Can Primary Care Doctors Prescribe Exercise to Improve Fitness?

The Step Test Exercise Prescription (STEP) Project

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Background: Sedentary lifestyle is associated with adverse health outcomes. Available evidence suggests that, despite positive attitudes toward regular exercise in promoting a healthy lifestyle, few physicians actually prescribe exercise for their patients. Barriers include lack of skills and standard office instruments. Because primary care physicians have regular contact with a large proportion of the population, the impact of preventive health interventions may be great.

Objectives: To determine the effect of an exercise prescription instrument (i.e., Step Test Exercise Prescription [STEP]), compared to usual-care exercise counseling delivered by primary care doctors on fitness and exercise self-efficacy among elderly community-dwelling patients.

Design: Randomized controlled trial; baseline assessment and intervention delivery with postintervention follow-up at 3, 6, and 12 months.

Setting: Four large (>5000 active patient files) academic, primary care practices: three in urban settings and one in a rural setting, each with four primary care physicians; two clinics provided the STEP intervention and two provided usual care control.

Participants: A total of 284 healthy community-dwelling patients (72 per clinic) aged >65 years were recruited in 1998–1999.

Intervention: STEP included exercise counseling and prescription of an exercise training heart rate.

Main outcome measures: The primary outcome measure was aerobic fitness (VO_{2max}). Secondary outcomes included predicted VO_{2max} from the STEP test, exercise self-efficacy (ESE), and clinical anthropometric parameters.

Results: A total of 241 subjects (131 intervention, 110 control) completed the trial. VO_{2max} was significantly increased in the STEP intervention group (11%; 21.3 to 24ml/kg/min) compared to the control group (4%; 22 to 23ml/kg/min) over 6 months ($p<0.001$), and 14% (21.3 to 24.9ml/kg/min) and 3% (22.1 to 22.8ml/kg/min), respectively, at 12 months ($p<0.001$). A similar significant increase in ESE (32%; 4.6 vs 6.8) was observed for the STEP group compared to the control group (22%; 4.2 vs 5.4) at 12 months ($p< 0.001$). Systolic blood pressure decreased 7.3% and body mass index decreased 7.4% in the STEP group, with no significant change in the control group ($p<0.05$). Exercise counseling time was significantly ($p<0.02$) longer in the STEP (11.7±3.0min) compared to the control group (7.1±7.0min), but more ($p<0.05$) subjects completed ≥80% of available exercise opportunities in the STEP group.

Conclusions: Primary care physicians can improve fitness and exercise confidence of their elderly patients using a tailored exercise prescription (e.g., STEP). Further, STEP appears to maintain benefits to 12 months and may improve exercise adherence. Future study should determine the impact of combining cognitive/behavior change strategies with STEP. (Am J Prev Med 2003;24(4):316–322) © 2003 American Journal of Preventive Medicine

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Introduction

Despite the strong evidence linking higher levels of physical fitness with improved health and functional outcomes,[1–4] helping patients change their physical activity behaviors is a difficult task for health providers.[5,6] Primary care physicians represent a large pool of professionals who have credibility with their patients and patients list their primary care physician as the desired source for preventive care information.[7,8] Despite this opportunity, research has shown that, for the most part, many physicians do not counsel or monitor their patients' physical activity behaviors.[9,10] In fact, physicians may counsel less often about exercise than other important health-promoting behaviors.[11] Reasons for this discrepancy are many, but likely include lack of time, lack of training, and knowledge about exercise counseling and prescription, including lack of instruments/materials.[3,9,10,12]

A message from a physician has been shown to be a potent catalyst in motivating change in health behaviors related to exercise.[3,5,12,13] The determinants of the physical activity "prescription" have been primarily defined and directed at behavioral change strategies.[5,10,12,14–17] These strategies support high-resource counseling that tailors or matches intensity of physical activity to the stage of readiness to adopt physical activity. The impact of these behavior change interventions alone on increasing physical activity level and fitness in the primary care setting has been variable,[18,19] and suggests a further need to evaluate the components, including the intensity (i.e., degree of resource intensity) of the intervention in the primary care setting.

