as mortality or readmission not addressed	1,2. Only 12 wks follow-up
Snoek et al (2020)[16,]	4,5. Descriptions of diversity in study populations were not reported	2. Intervention was an alternative for exercise-based cardiac rehabilitation and not for comprehensive cardiac rehabilitation; authors did not include all core components of cardiac rehabilitation in the intervention		1. Key health outcomes such as mortality or readmission not addressed	

The study limitations stated in this table are those notable in the current review; this is not a comprehensive gaps assessment.
a Population key: 1. Intended use population unclear; 2. Study population is unclear; 3. Study population not representative of intended use; 4, Enrolled populations do not reflect relevant diversity; 5. Other.
b Intervention key: 1. Not clearly defined; 2. Version used unclear; 3. Delivery not similar intensity as comparator; 4. Not the intervention of interest. 5: Other.
c Comparator key: 1. Not clearly defined; 2. Not standard or optimal; 3. Delivery not similar intensity as intervention; 4. Not delivered effectively. 5: Other.
d Outcomes key: 1. Key health outcomes not addressed; 2. Physiologic measures, not validated surrogates; 3. No CONSORT reporting of harms; 4. Not establish and validated measurements; 5. Clinical significant difference not prespecified; 6. Clinical significant difference not supported. 7. Other.
e Follow-Up key: 1. Not sufficient duration for benefit; 2. Not sufficient duration for harms. 3. Other.
RAMIT: Rehabilitation After Myocardial Infarction Trial.

Table 6. Study Design and Conduct Limitations

Study	Allocation[a]	Blinding[b]	Selective Reporting[c]	Follow-Up[d]	Power[e]	Statistical[f]
West et al (2012); RAMIT[11,]	3. Allocation concealment unclear	1,2. Not blinded				
Pandey et al (2017)[13,]	1. Participants not randomly allocated	1,2. Not blinded				
Opotowsky et al (2018)[15,]		1,2. Not blinded			1. Power calculations not reported	
Snoek et al (2020)[16,]		2. Not blinded to			3. Not powered to	

Study	Allocation[a]	Blinding[b]	Selective Reporting[c]	Follow-Up[d]	Power[e]	Statistical[f]
		outcome assessment			detect a difference in hard outcomes or more rare adverse events	

The study limitations stated in this table are those notable in the current review; this is not a comprehensive gaps s assessment.
a Allocation key: 1. Participants not randomly allocated; 2. Allocation not concealed; 3. Allocation concealment unclear; 4. Inadequate control for selection bias.
b Blinding key: 1. Not blinded to treatment assignment; 2. Not blinded outcome assessment; 3. Outcome assessed by treating physician.
c Selective Reporting key: 1. Not registered; 2. Evidence of selective reporting; 3. Evidence of selective publication.
d Follow-Up key: 1. High loss to follow-up or missing data; 2. Inadequate handling of missing data; 3. High number of crossovers; 4. Inadequate handling of crossovers; 5. Inappropriate exclusions; 6. Not intent to treat analysis (per protocol for noninferiority trials).
e Power key: 1. Power calculations not reported; 2. Power not calculated for primary outcome; 3. Power not based on clinically important difference.
f Statistical key: 1. Intervention is not appropriate for outcome type: (a) continuous; (b) binary; (c) time to event; 2. Intervention is not appropriate for multiple observations per patient; 3. Confidence intervals and/or p values not reported; 4. Comparative treatment effects not calculated.
RAMIT: Rehabilitation After Myocardial Infarction Trial.

Observational Studies

Sumner et al (2017) published a systematic review of controlled observational studies evaluating cardiac rehabilitation in patients diagnosed with acute myocardial infarction.[17,] Cardiac rehabilitation interventions consisted of structured multicomponent programs that included exercise and at least 1 of the following: education, information, health behavior change, and psychological or social support. Usual care interventions, generally supervised medical interventions, were the control conditions. Ten studies met reviewers' eligibility criteria. In a meta-analysis of 5 studies reporting all-cause mortality (an unadjusted outcome), there was a significantly lower risk of death in the group that received cardiac rehabilitation (odds ratio [OR], 0.25; 95% CI, 0.16 to 0.40). Three studies that reported an adjusted analysis of all-cause mortality also found a significant benefit from cardiac rehabilitation (OR, 0.47; 95% CI, 0.38 to 0.59). Similarly, a meta-analysis of 3 studies reporting cardiac-related mortality (an unadjusted analysis) found a significant benefit from cardiac rehabilitation (OR, 0.21; 95% CI, 0.12 to 0.37). Only 1 study reported an adjusted analysis of cardiac-related mortality, so data could not be pooled.

Nilsson et al (2018) investigated the effect of a 12-week cardiac rehabilitation program with a high-intensity interval exercise component using participant peak oxygen uptake as a measure of improved exercise capacity.[18,] Increased exercise capacity has been shown to improve survival among persons with coronary heart disease. The objective of the study was to assess whether this addition to a cardiac rehabilitation program yielded improved long-term results. One hundred thirty-three coronary patients participated in this prospective cohort study and were evaluated at baseline, at the end of the 12-week program, and again at a 15-month follow-up. Additional test measurements included a cardiopulmonary exercise test, body mass index, blood pressure tests,

and quality of life questionnaire. Of the 133 patients, 86 patients had complete information for the 15-month follow-up. Mean peak oxygen uptake improved from a baseline of 31.9 mL/kg/min to 35.9 mL/kg/min (p<.001) at the end of the 12-week program, and to 36.8 mL/kg/min (CI not reported) at 15-month follow-up. Most of the 86 patients reported maintaining an exercise routine. Study limitations included the small sample size, a relatively low-risk male population at baseline, and lack of information on the qualifying event for cardiac rehabilitation. The authors concluded that the cardiac rehabilitation program intervention potentially fostered consistent and beneficial exercise habits as demonstrated by improved peak oxygen uptake.

Jafri et al (2021) conducted a retrospective cohort study to evaluate home-based cardiac rehabilitation (HBCR) in patients with established cardiovascular disease.[19,] A total of 269 patients at a Veterans Affairs Medical Center were eligible for inclusion (HBCR group, n=157; non-HBCR control group, n=100); 12 patients were excluded due to having outcomes less than 90 days after enrollment (study follow-up period was between 3 to 12 months). A majority of patients (98%) were male, and the mean age was 72 years. The primary outcome was composite all-cause mortality and hospitalizations and secondary outcomes were all-cause hospitalization, all-cause mortality, and cardiovascular hospitalizations. The primary composite outcome occurred in both the HBCR (n=30) and control (n=30) (adjusted HR 0.56; 95% CI 0.33 to 0.95; p=.03). All-cause mortality occurred in 6.4% of HBCR patients versus 13% of the control group (adjusted HR 0.43; 95% CI 0.18 to 1.0; p=.05). There was no difference in cardiovascular or all-cause hospitalizations between groups.

