

**A Community-Based Health Promotion Program for Older Adults with
Coronary Artery Disease**

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Statement of Need

Coronary artery disease is defined by the American Heart Association as build-up of plaque in the coronary arteries, leading to ischemia, increasing the risk of heart attack.¹ In chronic CAD, narrowing of the coronary arteries happens over time due to risk factors such as cholesterol levels, hypertension, diabetes, smoking, obesity, and family history.¹ The AHA states that living a healthy lifestyle can play a preventative role in decreasing CAD risk.¹ Additionally, cardiovascular disease is the leading cause of mortality in the United States, and CAD is the most common type of heart disease in the US, affecting 18.2 million adults (or 6.7%) in the U.S.²

Most people who are eligible do not receive cardiac rehabilitation services, despite the benefits on improved health outcomes. Lack of utilization of cardiac rehabilitation services is likely due to varying costs of rehab that may not be covered by health insurance as well as suboptimal enrollment and completion into rehab programs especially among women and older adults.³ Only 30% of eligible patients participate in cardiac rehab services, including 16.3% of patients with Medicare and even lower percentages since the COVID-19 pandemic, which caused many cardiac programs to shut down.⁴

A health promotion program lead by a physical therapist would present many benefits to individuals with CAD including overall improved health outcomes, increased access to cardiac rehab services for underserved populations, and decreased healthcare costs due to reductions in readmissions. A physical therapy led health promotion program would include exercise as a key factor to reduce CAD risks. Exercise training is shown to have direct benefits on heart and coronary vasculature,

oxygen demand, function, and coagulation/clotting factors, improving cardiac health in patients with CVD.³ Reductions in mortality may also occur through exercise by improving risk factors. One systematic review showed reductions in total mortality, readmissions, improved quality of life after 12 month follow up through exercise-based cardiac rehab.³

In addition to exercise-based intervention, a health promotion program for CAD must include a multifactorial approach to promote of lifestyle changes in individuals with CAD. Modifiable behaviors that contribute to increased risk factors in this population include smoking, eating an unhealthy/high fat diet, low physical activity levels, and excess alcohol consumption.² These behavior habits can lead to hypertension, diabetes, and increased cholesterol levels which contribute to risk of plaque buildup in the heart. Health determinants such as increased risk for CAD occur at multiple levels of the socioecological model. An individual's health is affected by many upstream determinants of health related to their communities.⁵ For example, at the individual level, ones health determinants for CAD risk are impacted by lack of knowledge, lack of time, psychological stress, and physical limitations reducing ability to perform physical activity. At the interpersonal level, determinants for CAD may include living with family members who smoke, lack of social/family support to help cope with psychological stress, land ack of access to education and healthy food options. At the population level, poor socioeconomic status put individuals at risk for choosing unhealthy food options, locations in which individuals live may be in food deserts that determine their diet, or lack of access to exercise facilities or safe recreational areas to exercise.

Interventions in a health promotional program should occur at multiple levels of the SEM in order to be more effective in changing health behavior that is lasting and effective.⁵

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Background

A community-based health promotion program including exercise training and education would lead to several overall improvements in health outcomes such as reductions in mortality, improved exercise tolerance, improved CAD risk, and improved mobility in older adults with coronary artery disease.¹ This program will consist of resistance training combined with aerobic training as well as education on smoking cessation and a heart healthy diet. Aerobic capacity measured by VO₂peak is the best predictor of all-cause mortality in patients with CVD.² The combination of aerobic

training and resistance training in this population in the form of an exercise program increased aerobic capacity by 19% and muscle strength by 22%, which were both associated with decreases in mortality for these patients.² The exercise programs included in this systematic review varied in intensity and duration as well as included studies with both older adults and middle aged adults with CAD. The intensity of aerobic exercise ranged from moderate intensity, or 60-70% HRmax, to high intensity, or 85% HRmax, while the intensity of strength exercise ranged from low to high intensity, or 20%-80% of 1RM, however no significant differences were detected between the effect of the different intensities.² All studies progressively increased intensity and duration of session over the course of the exercise program.² In a community based program, intensities should begin at a tolerable level for the patient and progressively increase throughout the program. Participants who exercised for >40 minute sessions showed slightly greater increases in VO₂peak measurements.² For resistance training, participants who performed >40 sets and >500 repetitions per week increased slightly more strength gains than those who did not.²