The Activity Counseling Trial (ACT)[20] examined three strategies to improve fitness and physical activity level in the primary care setting. The basic strategy was considered low intensity (i.e., 2- to 4-minute assessment/counseling and goal setting by a physician, followed by referral to a health educator and follow-up telephone reinforcement) compared to the other two strategies, each of which used more intensive counseling. The results showed no change in physical activity at 24 months in any of the groups, and only a small increase in fitness confined to women participants in both of the more intensive intervention groups.[20] In an accompanying editorial,[21] it was suggested that more intensive strategies may not necessarily improve physical activity or fitness outcome.

Hence, it is unclear whether high-intensity behavior-tailored counseling is a primary determinant of physical activity and fitness in the primary care setting, or whether physicians' advice can have an impact on significant changes in fitness. It is also unclear whether a lower-intensity strategy designed to prescribe a dose of exercise training, regardless of stage of behavior readiness, by a physician is more effective than high-intensity behavior-change strategies in achieving goals of improving physical activity and fitness in the primary care setting. Specifically, we hypothesized that prescription of a dose of exercise training to increase heart rate to patients delivered by a primary care physician, regardless of matching readiness to change and without sophisticated reinforcement strategies outside the usual care setting, may be a determining factor in achieving change in fitness and associated perceived health outcomes among patients.

Methods

Design

The Step Test Exercise Prescription (STEP) project is a randomized controlled trial comparing the effect of assignment to an exercise prescription intervention (hereafter referred to as STEP)[22] or published guidelines alone (hereafter referred to as control) on fitness among elderly, community-dwelling, healthy patients. Secondary aims were to compare effects of the intervention on predicted fitness, exercise self-efficacy (ESE), clinical anthropometric measures (including body mass index [BMI]), exercise compliance, and counseling duration.

Setting

The study was conducted in 1998–1999 in four academic family medicine clinics (three urban, one rural) affiliated with the University of Western Ontario, London, Ontario, Canada (population 350,000). These clinics were geographically separated (two clinics in the north and two in the south sections of the city), and staff did not share patient care between or among clinics. At two clinics, physicians and staff were trained in STEP, and two other clinics were designated as the control group (one north and one south to allow access for patients randomized to either condition). Each clinic included four physicians ($n = 16$), and there were no other physicians attending these clinics. Physicians were provided with a brief 30-minute workshop that included simulated role playing using outcome measures and instruments specific to the assigned group. Demographic characteristics of the study physicians (including age, gender, and years in practice) were collected prior to the study to determine comparability between study physicians and groups. The study was approved by the institutional review board of the University of Western Ontario, and all participants gave written informed consent.

Participants

The study population was recruited from patients receiving their primary health care from the four identified family medicine clinics. Eligibility criteria for participating in the study were age >65 years and no formal participation in a regular exercise training program. Principal exclusion criteria included: (1) presence of unstable medical conditions that would preclude safe participation in regular exercise, including myocardial infarction or stroke in the past 6 months, evidence of ischemia during baseline exercise testing, New York Heart Association class 2 to 4 congestive heart failure, severe chronic obstructive pulmonary disease, active treatment of cancer, uncontrolled diabetes mellitus, severe systemic or musculoskeletal disease, or major psychiatric disease; (2) inability to walk on a treadmill without assistance; and (3) currently living in a long-term care facility. Diagnosis of exclusionary medical conditions was made on history and physical examination, including a maximal exercise treadmill test. All subjects agreed to obtain their usual medical care at the clinic from which the intervention was delivered for the duration of the study.

Recruitment

Patients were identified in two ways over 6 months. First, over a 2-month recruitment period, clinic staff identified potentially eligible patients opportunistically from the regular daily register. Second, a clinic-produced list of patients meeting the eligibility criteria was utilized until 72 patients from each clinic were identified. All staff were blinded during recruitment.