Section Summary: Outpatient Cardiac Rehabilitation for Heart Disease
Overall, the evidence from RCTs reviewed in well-structured systematic reviews suggests that cardiac rehabilitation is associated with reduced cardiovascular mortality in patients with coronary heart disease. Additional RCTs, systematic reviews, and observational studies have evaluated outpatient cardiac rehabilitation in patients with heart failure or in the postintervention setting. An overview of 6 meta-analyses found a statistically significant association between cardiac rehabilitation and reduction in all-cause mortality and/or cardiac mortality. The available evidence has limitations, including lack of blinded outcome assessment, but, for the survival-related outcomes of interest, this limitation is less critical.

REPEAT OUTPATIENT CARDIAC REHABILITATION

Clinical Context and Therapy Purpose
The purpose of repeat cardiac rehabilitation in patients who have heart disease without a second event is to provide a treatment option that is an alternative to or an improvement on existing therapies.

The question addressed in this evidence review is: Does the use of repeat cardiac rehabilitation in patients who have heart disease without a second event improve net health outcomes?

The following PICO was used to select literature to inform this review.

Populations
The relevant population of interest is patients with diagnosed heart disease who have had cardiac rehabilitation before but who have not had a second cardiac event.

Interventions
The treatment being considered is repeat cardiac rehabilitation. Cardiac rehabilitation includes long-term programs that include medical evaluation, prescribed exercise, modification to reduce cardiac risks, education, and counseling.

Comparators
The comparator of interest is standard management with a single course of cardiac rehabilitation. Cardiac rehabilitation includes long-term programs that include medical evaluation, prescribed exercise, modification to reduce cardiac risks, education, and counseling.

Outcomes
The general outcomes of interest are OS, disease-specific survival, symptoms, and morbid events.

Once diagnosed with heart disease, a patient will require lifelong monitoring by a cardiologist.

Study Selection Criteria
Methodologically credible studies were selected using the following principles:

1. To assess efficacy outcomes, comparative controlled prospective trials were sought, with a preference for RCTs.
2. In the absence of such trials, comparative observational studies were sought, with a preference for prospective studies.
3. To assess long-term outcomes and adverse events, single-arm studies that capture longer periods of follow-up and/or larger populations were sought.
4. Studies with duplicative or overlapping populations were excluded.

Review of Evidence
No studies were identified that evaluated the effectiveness of repeat participation in a cardiac rehabilitation program.

Section Summary: Repeat Outpatient Cardiac Rehabilitation
For individuals who have been diagnosed with heart disease without a second event who receive repeat outpatient cardiac rehabilitation, the evidence includes no trials.

Intensive Cardiac Rehabilitation for Heart Disease
There is no standard definition of an intensive cardiac rehabilitation program and, thus, specific programs are reviewed individually. Three programs have been evaluated by the Centers for Medicare & Medicaid Services, and the published evidence supporting these programs is reviewed. The ideal trial design would be an RCT comparing the impact of intensive cardiac rehabilitation with standard cardiac rehabilitation on health outcomes.

ORNISH PROGRAM FOR REVERSING HEART DISEASE

Clinical Context and Therapy Purpose
The purpose of the Ornish Program for Reversing Heart Disease in patients who have been diagnosed with heart disease is to provide a treatment option that is an alternative to or an improvement on existing therapies.

The question addressed in this evidence review is: Does the use of the Ornish Program for Reversing Heart Disease in patients who have heart disease improve net health outcomes?

The following PICO was used to select literature to inform this review.

Populations
The relevant population of interest is patients with diagnosed heart disease.

Interventions
The treatment being considered is the Ornish Program for Reversing Heart Disease.

The Ornish Program for Reversing Heart Disease is an intensive cardiac rehabilitation program that focuses on exercise, diet, stress management, and support from others.

The multiple 4-hour sessions are administered by an Ornish-certified physician, cardiac therapist, or other certified health care provider.

Comparators
The comparator of interest is standard outpatient cardiac rehabilitation. Cardiac rehabilitation includes long-term programs that include medical evaluation, prescribed exercise, modification to reduce cardiac risks, education, and counseling.

Outcomes
The general outcomes of interest are OS, disease-specific survival, symptoms, and morbid events.

Once diagnosed with heart disease, a patient will require lifelong monitoring by a cardiologist.

Study Selection Criteria
Methodologically credible studies were selected using the following principles:

1. To assess efficacy outcomes, comparative controlled prospective trials were sought, with a preference for RCTs.
2. In the absence of such trials, comparative observational studies were sought, with a preference for prospective studies.
3. To assess long-term outcomes and adverse events, single-arm studies that capture longer periods of follow-up and/or larger populations were sought.
4. Studies with duplicative or overlapping populations were excluded.

REVIEW OF EVIDENCE

Randomized Controlled Trials
Ornish et al (1990) conducted an RCT, called the Lifestyle Heart Trial, comparing a version of the Ornish Program for Reversing Heart Disease with usual care. Initial results were reported in 1990, and 5-year results in 1998.[20,21,] Eligibility for the trial included diagnosed coronary artery disease, left ventricular ejection fraction greater than 25%, no myocardial infarction during the previous 6 weeks, not scheduled for CABG, and not taking lipid-lowering medication. Ninety-four eligible patients were randomized to an intervention group (n=53) or a usual care control group (n=43). Final consenting was done after randomization; 28 (53%) of patients assigned to the intervention group and 20 (43%) assigned to the control group agreed to participate in the trial.

The lifestyle intervention consisted of recommending a low-fat vegetarian diet and an individualized exercise regimen. Also, patients were taught stress management techniques and were taught to practice them at home for at least an hour a day. Also, twice-weekly group discussions were offered to provide social support. It is not clear how long patients attended these group discussions (i.e., the number of weeks or months). As reported by Ornish et al (1990), the mean percentage diameter stenosis decreased from 40% at baseline to 37.8% at 1 year in the intervention group and increased from 42.7% to 46.1% in the control group (p=.001). The frequency and duration of chest pain did not differ between groups. However, during chest pain episodes, at 1 year, the intervention group reported mean chest pain severity of 1.7 (on a 7-point scale) whereas the mean score in the control group was 2.5 (p<.001).