In an RCT conducted in older adults with CAD, a moderate intensity exercise program consisting of 50 minutes of aerobic training on the cycle ergometer, 30 minutes of resistance training using low weight and high repetitions, and 30 minutes of balance training were tested for their effect on functional outcome measures and aerobic capacity.³ The combination of aerobic, strength, and balance training significantly improved exercise capacity, measured by VO₂peak, and functional mobility, measured by the 6MWT and the TUG, in patients with CAD.³ It is clear in the literature that an exercise program aimed at this population should include aerobic training for at least

40-50 minutes and general strength training at high amounts of sets and repetitions both at progressively increasing intensities in order to increase aerobic endurance, therefore decreasing risk of mortality in older adults with CAD.

In a community-based program, it would be most feasible to utilize the 6MWT, the TUG, and the grip strength test as outcome measures for functional mobility, strength, and aerobic capacity changes in this population. The 6MWT is a reliable and valid measure for functional mobility in the older adult population.⁴ However, Chen et al.³ found the 6MWT to correlate with METs for aerobic capacity, but not at a significant amount, whereas the TUG did correlate at a significant level with METs. The grip strength test also is a reliable and valid measure for overall strength measurement in older adults.⁵ Chen et al. suggests that the combined measure of TUG, 6MWT, and grip strength may be a better measure of aerobic capacity and functional mobility in older adults with CAD.³

Smoking cessation and adherence to a heart healthy diet are two modifiable risk factors that can reduce risk of developing secondary comorbidities such as hypertension and high cholesterol in patients with CAD.⁶ In a RCT, patient education on smoking cessation and low fat diets delivered by healthcare professionals in small groups of 8-12 for 2 hours significantly reduced smoking and improved healthy diet choices and maintained these changes 6 months following the intervention.⁷ Additionally, in a systematic review investigating the impact of patient education on behavior change in patients with CAD found that patient education significantly increased patient knowledge and positive outlook on dietary habits and smoking cessation.⁸ Education is necessary to provide to this population for self-management of

their condition. Patient education regarding smoking cessation and healthy eating habits reduce risk of CAD relatively by 22% and increase QOL at 6 months following intervention.⁷ The SF36 was used to measure QOL in this study, and is a reliable measure commonly used to assess QOL in healthcare. Additionally, QOL assessment is a critical component of cardiac rehabilitation for outcome prediction⁹, therefore would be critical to measure in a health promotion program for patients with CAD.

It is important to recognize that self-management of CAD, for many patients, requires a major lifestyle change. Individuals with CAD may present in a variety of stages of change, requiring individualized approaches to be taken in order to gain participation in an exercise and education focused health promotion program. One study investigating readiness for behavior change in patients with ischemic heart disease found that 88% were in the contemplation phase for weight control, 43% were in the precontemplation phase for smoking cessation, and only 36% were in the maintenance phase for reduction of high fat foods.¹⁰ This study overall supports that this population had a high prevalence for risk factors but a low readiness for change overall.¹⁰ When considering the recruitment of these individuals who are in the precontemplation or contemplation phase, the use of an incentive for participation as well as convenience of location at the local senior center may help to improve the overall interest in the health promotion program for these individuals. Additionally, we must consider the socioecological factors of participants that may restrict participation in such program. Individuals who may have lack of access to facilities to exercise in may benefit from a health promotion program located in a public space that has no cost, such as a senior center. Additionally, older adults who have vision or hearing deficits might benefit from patient education materials

provided in large print handouts as well as headphones that amplify the voice of the speaker at patient education sessions.

Program Goals

1. In 12 weeks, participants on average will improve 6MWT scores by 104m in order to decrease risk of cardiovascular event¹¹ and improve exercise capacity.
2. In 12 weeks, participants on average will perform the TUG in <13.5 seconds in order to reduce falls risk¹¹ and to improve exercise capacity and functional mobility.
3. In 12 weeks, participants on average will score >26 kg (men) or >16 kg (women) on the grip strength test in order to improve overall health risk outcomes including cardiovascular mortality risk.¹²
4. In 12 weeks, participants on average will score >50 on the SF36 to indicate improvements in quality of life and decreased depressive symptoms.¹³
5. In 2 weeks, participants will verbally recite the benefits of smoking cessation and healthy diet compliance on CVD risk.
6. In 6 months, participants will demonstrate >50% compliance with self-recorded smoking cessation log and healthy diet log in order to encourage behavior modification to decrease CVD risk.
7. In 12 months, participants and staff will show >7/10 satisfaction with program logistics and outcomes in order to demonstrate positive response to program operation over the course of the first year and predict future participation in the program.