Subjects were contacted by telephone, and those willing to participate after informed consent came to the exercise laboratory for baseline data collection, which included a step test and a graded maximal exercise treadmill test for determination of VO_{2max}. Subjects were then randomized to either STEP or control by a computer program, and scheduled to meet with a clinic family physician corresponding to their group assignment for exercise counseling. Subjects returned to the laboratory for determination of VO_{2max} at 3, 6, and 12 months.

Interventions

STEP intervention group. The STEP[22] study physician sites were given published exercise counseling guidelines,[23] a paper describing the benefits of exercise,[1] guidelines for delivery and training in interpretation of the step test data to determine patient aerobic capacity (VO_{2max}), including the prescription of an exercise training heart rate.[24] All exercise counseling and prescription were conducted in the clinic setting. In brief, physicians administered the step test, which included stepping up and down two small (9.5-cm) steps at a comfortable pace 20 times.[24] The stepping time (in seconds) and postexercise heart rate were recorded, followed by conversion to predicted VO_{2max} and an exercise heart rate based on 75% of predicted VO_{2max} using a hand-held programmed computer.[22] This method has been validated in groups of older adults varying in functional capacity,[24] and is endorsed by the College of Family Physicians of Canada as part of an accredited Continuing Health Education strategy to improve physical activity education among family physicians.[25] Patients were counseled as to examples of exercises[1] and application of the American College of Sports Medicine (ACSM)[23] principles of frequency, intensity, and duration. Heart rate intensity during training was determined by palpating the radial pulse. Patients were instructed to palpate the pulse for 10 seconds and multiply by 6 (for beats per minute).

Control group. Physicians in the control group were instructed to provide subjects with exercise counseling and prescription per their "usual care," with the addition of the ACSM guidelines[23] and the benefits of exercise.[1]

Both STEP and control groups were given a list of available facilities for physical activity participation in their community. At all times, patients in both groups were free to choose where and how they would exercise. On review of activity diaries, most subjects chose walking in local parks and malls. In order to reduce the risk of confounding outcomes, the same physicians who delivered initial counseling saw the patients at 3, 6, and 12 months. Duration of counseling and prescription was measured by the clinic staff as the time from physician–subject encounter to subject departure from the treatment room. In the STEP group, training heart rate was adjusted at 3 and 6 months based on the results of the step test. No effort to maintain or reinforce the exercise prescription was made between study visits. Subjects in the STEP group were instructed to record their weekly exercise activity (i.e., location, type of activity, frequency, duration, and whether target heart rate was achieved during the activity) in a diary book, which was collected at 3, 6, and 12 months. The control group collected activity information in a similar log but without reference to training heart rate. Non–exercise-related activity (i.e., gardening, housework) information was not collected.

Compliance with the intervention was defined as the number of exercise sessions at the prescribed training heart rate/total number of sessions possible over the time period at three or more sessions per week. All study and nonstudy clinic visits were conducted by the study physician and recorded for duration of contact by clinic staff.

Primary Outcome Measure

Maximal aerobic capacity (VO_{2max}). All subjects performed a modified Balke[26] protocol using a computer-driven treadmill (Quinton 4500, Seattle, Washington). Respired gases were measured breath by breath using a QMC metabolic cart (Quinton, Seattle, Washington), and VO_{2max} (ml/kg/min) was determined as previously described.[27]

Secondary Outcome Measures

Step test prediction of VO_{2max}. A self-paced step test was developed for elderly individuals to predict VO_{2max}.[24] Briefly, this test was a modification of the self-paced walking test.[28] Subjects were instructed to ascend and descend two 9.5-cm steps 20 times, first at a slow pace for familiarization and then at a pace considered "normal" following a 10-minute rest. In addition to age, weight, and gender, the time to complete the test in seconds and the resting and immediately postexercise heart rate were recorded. The step test data were used to predict VO_{2max}, using logistic regression,[24] and then to calculate a training heart rate corresponding to 75% of the predicted VO_{2max}, using a programmed hand-held computer. Subjects performed the step test in the clinic and laboratory, and predicted VO_{2max} results were compared for internal validity between clinic and laboratory site and with VO_{2max} determined on the treadmill. Only the STEP group received training regarding how to use the training heart rate data.