Twenty (71%) of 28 patients in the intervention group and 15 (75%) of 20 in the control group completed the 5-year follow-up. The intervention and control groups did not differ significantly in the number of myocardial infarction events (2 vs. 4), CABGs (2 vs. 5), or deaths (2 vs. 1). However, compared with the control group, the intervention group had significantly fewer percutaneous transluminal coronary angioplasties (8 vs. 14, p<.050) and cardiac hospitalizations (23 vs. 44, p<.001).

Section Summary: Ornish Program for Reversing Heart Disease
One RCT was identified that evaluated the Ornish Program in patients diagnosed with heart disease and compared it with usual care. This RCT, which included patients with coronary artery disease but no recent cardiac event, had mixed findings at 1 and 5 years. The trial had a small sample size for a cardiac trial (N=48), and only 35 patients were available for the 5-year follow-up. The Ornish Program is considered by the Centers for Medicare & Medicaid Services to be an intensive cardiac rehabilitation program, but the program described in this RCT might meet the criteria for standard cardiac rehabilitation. No studies were identified that compared the Ornish Program with any other cardiac rehabilitation program.

PRITIKIN PROGRAM

Clinical Context and Therapy Purpose
The purpose of the Pritikin Program in patients who have been diagnosed with heart disease is to provide a treatment option that is an alternative to or an improvement on existing therapies.

The question addressed in this evidence review is: Does the use of the Pritikin Program in patients who have heart disease improve net health outcomes?

The following PICO was used to select literature to inform this review.

Populations
The relevant population of interest is patients with diagnosed heart disease.

Interventions
The treatment being considered is the Pritikin Program.

The Pritikin Program is an intensive cardiac rehabilitation program based on effective exercise, a healthy diet, and a healthy mindset.

Comparators
The comparator of interest is standard outpatient cardiac rehabilitation. Cardiac rehabilitation includes long-term programs that include medical evaluation, prescribed exercise, modification to reduce cardiac risks, education, and counseling.

Outcomes
The general outcomes of interest are OS, disease-specific survival, symptoms, and morbid events.

Once diagnosed with heart disease, a patient will require lifelong monitoring by a cardiologist.

Study Selection Criteria
Methodologically credible studies were selected using the following principles:
1. To assess efficacy outcomes, comparative controlled prospective trials were sought, with a preference for RCTs.
2. In the absence of such trials, comparative observational studies were sought, with a preference for prospective studies.
3. To assess long-term outcomes and adverse events, single-arm studies that capture longer periods of follow-up and/or larger populations were sought.
4. Studies with duplicative or overlapping populations were excluded.

REVIEW OF EVIDENCE

Case Series
No RCTs evaluating the Pritikin Program were identified. The published evidence on this program consists of case series, and only 1 included patients with heart disease.[22,] Other case series included patients without heart failure (e.g., those with high cholesterol levels). Sixty-four patients with documented coronary artery disease attended a 26-day residential treatment program between 1976 and 1977. During the program, patients were encouraged to walk for 30 to 45 minutes twice a day, learned how to prepare foods consistent with the Pritikin diet, and attended over 60 hours of group education classes. Serum samples were taken at baseline and at the end of the program. Patients were called in March 1980 for a follow-up interview and asked to send in serum samples. At the 3- to 4-year follow-up, 12 (19%) of 64 patients had had bypass surgery, and 4 patients had died. Fifty (81%) patients provided serum samples at follow-up, and the mean cholesterol level (166 mg/dL) was significantly lower than the baseline value (220 mg/dL). The trial was limited in the lack of a control group, especially a group receiving "standard" outpatient cardiac rehabilitation, and long-term mortality outcomes were not reported.

Section Summary: Pritikin Program
No RCTs have evaluated the Pritikin Program; a single case series in patients with heart disease was identified. Conclusions cannot be drawn from this series on the impact of intensive cardiac rehabilitation with the Pritikin Program compared with standard outpatient cardiac rehabilitation.

BENSON-HENRY INSTITUTE PROGRAM

Clinical Context and Therapy Purpose

The purpose of the Benson-Henry Institute Program in patients who have been diagnosed with heart disease is to provide a treatment option that is an alternative to or an improvement on existing therapies.

The question addressed in this evidence review is: Does the use of the Benson-Henry Institute Program in patients who have heart disease improve net health outcomes?

The following PICO was used to select literature to inform this review.

Populations
The relevant population of interest is patients with diagnosed heart disease.

Interventions
The treatment being considered is the Benson-Henry Institute Program.

The Benson-Henry Institute Program is an intensive cardiac rehabilitation program based on effective exercise, a healthy diet, and a healthy mindset.

Comparators
The comparator of interest is standard outpatient cardiac rehabilitation. Cardiac rehabilitation includes long-term programs that include medical evaluation, prescribed exercise, modification to reduce cardiac risks, education, and counseling.

Outcomes
The general outcomes of interest are OS, disease-specific survival, symptoms, and morbid events.

Once diagnosed with heart disease, a patient will require lifelong monitoring by a cardiologist.

Study Selection Criteria
Methodologically credible studies were selected using the following principles:

1. To assess efficacy outcomes, comparative controlled prospective trials were sought, with a preference for RCTs.
2. In the absence of such trials, comparative observational studies were sought, with a preference for prospective studies.
3. To assess long-term outcomes and adverse events, single-arm studies that capture longer periods of follow-up and/or larger populations were sought.
4. Studies with duplicative or overlapping populations were excluded.

REVIEW OF EVIDENCE

Case-Control Studies
Zeng et al (2013) reported outcomes of a Medicare-sponsored demonstration of 2 intensive lifestyle modification programs in patients with symptomatic coronary heart disease: the Cardiac Wellness Program of the Benson-Henry Mind Body Institute and the Dr. Dean Ornish Program for Reversing Heart Disease.[23,] This analysis included 461 participants and 1,795 matched controls using Medicare claims data from 1998 to 2008. Four matched controls were sought for each participant from Medicare claims data, 2 of whom had received traditional cardiac rehabilitation within 12 months following their cardiac events (cardiac rehabilitation controls) and 2 of whom

had not (non-cardiac rehabilitation controls). Outcomes included mortality rates during the 3 post-enrollment years, total hospitalizations, hospitalizations with a cardiac-related principal discharge diagnosis, and Medicare-paid costs of care. Of the 324 participants in the Benson-Henry Mind Body Medical Institute program analysis, the authors concluded that during the active intervention and follow-up years, total, cardiac, and non-cardiac hospitalizations were lower in the Benson-Henry program participants than their controls for each comparison ($p<.001$). The investigators further reported that after year 1, the mortality rate was 1.5% in the Benson-Henry program participants compared with 2.5% and 4.2%, respectively, in cardiac rehabilitation and non-cardiac rehabilitation controls. After year 3, comparable figures were 6.2% in Benson-Henry program participants, 10.5% in cardiac rehabilitation controls, and 11.0% in non-cardiac rehabilitation controls. These mortality differences for the Benson-Henry program participants reached borderline significance ($p=0.08$).

