Can a Virtual Exercise Program Improve Outcomes for Teens Living with Heart Transplants?

Health Equity

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Every year more than 400 children in the U.S. get a heart transplant.

While science has advanced to the point that most of these children will have a positive outcome and go on to lead a full life, children living with a heart transplant have complex and urgent health needs. Furthermore, youth from disadvantaged backgrounds are at increased risk for poor outcomes after their heart transplant.

Heart transplant survivors have increased cardiovascular risk profiles, even as children. They are more likely to experience elevated cholesterol levels, high blood pressure, obesity and diabetes. These comorbidities increase the risk of coronary allograft vasculopathy which is when the blood vessels supplying blood to the heart muscle become narrowed and eventually blocked, and is a major reason that transplanted hearts only last around 20 years.

But it's not all bad news.

Interventions to promote physical activity can positively influence heart transplant survivors' cardiovascular risk profiles, are often low-cost, and could serve a broader population of youth with cardiovascular disease. And we know that by modifying some of these risk factors, such as LDL cholesterol and hypertension, we can positively impact long-term mortality.

Given that studies show that pediatric heart transplant patients have substantially decreased activity levels, with most barely exceeding 10% of the recommended amount of moderate to vigorous physical activity, this could be a critical opportunity to improve care.

As a pediatric cardiologist, I see the benefits of exercise not just on a patient's cardiovascular health, but also their emotional well-being and body mass composition. That's why increasing moderate to vigorous physical activity in children after a heart transplant should be a major goal of post-transplant care.

Unfortunately, pediatric cardiac rehabilitation programs are limited and distance to rehabilitation centers may be a barrier to receiving services. Research has also shown that youth from racial minority backgrounds and with lower socioeconomic status may get less exercise and have increased sedentary behaviors, more unhealthy eating patterns, and higher rates of obesity, underscoring the presence of additional barriers to post-transplant physical health for some of our most vulnerable patients.

Can a virtual exercise program lead to more equitable care?

To better support outcomes for all adolescent heart transplant recipients, my team and I hypothesized that using a virtual platform would increase accessibility to cardiac rehabilitation and lead to more equitable care. We also hoped that using a group exercise model would incorporate a social incentive and increase the efficiency of the intervention.

We are currently piloting the Motivational Interaction Group Heart Transplant Exercise and Education (MIGHTEE) program, in which we are studying the feasibility and impact of a 16-week group aerobic training program, delivered remotely via video conferencing, on physical activity and psychological well-being in adolescents after a heart transplant.

Participants are given a wearable activity monitor and meet with a transplant psychologist to discuss barriers and motivations to exercise and create an exercise-related goal. After we collect baseline physical activity data and measures of quality of life, participants meet with a cardiac exercise physiologist with experience and training in the care of children with heart disease, who reviews appropriate aerobic training exercises that maintain patients' heart rates within their target ranges.

In groups of 4-6, participants are assigned a 30-minute timeframe to meet virtually after school 3 times per week. An exercise physiologist attends these sessions to interact with, encourage, and instruct participants while they complete their assigned aerobic exercises, all of which can be performed at home and with minimal equipment. Once a month, each participant meets virtually with a study psychologist to review progress and perform motivational interviewing.

Over 18 months, we enrolled 21 participants. Of the teens who have completed the intervention, exercise capacity and quality of life scores increased, suggesting that this format may be an effective way to promote physical activity and in turn, improve cardiovascular and mental health.

In post-intervention interviews, participants shared that the virtual format made participation easier. They also shared how important the team aspect of the intervention was to them, emphasizing that the opportunity to encourage other children living with a heart transplant was an important motivator.

Notably, we also learned that competing responsibilities, such as school work, after-school jobs and religious responsibilities, were the largest barriers to participating in the program.

Our initial results from MIGHTEE are promising.

We have identified how collaborative methods, wearable technology and virtual platforms can be used to improve the care of pediatric heart transplant recipients. Changing behavior and positively affecting emotional well-being is notoriously challenging, and so finding that our intervention has increased both exercise performance and health-related quality of life is incredibly encouraging.

As we build on this study, we plan to trial the use of asynchronous classes and pilot a similar program in a larger multi-center cohort. We also aim to measure how positively influencing activity levels and mental health in these children impacts other measures of cardiovascular health, like blood pressure, lipid levels and obesity.

Ultimately, we hope that the methodology developed in this program can be applied and adapted to support a wide range of children and improve the cardiovascular and emotional health of those with and without cardiorespiratory disease.