ESE. The ESE is a 16-item instrument designed to measure patients' confidence in their ability to exercise.[29] Participants rated items such as "I am confident. . ." on a Likert scale from 0 to10. Summary scores range from 0 (low confidence) to 10 (completely confident). A composite ESE score was created by summing the individual scores and dividing by the number of items.

Demographic, anthropometric, and clinical variables. Information on age, gender, and current level of regular exercise participation per week was obtained by self-report. Information on comorbid conditions was obtained from self-report, medical history, physical examination, and treadmill testing. Weight and height were measured to the nearest 0.2 kg and 0.5 cm, respectively, using a calibrated balance-beam scale; BMI was calculated as weight in kilograms divided by the square of height in meters. The presence of hypertension was defined as self-report and concomitant use of anti-hypertensive medications or an average seated systolic blood pressure of ≥140 mmHg and/or a diastolic blood pressure of ≥90 mmHg on two measurements.[30] The presence of coronary artery disease was defined as a self-report of myocardial infarction, angioplasty, cononary artery bypass, or self-report of angina or use of anti-anginal medications. Diabetes mellitus was defined as a self-report of diabetes or concomitant treatment with diet or hypoglycemic medication. The presence of osteoarthritis was defined as self-report or treatment with analgesics or anti-inflammatory medications. Testing in the laboratory was overseen by a study coordinator and trained physician, both of whom were blind to group assignments.

Statistical Analyses

The primary objective of the trial was to compare the effect of an exercise prescription delivered in the primary care practice setting on physical fitness in older community-dwelling adults with a control. The trial was designed to randomize 140 subjects to each group in order to achieve at least 120 subjects at the end of 12 months. A total sample size of 280 subjects was projected to provide a power of 90% to detect a 10% difference in fitness (VO_{2max}) between groups with 20% dropout. Analysis of variance and the chi-square test were used to test for differences in baseline characteristics by treatment group. All participants were analyzed according to group assignment. The dependent variable was VO_{2max}. The effect of the intervention on VO_{2max}, predicted VO_{2max}, ESE, and clinical characteristics measured at 3, 6, and 12 months postrandomization were determined by repeated-measures analysis of covariance. Analyses were conducted using SAS software, version 6.0 (SAS Institute, Cary, North Carolina). All tests of hypotheses and reported p values were two-sided.

Estimates of intervention effects were obtained at each follow-up. Analyses of group differences and intervention effect were adjusted for the prerandomization levels of baseline factors and tested by comparing measures at 12 months. Significance was accepted at $p<0.05$. Post hoc secondary analyses were performed to examine outcomes by subgroups (age, gender, BMI, and presence of two or more chronic diseases) and by compliance with the prescription (defined as >80% of prescribed sessions recorded in the diary).

All participants with 12-month VO_{2max} values were analyzed, and all follow-up values were included in the analyses. Missing results were compared at 12 months using one of two methods: (1) the last-observation-carried-forward (LOCF) method, whereby missing values at 12 months were replaced with 6-month data, or (2) imputation using baseline measures.[31] In part, due to the low number of missing values, the significance of the results was not changed by the LOCF or baseline imputation methods.

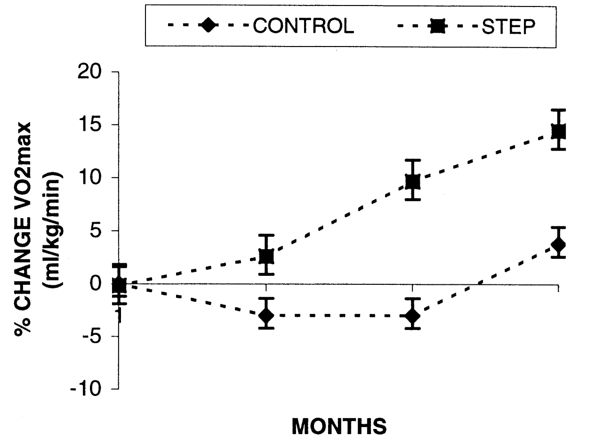

Figure 1. Percentage change in VO_{2max} at 3, 6, and 12 months for STEP (step test exercise prescription) and control groups.