Case Series

Casey et al (2009) reported the results of a case series that evaluated the effects of an intensive cardiac rehabilitation program, incorporating components of the Benson-Henry Institute Cardiac Wellness Program at a single center.[24,] From 1997 to 2005, 637 patients with coronary artery disease were enrolled and completed the program, which consisted of 13 weekly 3 hour sessions with supervised exercise, relaxation techniques, stress management, and behavioral interventions. The mean age of participants was 63 years (range, 27 to 92 years); men comprised 72% of the study population. Results revealed significant improvements in clinical (blood pressure, lipids, weight, exercise conditioning, frequency of symptoms of chest pain, and shortness of breath) and psychological outcomes (general severity index, depression, anxiety, and hostility) ($p<.0001$) with the program.

Section Summary: Benson-Henry Institute Program

No RCTs have evaluated the Benson-Henry Institute Program; a case-control study found the program participants to have lower total, cardiac, and non-cardiac hospitalizations during the active intervention and follow-up years as compared to controls for each comparison. Additionally, program participants had lower mortality rates compared to controls; however, the mortality differences were borderline significant at year 3. A case series also demonstrated that the implementation of components of the Benson-Henry Institute program resulted in an improvement in clinical and psychological outcomes. Conclusions cannot be drawn from these data on the impact of intensive cardiac rehabilitation with the Benson Henry Institute program compared with standard outpatient cardiac rehabilitation.

Summary of Evidence

For individuals who have been diagnosed with heart disease and receive outpatient cardiac rehabilitation, the evidence includes multiple RCTs and systematic reviews of these trials. Relevant outcomes are OS, disease-specific survival, symptoms, and morbid events. Meta-analyses of the available trials have found that cardiac rehabilitation improves health outcomes for select patients, particularly those with coronary heart disease, heart failure, and who have had cardiac surgical interventions. The available evidence has limitations, including lack of blinded outcome assessment, but for the survival-related outcomes of interest, this limitation is less critical. The evidence is sufficient to determine that the technology results in an improvement in the net health outcome.

For individuals who have been diagnosed with heart disease without a second event and receive repeat outpatient cardiac rehabilitation, the evidence includes no trials. Relevant outcomes are OS, disease-specific survival, symptoms, and morbid events. No studies were identified evaluating the effectiveness of repeat participation in a cardiac rehabilitation program. The evidence is insufficient to determine that the technology results in an improvement in the net health outcome.

For individuals who have been diagnosed with heart disease and receive intensive cardiac rehabilitation with the Ornish Program for Reversing Heart Disease, the evidence includes an RCT and uncontrolled studies. Relevant outcomes are OS, disease-specific survival, symptoms, and morbid events. No RCTs have compared the Ornish Program with a "standard" cardiac rehabilitation program; an RCT compared it with usual care. The trial included patients with coronary artery disease and no recent cardiac events and had mixed findings at 1 and 5 years. The trial had a small sample size for a cardiac trial (N=48), and only 35 patients were available for the 5-year follow-up. The Ornish Program is considered by the Centers for Medicare & Medicaid Services as an intensive cardiac rehabilitation program, but the program described in the RCT could meet criteria for standard cardiac rehabilitation. No studies were identified comparing the Ornish Program with any other cardiac rehabilitation program. The evidence is insufficient to determine that the technology results in an improvement in the net health outcome.

For individuals who have been diagnosed with heart disease and receive intensive cardiac rehabilitation with the Pritikin Program, the evidence includes a case series. Relevant outcomes are OS, disease-specific survival, symptoms, and morbid events. Studies are needed that compare the impact of intensive cardiac rehabilitation using the Pritikin Program with standard outpatient cardiac rehabilitation programs. The evidence is insufficient to determine that the technology results in an improvement in the net health outcome.

For individuals who have been diagnosed with heart disease and receive intensive cardiac rehabilitation with the Benson-Henry Institute Program, the evidence includes a case-control study and case series. Relevant outcomes are OS, disease-specific survival, symptoms, and morbid events. Studies are needed that compare the impact of intensive cardiac rehabilitation using the Benson-Henry Institute Program with standard outpatient cardiac rehabilitation programs. The evidence is insufficient to determine that the technology results in an improvement in the net health outcome.

SUPPLEMENTAL INFORMATION

The purpose of the following information is to provide reference material. Inclusion does not imply endorsement or alignment with the evidence review conclusions.

Practice Guidelines and Position Statements

Guidelines or position statements will be considered for inclusion in 'Supplemental Information' if they were issued by, or jointly by, a US professional society, an international society with US representation, or National Institute for Health and Care Excellence (NICE). Priority will be given to guidelines that are informed by a systematic review, include strength of evidence ratings, and include a description of management of conflict of interest.

American College of Cardiology Foundation

In 2013, the American College of Cardiology Foundation and the American Heart Association updated their joint guidelines on the management of heart failure.[25,] These guidelines included the following class IIA recommendation on cardiac rehabilitation (level of evidence: B): "Cardiac rehabilitation can be useful in clinically stable patients with heart failure to improve functional capacity, exercise duration, health-related quality of life, and mortality." The 2017 focused update of the guideline did not include additional information on cardiac rehabilitation.[26,]

American College of Physicians

In 2012, the American College of Physicians and 6 other cardiology associations published joint guidelines on the management of stable ischemic heart disease.[27,] The guidelines included the following statement on cardiac rehabilitation: "Medically supervised exercise programs (cardiac rehabilitation) and physician-directed, home-based programs are recommended for at-risk patients at first diagnosis." The 2014 update to the guideline did not include additional information on cardiac rehabilitation.[28,]

American Heart Association

In 2007, the American Heart Association and the American Association of Cardiovascular and Pulmonary Rehabilitation issued a consensus statement on the core components of cardiac rehabilitation programs.[2,] The core components included patient assessment before beginning the program, nutritional counseling, weight management, blood pressure management, lipid management, diabetes management, tobacco cessation, psychosocial management, physical activity counseling, and exercise training. Programs that only offered supervised exercise training were not considered cardiac rehabilitation. The guidelines specified the assessment, interventions, and expected outcomes for each of the core components. For example, symptom-limited exercise testing before exercise training was strongly recommended. The guidelines did not specify the optimal overall length of programs or the number or duration of sessions.

