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## Home-Based Exercise: A Therapeutic Option for Peripheral Artery Disease

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People with lower extremity peripheral artery disease (PAD) have impaired lower extremity functioning, increased rates of functional decline, and faster rates of mobility loss than people without PAD (1). Yet few therapies are available for improving functional performance or preventing mobility loss in people with PAD. Only two medications, pentoxifylline and cilostazol, are FDA approved for treating PAD-related walking impairment. No medications for PAD-related walking impairment have been FDA approved since 1999. Recent evidence shows that pentoxifylline is not much more effective than placebo and benefits from cilostazol are modest. Most PAD patients without critical limb ischemia are not candidates for lower extremity revascularization. Among PAD patients who undergo angioplasty with stenting, up to 25–30% of these stents develop re-stenosis within one year.

Supervised treadmill exercise has greater benefit than medications and is recommended as first-line therapy to improve walking performance in PAD. Yet barriers exist to participation in supervised treadmill exercise for PAD patients. First, supervised exercise is not reimbursed by health insurance, including Medicare. Many PAD patients cannot afford this highly effective treatment. Second, traveling to an exercise center three times weekly for supervised exercise is burdensome, especially for PAD patients whose mobility is limited. Even when supervised exercise is offered without costs to PAD patients in a research program, many decline participation (2). In a recent report of 23 clinical trials of 1,541 potential PAD participants without critical limb ischemia who had sufficient ischemic symptoms for eligibility in the clinical trials, 769 (50%) reported insufficient interest or refused participation in supervised exercise and an additional 295 (19%) reported that attending supervised exercise was inconvenient (2). Overall, 69% of eligible PAD participants refused participation in supervised exercise. Based on this evidence, even if Medicare paid for supervised exercise, relatively few PAD patients would take advantage of this opportunity and the impact of Medicare-covered supervised treadmill exercise for PAD patients may be modest.

Home-based walking exercise is an inexpensive and convenient alternative to supervised exercise. However, initial small studies of home exercise showed little to no benefit for PAD patients. Based on these early studies, the 2006 American Heart Association/American College of Cardiology Clinical Practice Guidelines stated there was no evidence for advising PAD patients to “go home and walk”.

Since 2011, three randomized clinical trials reported a significant benefit of home-based walking exercise for patients with PAD. For example, Gardner et al conducted a home-based exercise trial in PAD participants, using an intervention requiring only monthly contact between participants and investigators (3). One hundred eighty PAD participants were randomized to 12-weeks of either home-based exercise, supervised treadmill exercise, or a control group. Participants in the home-exercise group were asked to walk for exercise at home three times weekly for up to 45 minutes each session, using an activity monitor and a log to record their walking exercise. Each month, participants met with an investigator who reviewed their exercise activity and provided feedback. Participants in the supervised treadmill exercise group exercised on a treadmill with a trainer three times weekly for 40 minutes per session. At 12-week follow-up, participants in the home-exercise and supervised exercise groups each achieved significantly greater gains in the primary outcomes of maximal and pain-free treadmill walking time compared to the control group. For the secondary outcome of six-minute walk, only the home-based exercise group, but not the supervised exercise group, significantly improved compared to the control group.

In the home-based exercise trial with longest follow-up, McDermott et al randomized 194 PAD participants to either a Group Mediated Cognitive Behavioral intervention vs. an attention control group for six months (4). Participants in the intervention were asked to walk for exercise at home five days per week for up to 50 minutes per session, record their exercise goals each week, and write down the time they spent walking for exercise each day. Participants met weekly with other PAD patients and a facilitator, where successes, challenges, and strategies to overcome barriers to exercise were discussed in a group setting. At six-month follow-up, participants in the home-based exercise intervention achieved significantly greater improvement in the six-minute walk test (primary outcome) compared to the control group (+42.4 meters vs. -11.1 meters,  $P < 0.001$ ).

Still, supervised treadmill exercise has been considered superior to home-based exercise for PAD patients. For example, Fokkenrood et al meta-analyzed 14 randomized trials of 1,002 participants, comparing supervised treadmill exercise to unsupervised exercise (5). Supervised treadmill exercise was associated with a 180 meter greater improvement in maximal treadmill walking distance than unsupervised exercise, but there were no differences in quality of life between the two groups. An important consideration when interpreting relative benefits of supervised vs. home-based exercise interventions for PAD patients is that the treadmill walking outcome is associated with a learning effect and does not represent over-ground walking in daily life (5). Supervised treadmill exercise trains the participant to the treadmill walking outcome measure and may contribute to the long-standing perception that supervised treadmill exercise is better than home-based exercise, since treadmill walking is typically the primary outcome measure in PAD clinical trials.

Characteristics of home-based and supervised exercise are in the Table. To our knowledge, no cost-effectiveness analyses have compared home-based vs. supervised exercise in PAD. It is likely that some PAD patients will achieve greater improvements in a formal, structured program of supervised exercise while others will adhere better and improve more with home-based exercise.

Interventions in successful randomized trials of home-based exercise for PAD patients included substantially more than advice to “go home and walk”. Home-based exercise programs should include asking PAD patients to record exercise goals, monitor their exercise activity, and follow-up with a ‘coach’. The growing availability of inexpensive activity monitors, increased implementation of electronic health records with patient portals, and emphasis of the Affordable Care Act on health coaching makes successful home-based exercise programs increasingly feasible for PAD patients. Even with behavioral intervention components, home-based exercise requires fewer resources than supervised treadmill exercise and is likely to be more accessible and acceptable to many PAD patients.

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### Disclosures

Drs. McDermott and Polonsky are conducting a study of home-based exercise in participants with peripheral artery disease that is funded by PCORI. Dr. McDermott has funding from NHLBI for a study that involves home-based exercise for peripheral artery disease participants.

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**Table**

Characteristics of home-exercise vs. supervised exercise in peripheral artery disease

Characteristic	Supervised treadmill exercise	Home-based walking exercise	Usual Care
Components of a successful exercise programs	3 times weekly treadmill exercise, gradually working up to 40 to 50 minutes per session. Includes direct supervision by an exercise physiologist or Registered Nurse.	3 to 5 times weekly walking exercise over ground (i.e. outside, around a track, in a hallway), working up to 50 minutes per session.	Not Applicable.
Changes in walking performance over time.	Improves treadmill walking performance. Does not consistently improve the six-minute walk as compared to a control group.	Improves six-minute walk performance and treadmill walking performance. Improves the six-minute walk to a greater degree than supervised exercise.	The six-minute walk declines over six month follow-up. Treadmill walking performance remains stable or slightly improves over six months.
Relative costs <sup>1</sup>	+++	++	+
Uptake by patients with PAD	In a recent systematic analysis, 69% of PAD participants potentially eligible for supervised exercise refused participation.	Data not available.	Not applicable.

<sup>1</sup>To our knowledge, no formal cost analyses have been completed.