Results

Recruitment

Recruitment of participants was conducted over a 6-month period (Figure 1). During a 2-month period of opportunistic patient recruitment, 76 patients (range 1 to 12 per practice) were identified out of 868 total patient encounters (8.7%), thus meeting entry criteria. An additional 424 patients meeting the entry criteria were identified from the patient databases in the clinics over the next 4 months. Potential subjects were then screened until a cell of 80 recruits per site (320 total) was achieved. Of the 320 patients who were approached and showed interest, 36 subjects were found to be ineligible due to current regular participation in exercise training programs; the remaining 284 subjects were randomized. There was no difference between patients identified opportunistically from the total patient group in terms of age, gender, and VO_{2max}.

Subject Characteristics

The characteristics of the randomized subjects are shown in Table 1. Participants' mean age was 73±6 years. Of the 284 randomized subjects, 241 (86%) completed the study. No serious adverse events were reported during the trial. Intention-to-treat analyses were conducted on 284 subjects and the remainder of analyses conducted on 241 subjects. The intervention group included 131 subjects (66 female, 65 male), and the control group, 110 subjects (51 female, 59 male). Fifty-five percent of subjects reported two or more chronic medical conditions related to physical inactivity.

Exercise Counseling Characteristics

There were no differences in demographic characteristics of the physicians in the STEP or control groups. The duration of exercise counseling was 11.7±3.0 minutes (range, 7 to 22 minutes) in the STEP group and

Table 1. Demographic and clinical characteristics of the randomized participants at baseline in the STEP trial[a]

Variable	Control (n=110)	STEP (n=131)	p value
Age, y mean years ± SD	73 ± 6	74 ± 4	0.34
Gender, n (% female)	51 (46)	66 (50)	0.60
Marital status, single and widowed	66	70	0.66
Education, n (%)			
<12 yr	42 (38)	59 (45)	
≥12 yr	68 (62)	72 (54)	0.44
Comorbid illnesses, n (%)			
Arthritis	72 (65)	85 (65)	
Obesity (BMI >27)	30 (27)	41 (31)	
Hypertension	44 (40)	59 (45)	
CAD	22 (20)	29 (22)	
Diabetes	15 (14)	21 (16)	0.88
Annual income, n (%)			
<\$10,000	20 (18)	26 (19)	
>\$35,000	37 (34)	46 (35)	0.77
VO_{2max} (ml/kg/min), mean ± SD	21.3 ± 2.1	22 ± 1.9	0.87
SBP (mmHg), mean ± SD	139 ± 6	137 ± 4	0.94
DBP (mmHg), mean ± SD	87 ± 3	85 ± 2	0.88
BMI (ht/m^2), mean ± SD	27.9 ± 1.1	28.2 ± 0.8	0.71
ESE, mean ± SD	4.2 ± 0.4	4.6 ± 0.8	0.96

[a]Statistical comparisons of continuous means were performed using analysis of variance; comparisons of categorical variables were performed using Chi-square analysis.

BMI, body mass index; CAD, coronary artery disease; DBP, diastolic blood pressure; ESE, exercise self-efficacy; SBP, systolic blood pressure; SD, standard deviations; STEP, Step Test Exercise Prescription; VO_{2max}, maximal aerobic power.

7.1±7.0 (range, 3 to 15 minutes) in the control (p<0.02). Overall compliance with the STEP group (three or more sessions at target heart rate) compared to the control was 76% vs 61% at 6 months (p<0.05) and 71% vs 56% at 12 months (p<0.05). The target heart rate for STEP was 124±16 beats/minute per session, with 4.2 sessions per week recorded as the target. There were no difference in non-study visits to the physician recorded between the groups at 12 months, while there were more study query contacts to the laboratory from the STEP group (2.6±1.4) compared to the control group (0.6±0.8) (p<0.05).