In 2019, the American Heart Association, with the American Association of Cardiovascular and Pulmonary Rehabilitation and the American College of Cardiology, released a scientific statement on home-based cardiac rehabilitation.[29,] They make the following suggestions for healthcare providers:

- Recommend center-based cardiac rehabilitation (CBCR) to all eligible patients.
- As an alternative, recommend home-based cardiac rehabilitation (HBCR) to clinically stable low- and moderate-risk patients who cannot attend CBCR.
- Design and test HBCR "using effective processes of care for CVD secondary prevention."
- For healthcare organizations, develop and support the following:
    - Maximization of CR referrals
    - High-quality CBCR and HBCR programs "using evidence-based standards and guidelines, strategies to maximize patient adherence both in the shorter and longer-term, and outcome tracking methods to help promote continuous quality improvement."
    - "Testing and implementation of an evidence-based hybrid approach to CR" that are optimized for each patient and that "promote long-term adherence and favorable behavior change."
- For CR professionals, "work with other healthcare professionals and policymakers to implement additional research and...expand the evidence base for HBCR."

U.S. Preventive Services Task Force Recommendations

Not applicable.

Intensive Cardiac Rehabilitation
In January 2010, Medicare added intensive cardiac rehabilitation as a benefit. Intensive cardiac rehabilitation programs must be approved by Medicare on an individual basis.[31,]

The national coverage determination described intensive cardiac rehabilitation in the following manner:

"Intensive cardiac rehabilitation (ICR) refers to a physician-supervised program that furnishes cardiac rehabilitation services more frequently and often in a more rigorous manner. As required by §1861(eee)(4)(A) of the Social Security Act (the Act), an ICR program must show, in peer-reviewed published research, that it accomplished 1 or more of the following for its patients: (1) positively affected the progression of coronary heart disease; (2) reduced the need for coronary bypass surgery; and, (3) reduced the need for percutaneous coronary interventions. The ICR program must also demonstrate through peer-reviewed published research that it accomplished a statistically significant reduction in 5 or more of the following measures for patients from their levels before cardiac rehabilitation services to after cardiac rehabilitation services: (1) low density lipoprotein; (2) triglycerides; (3) body mass index; (4) systolic blood pressure; (5) diastolic blood pressure; and, (6) the need for cholesterol, blood pressure, and diabetes medications. Individual ICR programs must be approved through the national coverage determination process to ensure that they demonstrate these accomplishments."

In 2010, the Centers for Medicare & Medicaid Services also issued 2 decision memos on specific programs. One stated that the Ornish Program for Reversing Heart Disease met the intensive cardiac rehabilitation program requirements and was included on the list of approved intensive cardiac rehabilitation programs.[32,] It provided the following description of the Ornish Program: "The Ornish Program for Reversing Heart Disease (also known as the Multisite Cardiac Lifestyle Intervention Program, Multicenter Cardiac Lifestyle Intervention Program and the Lifestyle Heart Trial program) … incorporates comprehensive lifestyle modifications including exercise, a low-fat diet, smoking cessation, stress management training, and group support sessions. Over the years, the Ornish program has been refined but continues to focus on these specific risk factors."

The other stated that the Pritikin Program met program requirements and was included on the list of approved intensive cardiac rehabilitation programs.[33,] As described in the decision memo: "The Pritikin program (also known as the Pritikin Longevity Program) evolved into a comprehensive program that is provided in a physician's office and incorporates a specific diet (10% to 15% of calories from fat, 15% to 20% from protein, 65% to 75% from complex carbohydrates), exercise and counseling lasting 21 to 26 days. An optional residential component is also available for participants."

In 2014, Centers of Medicare & Medicaid Services issued another decision memo on the Benson-Henry Institute Cardiac Wellness Program.[34,] The memo stated that "the evidence is sufficient to expand the intensive care rehabilitation benefit to include the Benson-Henry Institute Cardiac Wellness Program. The Cardiac Wellness Program is a multicomponent intervention program that includes supervised exercise, behavioral interventions, and counseling, and is designed to reduce cardiovascular risk and improve health outcomes."

Ongoing and Unpublished Clinical Trials

Some currently ongoing and unpublished trials that might influence this review are listed in Table 7.

Table 7. Summary of Key Trials

NCT No.	Trial Name	Planned Enrollment	Completion Date
Ongoing			
NCT02762825	Novel Cardiac Rehabilitation in Patients With Heart Failure and Preserved Ejection Fraction	66	Sep 2022
NCT04245813	Effectiveness of a Cardiac Rehabilitation Program in Patients With Heart Failure	144	Aug 2022
NCT03218891	Cardiac Rehabilitation in Patients With Refractory Angina	72	Mar 2023
NCT02984449	Preventive Heart Rehabilitation in Patients Undergoing Elective Open Heart Surgery to Prevent Complications and to Improve Quality of Life (Heart-ROCQ) - A Prospective Randomized Open Controlled Trial, Blinded End-point (PROBE)	350	Aug 2025
Unpublished			
NCT03385837	Activity Level and Barriers to Participate of Cardiac Rehabilitation in Advanced Heart Failure Patients	50	Dec 2018 (unknown; last updated 03/09/20)
NCT02619422	Multicenter, Prospective, Randomized, Open, Blinded for the End Point Evaluator to Compare Compliance to Secondary Prevention Measures After Acute Coronary Syndrome and Intensive Cardiac Rehabilitation Program vs. Standard Program	509	Feb 2018 (last updated 06/06/18)

NCT: national clinical trial.

CODING

The following codes for treatment and procedures applicable to this policy are included below for informational purposes. This may not be a comprehensive list of procedure codes applicable to this policy.

Inclusion or exclusion of a procedure, diagnosis or device code(s) does not constitute or imply member coverage or provider reimbursement. Please refer to the member's contract benefits in effect at the time of service to determine coverage or non-coverage of these services as it applies to an individual member.

The code(s) listed below are medically necessary ONLY if the procedure is performed according to the "Policy" section of this document.