Methods

Recruitment

Both participants and staff must be recruited for the operation of this community-based program. Participants will be recruited by visiting local physical therapy clinics and outpatient cardiopulmonary clinics and speaking to clinicians about our program goals and patients who would be appropriate referrals to our program. The goal is to achieve a referral network from providers in the area to provide the program with good candidates for participation. Volunteer staff will also be recruited through this method. Any nurse, dietician, physical therapist, physical therapy assistant, physician, or exercise physiologist may volunteer as staff for this program. Physician approval of patient's appropriateness for participation in the program. This program can be used as an alternative for physical therapy cardiac rehabilitation for patients who do not have insurance coverage for PT, or as a continuation program following cessation of cardiac rehabilitation program to increase compliance with long term maintenance exercise training in this population. Additionally, recruitment would be done through local community centers, such as the senior center, through the distribution of flyers. We will incentivize participation by advertising the convenience of the program location at the local senior center as well as advertising the program as donation based.

Screening/Assessment

Initial screening will occur at the participants first session of the program. Participants will be asked to sign consent waivers, liability waivers, and any other safety

waivers deemed appropriate by the senior center. Participants will also be asked about medical history to assess appropriateness for participation. Initial outcome measure assessments will also be performed during the first visit, including the TUG, 6MWT, grip strength, and SF-36 survey. Reassessment will occur following 12 weeks of participation in the program and will include a compliance check of logged diet and smoking behavior changes. The final assessment of all outcome assessments will occur following 6 months of participation.

Intervention

Interventions that will be implemented in this community-based program will consist of resistance/balance training, aerobic training, and patient education. Participants will be encouraged to participate in three days of aerobic training, two days of resistance training, and one session of patient education per week. However, it is expected that a portion of participants will not be available or will be unable to find transportation for 100% participation during all weeks. Caregivers are welcomed for participants who have one to assist with safety and transportation if needed. The program is to be held at a local public space, such as a local senior center, or a physical therapy clinic who is willing to offer their space for the program. Under the circumstance that we are unable to find a space willing to host our program, sessions will be held at a local public park. Sessions will be held after 5 pm daily to allow for volunteer staff and working participants to attend. More class sessions may be offered if interest and available staffing increases.

Resistance and balance training will be performed on the same day, for a total of one hour in duration including a dynamic warmup period for 10 minutes, for two days per week. Resistance training will include seven major muscle group strengthening exercises², as listed above. Balance training is combined with several resistance exercises for efficiency, such as sit to stand and standing calf raises. Variations of exercises may be provided to participants during the session by the instructor to increase or decrease difficulty of the exercises. Participants will be encouraged to take rest as needed, progressively decreasing the number of rest periods necessary as exercise tolerance increases throughout the program. All exercises should be performed at a moderate intensity level, as indicated by an RPE scale ranking of ~5-6 out of 10.¹⁴ Participants and staff may bring donated items that can substitute as weights for resistance training to increase intensities, such as cans or water bottles, assuming that our program may not be able to find funding to provide enough weights for participants in the program to use.

Aerobic training^{2,3} will be performed on either a treadmill or recumbent stationary bike for 50 minutes total in order to increase peak VO₂max and performance on the 6MWT and TUG outcome measures. The 50-minute session will include a 10-minute warm-up and 5-minute cooldown period. Participants will be allowed to self-select pacing to achieve moderate intensity. With the anticipation that our program may not be able to find funding for adequate supply of treadmills or stationary bikes, aerobic exercise may be performed through walking or jogging around the perimeter of the host location for the program. Additionally, participants may bring their own bicycles if they own one and prefer biking over walking. Participants will be encouraged to take rest

breaks as needed, with hopes of progressing exercise tolerance and goal intensity over time. Both aerobic and resistance/balance sessions may be led by volunteer physical therapists, exercise physiologists, physical therapy assistants, or certified personal trainers.

