PEDIATRIC CARDIAC REHABILITATION

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BACKGROUND

CLINICAL BACKGROUND

Pediatric cardiac rehabilitation is aimed to improve a child's functional capacity, improve quality of life, increase lean mass relative to fat mass, increase overall physical activity, educate a family to adopt a healthy lifestyle, and ultimately decrease risk of future cardiovascular disease. Cardiac rehabilitation typically is composed of three separate components, including aerobic training, resistance training, and flexibility training.

POLICY AND CRITERIA

For Medicare Members

Source	Policy
CMS Coverage Manuals	None
National Coverage Determinations (NCD)	NCD 20.10.1 "Cardiac Rehabilitation Programs for Chronic Heart Failure"
Local Coverage Determinations (LCD)	None
Local Coverage Article	None
Kaiser Permanente Medical Policy	For Medicare lines of business, apply the criteria in the NCD to determine medical necessity.

For non-Medicare Members

Pediatric cardiac rehabilitation may be medically indicated for patients aged 8 to 17 years when ONE of the following are true:

1. Patient has at least one of the following diagnoses:
    a. Cardiomyopathy; OR
    b. Single ventricle; OR
    c. Coronary artery anomalies

    OR

2. Patient is status post valve repair or replacement

Pediatric cardiac rehabilitation is not considered to be medically indicated for pulmonary hypertension, atrial septal defect, or ventricular septal defect.

For patients meeting criteria for pediatric cardiac rehabilitation, treatment is limited to 15 visits over 6 months, to include initial consult (with cardiopulmonary exercise testing and 6-minute walk tests). Twelve weekly visits may also be authorized.

RATIONALE

EVIDENCE BASIS

Wittekind (2018) reported outcomes among 8 young patients with nonischemic dilated cardiomyopathy who underwent cardiac rehabilitation. Patients ranged in age from 10 years to 31 years, and half of patients were male. Average BMI was 38.2 kg/m2 at baseline, with a mean waist circumference of 46.8 inches. Of the 8 subjects included in this study, 3 were under age 18 (a 10-year old boy, a 14-year old boy, and a 17-year old girl). Subjects attended two 45-minute sessions per week for up to 16 weeks. Authors reported that patients attended, on average, 85% of possible sessions. Overall, there were no statistically significant differences in mean left ventricular ejection fraction or in body mass index. However, waist circumference was significantly decreased by approximately 1.4 inches at one-year follow-up, and 6-minute walk distance increased by roughly 111 meters. Findings from this study are limited by the extremely small sample size, and the failure to control for medications used.

Rhodes (2005) reported on 19 children with serious congenital heart disease who were referred for cardiac rehabilitation. Of the patients who completed the study (n=16), 11 were Fontan patients and 5 had other congenital heart disease. Patients were only eligible if they were between ages 8 and 17 years, had nontrivial congenital heart disease of severity sufficient to have activity restriction, had undergone at least 1 surgical or interventional procedure and/or had significant residual hemodynamic defect, have abnormal exercise function (peak VO_2 less than 80%) measured within the prior 6 months, and a commitment to attend and participate in rehabilitation. The treatment program consisted of 1-hour sessions twice weekly for 12 weeks. On average, patients attended 18 of 24 sessions. Authors reported that 15 of 16 patients had statistically significant improvements in at least one measure. On average, peak VO_2 increased from 26.4 to 30.7 mL/kg, and peak work rate increased from 93 to 106 W. There were no statistically significant changes in body mass index, resting oxygen saturation, FEV1/FVC, or blood pressure. No adverse events were reported, and authors concluded that the study was inadequately powered to identify adverse events due to small sample size.

While findings from the initial Rhodes study support use of cardiac rehabilitation in this highly selected population, the duration of treatment effect remains unclear. The same authors published a follow-up study of the same population, reporting outcomes on average 7 months after completion of the rehabilitation program (Rhodes 2006). In that analysis, authors reported that exercise function did not significantly decrease from completion of the program to follow-up and remained significantly elevated relative to baseline. Authors also reported improved quality of life measures, such as self-esteem, behavior, and emotional state. A group of 18 control subjects with similar diagnoses who had not undergone cardiac rehabilitation were found to have no statistically significant changes in exercise function over the same period.

Dulfer (2014) evaluated the effects of an exercise program in terms of health-related quality of life among children and adolescents with congenital heart disease. Patients included those who had undergone surgical repair for tetralogy of Fallot or those with a Fontan circulation for single-ventricle defects. Authors randomized subjects to a control group or to a cardiac rehabilitation program consisting of 3 weekly visits for 12 weeks. Authors reported that the younger patients (aged 10-15) had significantly improved cognitive functioning (self-reported) and social functioning (parent-reported). Subjects who were older (16 to 25 years) had no significant changes in health-related quality of life.

Kroll (2021) examined the impacts of a multidisciplinary cardiac rehabilitation program on exercise capacity, patient functioning (social, emotional, school, psychological), and quality of life in 25 patients with CHD between the ages of 7 and 24 years old. The program was a home-based year-long program based out of a children’s hospital that included 4 in-person visits with multiple providers (e.g., cardiologist, physical therapist, occupational therapist, psychologist, registered nutritionist) every 3 to 6 months. Participants were provided an activity monitor and personalized physical activity prescription and had the option of being paired with a mentor who would contact them between in-person visits to assess progress with the physical activity recommendations. Between baseline and the final session, a significant improvement in exercise capacity was observed. Parents of participants reported improvements in the patients' emotional, social, school, psychosocial, cognitive functioning, communication, and overall QoL, whereas patients did not report improvements in these areas. Patients reported improvements in perceived cardiac-related QoL and self-concept.

Ferrer-Sargues (2021) reported on the effect of a cardiopulmonary rehabilitation program on peripheral musculature function of 15 children (ages 12-16 years) with CHD. The intervention consisted of twice weekly exercise sessions of 70 minutes each, including both endurance and resistance training components, for a total of 24 sessions. Peripheral muscle function was measured at baseline, upon completion of the 24 sessions, and 6 months after program completion via hand grip strength, biceps brachii strength, quadriceps femoris strength, and single heel-rise tests. Improvements in peripheral muscle function were observed across all measures of strength from baseline and were maintained at 6 months post-intervention. Findings from this study are limited by the small sample size, lack of comparison group, and lack of data collection about physical activity during the 6-month follow-up period.

Balfour (1991) reported on 16 patients who participated in a pediatric/young adult cardiac rehabilitation program. Less than half of patients completed the program (7 of 16), and outcome data were only available for 6 patients. The treatment program included 3 supervised sessions of 30-40 minutes each week for 3-6 months. Diagnoses among the patients included: dilated cardiomyopathy, aortic stenosis, tetralogy of Fallot, idiopathic hypertrophic subaortic stenosis, aortic valve replacement, ventricular septal defect, mitral valve prolapse, Fontan circulation, premature ventricular contractions, and pulmonary stenosis. Overall, there were statistically significant decreases in resting blood pressure, as well as significant increases in peak oxygen consumption and exercise treadmill time. The study was limited by very small sample size and high loss to follow-up.

EXPLANATION AND RATIONALE

There is very low strength of evidence that pediatric cardiac rehabilitation may yield short-term improvements in VO_2 among patients with severe congenital heart disease. There is insufficient evidence to determine whether cardiac rehabilitation is effective among other pediatric populations. Additionally, there is insufficient evidence regarding long-term outcomes following pediatric cardiac rehabilitation, as the longest follow-up was roughly nine months after program completion. However, Northwest Permanente clinical expert consensus supports pediatric cardiac rehabilitation as being valuable for select populations despite the limited evidence base.

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