CPT/HCPCS	
93797	Physician services for outpatient cardiac rehabilitation; without continuous ECG monitoring (per session)
93798	Physician services for outpatient cardiac rehabilitation; with continuous ECG monitoring (per session)
G0422	Intensive cardiac rehabilitation; with or without continuous ECG monitoring with exercise, per session
G0423	Intensive cardiac rehabilitation; with or without continuous ECG monitoring; without exercise, per session

ICD-10 DIAGNOSES	
I20.8-I20.9	Angina pectoris, other/unspecified code range
I21.01-I21.4	ST elevation (STEMI) and non-ST elevation (NSTEMI) myocardial infarction code range
I22.0	Subsequent ST elevation (STEMI) myocardial infarction of anterior wall
I22.1	Subsequent ST elevation (STEMI) myocardial infarction of inferior wall
I22.2	Subsequent non-ST elevation (NSTEMI) myocardial infarction
I22.8	Subsequent ST elevation (STEMI) myocardial infarction of other sites
I22.9	Subsequent ST elevation (STEMI) myocardial infarction of unspecified site
I25.110	Atherosclerotic heart disease of native coronary artery with unstable angina pectoris
I25.111	Atherosclerotic heart disease of native coronary artery with angina pectoris with documented spasm
I25.118	Atherosclerotic heart disease of native coronary artery with other forms of angina pectoris
I25.119	Atherosclerotic heart disease of native coronary artery with unspecified angina pectoris
I25.2	Old myocardial infarction
I25.700	Atherosclerosis of coronary artery bypass graft(s), unspecified, with unstable angina pectoris
I25.701	Atherosclerosis of coronary artery bypass graft(s), unspecified, with angina pectoris with documented spasm

ICD-10 DIAGNOSES	
I25.708	Atherosclerosis of coronary artery bypass graft(s), unspecified, with other forms of angina pectoris
I25.709	Atherosclerosis of coronary artery bypass graft(s), unspecified, with unspecified angina pectoris
I25.710	Atherosclerosis of autologous vein coronary artery bypass graft(s) with unstable angina pectoris
I25.711	Atherosclerosis of autologous vein coronary artery bypass graft(s) with angina pectoris with documented spasm
I25.718	Atherosclerosis of autologous vein coronary artery bypass graft(s) with other forms of angina pectoris
I25.719	Atherosclerosis of autologous vein coronary artery bypass graft(s) with unspecified angina pectoris
I25.720	Atherosclerosis of autologous artery coronary artery bypass graft(s) with unstable angina pectoris
I25.721	Atherosclerosis of autologous artery coronary artery bypass graft(s) with angina pectoris with documented spasm
I25.728	Atherosclerosis of autologous artery coronary artery bypass graft(s) with other forms of angina pectoris
I25.729	Atherosclerosis of autologous artery coronary artery bypass graft(s) with unspecified angina pectoris
I25.730	Atherosclerosis of nonautologous biological coronary artery bypass graft(s) with unstable angina pectoris
I25.731	Atherosclerosis of nonautologous biological coronary artery bypass graft(s) with angina pectoris with documented spasm
I25.738	Atherosclerosis of nonautologous biological coronary artery bypass graft(s) with other forms of angina pectoris
I25.739	Atherosclerosis of nonautologous biological coronary artery bypass graft(s) with unspecified angina pectoris
I25.750	Atherosclerosis of native coronary artery of transplanted heart with unstable angina
I25.751	Atherosclerosis of native coronary artery of transplanted heart with angina pectoris with documented spasm
I25.758	Atherosclerosis of native coronary artery of transplanted heart with other forms of angina pectoris
I25.759	Atherosclerosis of native coronary artery of transplanted heart with unspecified angina pectoris
I25.760	Atherosclerosis of bypass graft of coronary artery of transplanted heart with unstable angina
I25.761	Atherosclerosis of bypass graft of coronary artery of transplanted heart with angina pectoris with documented spasm
I25.768	Atherosclerosis of bypass graft of coronary artery of transplanted heart with other forms of angina pectoris
I25.769	Atherosclerosis of bypass graft of coronary artery of transplanted heart with unspecified angina pectoris
I25.790	Atherosclerosis of other coronary artery bypass graft(s) with unstable angina pectoris

ICD-10 DIAGNOSES	
I25.791	Atherosclerosis of other coronary artery bypass graft(s) with angina pectoris with documented spasm
I25.798	Atherosclerosis of other coronary artery bypass graft(s) with other forms of angina pectoris
I25.799	Atherosclerosis of other coronary artery bypass graft(s) with unspecified angina pectoris
I50.1-I50.9	Heart Failure code range
Z94.1	Heart transplant status
Z94.3	Heart and lungs transplant status
Z95.1	Presence of aortocoronary bypass graft
Z95.2-Z95.4	Presence of heart valve code range
Z95.5	Presence of coronary angioplasty implant and graft
Z98.61	Coronary angioplasty status

REVISIONS	
08-17-2010	Policy added to the bcbsks.com web site.
09-24-2012	Description section updated.
	In the Policy section: ▪ In Item E, added "It is preferable that programs start within 90 days of the cardiac event and be completed within 6 months of the cardiac event."
	Rationale section updated.
	Reference section updated.
12-11-2013	Added Medical Policy and Coding Disclaimers.
	Updated Description section.
	In Policy section: ▪ In Item A, added #7, "Compensated heart failure".
	Updated Rationale section.
	In Coding section: ▪ Added ICD-10 Diagnosis codes *(Effective October 1, 2014)*
	Updated Reference section.
07-15-2014	Description section updated
	In Policy section: ▪ Added to A 7 "(Stable congestive heart failure with left ventricular ejection fraction of 35% or less and New York Heart Association (NYHA) class II to IV symptoms despite being on optimal heart failure therapy for at least 6 weeks)" to define compensated heart failure.
	Revision section updated
	References updated
09-23-2015	Title of policy changed from "Cardiac Rehabilitation Programs"
	Updated Description section.
	In Policy section: ▪ In Item A, removed "items and services" and "who have experienced one or more" and added "outpatient", "programs," "with a history", and "conditions and procedures", to read "Outpatient cardiac rehabilitation programs are considered medically necessary for patients with a history of the following conditions and procedures:" ▪ In Item A 1, added "(MI) (heart attack)", to read "An acute myocardial infarction (MI) (heart attack) within the preceding 12 months; OR"