Patient education sessions will be held on weekends and will be 1 hour in length. Sessions may be led by volunteer dietitians, physicians, physical therapists, or nurses. 30 minutes of the session will be devoted to smoking cessation, heart healthy diet education, and strategies for behavior change. The remaining 30 minutes will be for discussion and psychosocial support in either a group or individual setting. The goal of this intervention is to encourage healthy behavior change that will decrease CVD risk and improve QOL measures in this patient population. Printed handouts will be available for all participants. A microphone, speakers, and headsets may be available for those with hearing impairment, pending adequate funding or donations. Sessions will preferably be held in either a local senior setting or physical therapy clinic with enough space and seating to accommodate participants. In the case this is not available, sessions may be held virtually.

Exercise Intervention	Duration/Repetitions	Frequency	Intensity
Resistance and Balance Training 2.3.15	3 sets of 12-15 repetitions (60 minutes total)	2 days per week (Tuesday, Thursday)	Moderate

Aerobic Training ^{2,3}	50 minutes (10-minute warm-up and 5-minute cooldown)	3 days per week (Monday, Wednesday, Friday)	Moderate
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Resistance and balance training sessions will consist of the following exercises:^{2,3,15}

- Sit to stands
- Standing hip abduction
- Standing calf raises
- Seated knee extension
- Seated shoulder abduction to 90 degrees
- Wall pushups
- Seated bicep curls
- Reaching
- Stepping forward and sideways
- Heel and toe stand
- Stepping over an obstacle
- Tandem stance
- Single leg stance

Patient education and support sessions will consist of the following topics:^{7,8}

- Smoking cessation

- Behavior change
- Heart healthy diet education
- Psychosocial support

Program Evaluation

The community-based program goals consist of improved participant performance on evidence-based functional outcome measures and one survey selected to indicate decreased CVD risk, decrease all mortality risk, quality of life, and increase overall health outcomes in participants with CVD.^{3.7} These measures will be assessed initially and every 3 months following for participants who continuously participate in the program. Each year, all data will be compiled to assess average total progress of participants in the program to determine if significant change has been made as a result of the exercise and education program.

Self-management is an important aspect of chronic illness management.¹⁶ This program aims to educate and encourage self-sufficiency of physical activity to manage disease risk of CVD. Participants will be assessed via survey to determine whether they feel they are able to self-manage their condition. Additionally, self-management will be assessed via the final assessment of compliance with their healthy behavior log as well as recording attendance to exercise sessions.

According to the Centers for Disease Control and Prevention guidelines for evaluation of public health programs¹⁷, program evaluation is critical in identifying strengths, weaknesses, and areas for improvement to determine if objectives are being implemented as planned.¹⁷ This program is accountable in providing credible evidence

for selected interventions. Additionally, appropriate measures will be assessed every 12 weeks and at the end of the year in order to determine if the program has an effect on decreasing disease risk, which is another component of program accountability. Program evaluation should include assessment of implementation, effectiveness, efficiency, cost-effectiveness, and attribution.¹⁷ the founders of the program will participate in a yearly evaluation based on this criteria to determine areas where the program is lacking. In order to diminish bias in results, outside assessors will also be asked to participate in the program evaluation process. The participants will be integrated in the evaluation progress by completing an overall satisfaction survey that will be given yearly to indicate level of satisfaction of the program structure and outcomes. The program is expected to meet >7/10 satisfaction rates and is expected to make changes according to feedback in order to increase satisfaction in the future.

Conclusion

Overall, this community-based health promotion program serves as a resource to encourage people with coronary artery disease to participate in healthy behavior changes such as physical activity, healthy eating habits, and smoking cessation, ultimately leading to long-term self-management of CVD. Reductions in mortality, improvements in quality of life, and improved CVD risk factors are all anticipated outcomes from this program. Implementation of this program may help people with CVD who do not have insurance coverage or access to appropriate cardiac rehabilitation services or who are unable to self-motivate participation in healthy behaviors. Requested funding will aid in appropriate recruitment and implementation of the

program, ultimately leading to its success in achieving the program goals. With sufficient resources, this program will be able to serve a meaningful portion of the community who would benefit from the health-promotion program.

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