REVISIONS	
	▪ In Item A 2, added "graft (CABG)", to read "A coronary artery bypass graft (CABG) surgery; OR ▪ In Item A 4, added "surgery" and removed "repair or replacement", to read "Heart valve surgery; OR" ▪ In Item A 6, added "OR", to read "A heart or heart-lung transplant; OR" ▪ In Item A 7, removed "(Stable congestive heart failure with left ventricular ejection fraction of 35% or less and New York Heart Association (NYHA) class II to IV symptoms despite being on optimal heart failure therapy for at least 6 weeks)" ▪ In Item B 2, removed ", including education, counseling, and behavioral intervention at least once during the program, tailored to patients' individual needs", to read "Cardiac risk modification" ▪ In Item B 5, removed "for each patient", to read "An individualized treatment plan detailing how components are utilized."
	Updated Rationale section.
	In Coding section: ▪ Removed bullet stating "A single initial visit with the physician for referral to a program may be allowed under CPT code 99215."
	Updated References section.
11-24-2015	In Coding section: ▪ Removed ICD-10 code I20.0.
	Updated References section.
05-11-2016	Updated Description section.
	In Policy section: ▪ Previous Policy Items B, C, D, E, and F were moved to Policy Guidelines section. ▪ In Policy Guidelines, added "each of the above" to Item 1 (previous Policy Item B) to read "An individualized treatment plan detailing how each of the above components are utilized."
	Updated Rationale section.
	Updated References section.
08-18-2017	Updated Description section.
	In Policy section: ▪ Added new Item C, "Intensive cardiac rehabilitation with the Ornish Program for Reversing Heart Disease or Pritikin Program is considered experimental / investigational." ▪ In Policy Guidelines, removed "Note: This policy does not address programs considered to be "intensive cardiac rehabilitation programs," such as the Dean Ornish Program for Reversing Heart Disease and the Pritikin Program."
	Updated Rationale section.
	In Coding section: ▪ Added HCPCS codes: G0422, G0423.
	Updated References section.
10-01-2017	In Coding section: ▪ Added ICD-10 codes: I21.A1, I50.810, I50.811, I50.812, I50.813, I50.814, I50.82, I50.83, I50.84.
04-11-2018	Updated Description section.
	Updated Rationale section.
	In Coding section: ▪ Removed ICD-9 codes.
	Updated References section.
04-24-2019	Updated Description section.
	Updated Rationale section.

REVISIONS	
	Updated References section.
03-23-2021	Updated Description section.
	Updated Rationale section.
	Updated References section.
06-03-2022	Updated Description Section
	Updated Policy Section ▪ Added "or Benson-Henry Institute Program" to the statement "Intensive cardiac rehabilitation with the Ornish Program for Reversing Heart Disease or Pritikin Program is considered experimental / investigational."
	Updated Policy Guideline Section ▪ Duration of the Program: changed wording to read "A cardiac rehabilitation exercise program is eligible for coverage for 3 sessions per week up to a 12-week period (36 sessions). Programs should start within 90 days of the cardiac event and be completed within 6 months of the cardiac event."
	Updated Rationale Section
	Updated Coding Section ▪ Converted ICD-10 codes to ranges ▪ Added ICD-10 codes Z94.1, Z94.3, Z95.1, Z95.2, Z95.4, Z95.5, Z98.61
	Updated References Section
11-9-2022	Updated Policy Guideline Section ▪ Duration of the Program: Removed: "Programs should start within 90 days of the cardiac event and be completed within 6 months of the cardiac event." from criteria

REFERENCES

1. Virani SS, Alonso A, Benjamin EJ, et al. Heart Disease and Stroke Statistics-2020 Update: A Report From the American Heart Association. Circulation. Mar 03 2020; 141(9): e139-e596. PMID 31992061
2. Balady GJ, Williams MA, Ades PA, et al. Core components of cardiac rehabilitation/secondary prevention programs: 2007 update: a scientific statement from the American Heart Association Exercise, Cardiac Rehabilitation, and Prevention Committee, the Council on Clinical Cardiology; the Councils on Cardiovascular Nursing, Epidemiology and Prevention, and Nutrition, Physical Activity, and Metabolism; and the American Association of Cardiovascular and Pulmonary Rehabilitation. Circulation. May 22 2007; 115(20): 2675-82. PMID 17513578
3. Corra U, Piepoli MF, Carre F, et al. Secondary prevention through cardiac rehabilitation: physical activity counselling and exercise training: key components of the position paper from the Cardiac Rehabilitation Section of the European Association of Cardiovascular Prevention and Rehabilitation. Eur Heart J. Aug 2010; 31(16): 1967-74. PMID 20643803
4. Leon AS, Franklin BA, Costa F, et al. Cardiac rehabilitation and secondary prevention of coronary heart disease: an American Heart Association scientific statement from the Council on Clinical Cardiology (Subcommittee on Exercise, Cardiac Rehabilitation, and Prevention) and the Council on Nutrition, Physical Activity, and Metabolism (Subcommittee on Physical Activity), in collaboration with the American association of Cardiovascular and Pulmonary Rehabilitation. Circulation. Jan 25 2005; 111(3): 369-76. PMID 15668354
5. Lindenfeld J, Albert NM, Boehmer JP, et al. HFSA 2010 Comprehensive Heart Failure Practice Guideline. J Card Fail. Jun 2010; 16(6): e1-194. PMID 20610207

6. Oldridge N. Exercise-based cardiac rehabilitation in patients with coronary heart disease: meta-analysis outcomes revisited. Future Cardiol. Sep 2012; 8(5): 729-51. PMID 23013125
7. Anderson L, Thompson DR, Oldridge N, et al. Exercise-based cardiac rehabilitation for coronary heart disease. Cochrane Database Syst Rev. Jan 05 2016; (1): CD001800. PMID 26730878
8. Davies EJ, Moxham T, Rees K, et al. Exercise based rehabilitation for heart failure. Cochrane Database Syst Rev. Apr 14 2010; (4): CD003331. PMID 20393935
9. Heran BS, Chen JM, Ebrahim S, et al. Exercise-based cardiac rehabilitation for coronary heart disease. Cochrane Database Syst Rev. Jul 06 2011; (7): CD001800. PMID 21735386
10. Long L, Mordi IR, Bridges C, et al. Exercise-based cardiac rehabilitation for adults with heart failure. Cochrane Database Syst Rev. Jan 29 2019; 1: CD003331. PMID 30695817
11. West RR, Jones DA, Henderson AH. Rehabilitation after myocardial infarction trial (RAMIT): multi-centre randomized controlled trial of comprehensive cardiac rehabilitation in patients following acute myocardial infarction. Heart. Apr 2012; 98(8): 637-44. PMID 22194152
12. Doherty P, Lewin R. The RAMIT trial, a pragmatic RCT of cardiac rehabilitation versus usual care: what does it tell us?. Heart. Apr 2012; 98(8): 605-6. PMID 22505460
13. Pandey A, Kitzman DW, Brubaker P, et al. Response to Endurance Exercise Training in Older Adults with Heart Failure with Preserved or Reduced Ejection Fraction. J Am Geriatr Soc. Aug 2017; 65(8): 1698-1704. PMID 28338229
14. Kitzman DW, Brubaker PH, Morgan TM, et al. Exercise training in older patients with heart failure and preserved ejection fraction: a randomized, controlled, single-blind trial. Circ Heart Fail. Nov 2010; 3(6): 659-67. PMID 20852060
15. Opotowsky AR, Rhodes J, Landzberg MJ, et al. A Randomized Trial Comparing Cardiac Rehabilitation to Standard of Care for Adults With Congenital Heart Disease. World J Pediatr Congenit Heart Surg. Mar 2018; 9(2): 185-193. PMID 29544423
16. Snoek JA, Prescott EI, van der Velde AE, et al. 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. JAMA Cardiol. Apr 01 2021; 6(4): 463-468. PMID 33112363
17. Sumner J, Harrison A, Doherty P. The effectiveness of modern cardiac rehabilitation: A systematic review of recent observational studies in non-attenders versus attenders. PLoS One. 2017; 12(5): e0177658. PMID 28498869
18. Nilsson BB, Lunde P, Grogaard HK, et al. Long-Term Results of High-Intensity Exercise-Based Cardiac Rehabilitation in Revascularized Patients for Symptomatic Coronary Artery Disease. Am J Cardiol. Jan 01 2018; 121(1): 21-26. PMID 29096886
19. Jafri SH, Imran TF, Medbury E, et al. Cardiovascular Outcomes of Patients Referred to Home Based Cardiac Rehabilitation. Heart Lung. Nov 18 2021; 52: 1-7. PMID 34801771
20. Ornish D, Brown SE, Scherwitz LW, et al. Can lifestyle changes reverse coronary heart disease? The Lifestyle Heart Trial. Lancet. Jul 21 1990; 336(8708): 129-33. PMID 1973470
21. Ornish D, Scherwitz LW, Billings JH, et al. Intensive lifestyle changes for reversal of coronary heart disease. JAMA. Dec 16 1998; 280(23): 2001-7. PMID 9863851
22. Barnard RJ, Guzy PM, Rosenberg JM, et al. Effects of an intensive exercise and nutrition program on patients with coronary artery disease: five-year follow-up. J Cardiac Rehabil 1983;3:183-190.

23. Zeng W, Stason WB, Fournier S, et al. Benefits and costs of intensive lifestyle modification programs for symptomatic coronary disease in Medicare beneficiaries. Am Heart J. May 2013; 165(5): 785-92. PMID 23622916
24. Casey A, Chang BH, Huddleston J, et al. A model for integrating a mind/body approach to cardiac rehabilitation: outcomes and correlators. J Cardiopulm Rehabil Prev. Jul-Aug 2009; 29(4): 230-8; quiz 239-40. PMID 19451830
25. Yancy CW, Jessup M, Bozkurt B, et al. 2013 ACCF/AHA guideline for the management of heart failure: executive summary: a report of the American College of Cardiology Foundation/American Heart Association Task Force on practice guidelines. Circulation. Oct 15 2013; 128(16): 1810-52. PMID 23741057
26. Yancy CW, Jessup M, Bozkurt B, et al. 2017 ACC/AHA/HFSA Focused Update of the 2013 ACCF/AHA Guideline for the Management of Heart Failure: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines and the Heart Failure Society of America. Circulation. Aug 08 2017; 136(6): e137-e161. PMID 28455343
27. Qaseem A, Fihn SD, Dallas P, et al. Management of stable ischemic heart disease: summary of a clinical practice guideline from the American College of Physicians/American College of Cardiology Foundation/American Heart Association/American Association for Thoracic Surgery/Preventive Cardiovascular Nurses Association/Society of Thoracic Surgeons. Ann Intern Med. Nov 20 2012; 157(10): 735-43. PMID 23165665
28. Lanza GA, Grea F. Stable Ischemic Heart Disease: The Update to the 2012 Guideline. https://www.acc.org/latest-in-cardiology/articles/2015/01/30/12/26/stable-ischemic-heart-disease-the-update-to-the-2012-guideline. Accessed February 4, 2022.
29. Thomas RJ, Beatty AL, Beckie TM, et al. Home-Based Cardiac Rehabilitation: A Scientific Statement From the American Association of Cardiovascular and Pulmonary Rehabilitation, the American Heart Association, and the American College of Cardiology. J Am Coll Cardiol. Jul 09 2019; 74(1): 133-153. PMID 31097258
30. Centers for Medicare % Medicaid Services (CMS). National Coverage Determination (NCD) for Intensive Cardiac Rehabilitation Programs (20.31). 2010; http://www.cms.gov/medicare-coverage-database/details/ncd-details.aspx?NCDId=339&ncdver=1&CoverageSelection=National&KeyWord=intensive+cardiac&KeyWordLook Up=Title&KeyWordSearchType=And&clickon=search&bc=gAAAABAAAAAA&. Accessed February 4, 2022.
31. Centers for Medicare & Medicaid Services (CMS). CMS Manual System: Pub 100-03 Medicare National Coverage Determinations. Cardiac Rehabilitation Programs for Chronic Heart Failure. 2014; https://www.cms.gov/medicare-coverage-database/details/ncd-details.aspx?NCDId=359&ncdVer=1. Accessed February 4, 2022.
32. Centers for Medicare & Medicaid Services (CMS). Decision Memo for Intensive Cardiac Rehabilitation (ICR) Program - Dr. Ornish's Program for Reversing Heart Disease (CAG-00419N). 2010; https://www.cms.gov/medicare-coverage-database/details/nca-decision-memo.aspx?NCAId=240&NCDId=339&ncdver=1&CoverageSelection=National&KeyWord=intensive+cardiac&K eyWordLookUp=Title&KeyWordSearchType=And&clickon=search&IsPopup=y&bc=AAAAAAAACAAAAA%3d%3 d&. Accessed February 4, 2022.
33. Centers for Medicare & Medicaid Services (CMS). Decision Memo for Intensive Cardiac Rehabilitation (ICR) Program - Pritikin Program (CAG-00418N). 2010; https://www.cms.gov/medicare-coverage- database/details/nca-decision-

memo.aspx?NCAId=239&NCDId=339&ncdver=1&CoverageSelection=National&KeyWord=intensive+cardiac&KeyWordLookUp=Title&KeyWordSearchType=And&clickon=search&IsPopup=y&bc=AAAAAAAACAAAAA%3d%3 d&. Accessed February 4, 2022.

34. Centers for Medicare and Medicaid Services. Decision memo for intensive cardiac rehabilitation (ICR) program - Benson-Henry Institute Cardiac Wellness Program (CAG-00434N). May 6, 2014. https://www.cms.gov/medicare-coverage-database/details/nca-decision-memo.aspx?NCAId=271. Accessed February 4, 2022.

OTHER REFERENCES

1. Blue Cross and Blue Shield of Kansas Cardiology Liaison Committee, April 2010; May 2014; May 2015; July 2016; May 2018, July 2022.