Main Outcomes

The primary outcome of the trial was VO_{2max}. Eleven percent of the STEP group significantly increased VO_{2max} (21.3 to 24 ml/kg/min) compared to 4% (22 to 23 ml/kg/min) in the control at 6 months and 17% (21.3 to 24.9 ml/kg/min) vs 3% (22 to 22.8 ml/kg/min) at 12 months (p<0.001) (Figure 1). Predicted VO_{2max} on the office step test was similar to laboratory step test and the treadmill VO_{2max} at baseline, and at 3, 6, and 12 months. The STEP group reported significantly higher ESE (4.6 vs 6.8) compared to control at 12 months (p<0.001), as shown in Table 2. Of note, ESE did show a significant increase from baseline in the control group (4.2 vs 5.4; p<0.05). Clinical variables also showed improvement favoring the STEP intervention. A 9-mmHg reduction in systolic blood pressure (p<0.002) and a 7.4% reduction in BMI (p<0.05) were observed in the STEP group compared to the control group at 12 months (Table 2).

Subgroup Analyses

Post hoc analyses were performed to examine whether there were differences in the effects of the STEP intervention on VO_{2max} and ESE by demographic and clinical characteristics (Table 3). In general—and regardless of gender, age, having >2 chronic disease conditions, and BMI >32—the STEP group showed greatest improvement in VO_{2max} and ESE compared to the control group. To determine if there were a dose–response with exercise compliance (80% of sessions following ACSM guidelines, as recorded by subjects in their exercise diary) and the effect on VO_{2max} and ESE, the VO_{2max} and ESE were determined by three levels of

Table 2. Comparison of main and secondary outcome variables between control and intervention groups at 12 months[a]

Variable	Control	Δ %	STEP	Δ %	p value
VO_{2max} (ml/kg/min)	22.8 ± (0.9)	+3	24.9 ± (1.3)	+15	<0.001
ESE	5.4 (0.8)	+22	6.8 (0.9)	+32	0.001
SBP (mmHg)	137 (3)	−1.4	127 (4)	−7.3	<0.002
DBP (mmHg)	87 (2)	+1.1	84 (3)	−1.2	NS
BMI (ht/m^2)	27.3 ± (0.9)	−2.2	26.1 ± (1.2)	−7.4	0.05

[a]The results are adjusted/least/squares mean scores with standard deviations in parentheses; statistical comparisons were made to test for the overall effects of the STEP versus control group using repeated/measures analysis of variance.

BMI, body mass index; DBP, diastolic blood pressure; ESE, exercise self-efficacy; NS, not significant; SBP, systolic blood pressure; STEP, Step Test Exercise Prescription; VO_{2max}, maximal aerobic power.

Table 3. Effect of assignment to STEP in subgroups at 12 months[a]

Group	VO_{2max}			ESE		
	STEP	Control	*p*	STEP	Control	*p*
Overall	24.9 (1.3)	22.8 (0.9)	0.001	6.8 (0.9)	5.4 (0.8)	0.001
Gender						
Male (124)	25.8 (1.1)	21.9 (1.3)	0.008	6.6 (0.5)	5.0 (0.3)	0.001
Female (117)	26.1 (1.3)	22.4 (0.6)	0.008	5.4 (0.3)	4.6 (0.6)	0.004
Age (yr)						
<70 (144)	28.9 (1.3)	25.7 (1.2)	0.001	6.4 (0.6)	5.0 (0.3)	0.07
>70 (97)	24.8 (0.5)	21.1 (1.1)	0.002	6.8 (0.7)	4.2 (0.4)	0.03
Chronic health conditions						
<2 (58)	26.1 (1.8)	25.2 (1.0)	0.03	6.6 (0.6)	5.8 (0.9)	0.09
>2 (183)	25.6 (1.3)	22.1 (0.8)	0.001	7.2 (0.4)	5.8 (1.0)	0.03
BMI (wt/m^2)						
<27 (176)	25.9 (1.6)	23.7 (1.6)	0.052	6.6 (0.6)	5.8 (0.6)	0.10
27–31 (48)	24.1 (1.1)	22.0 (0.9)	0.02	6.6 (0.3)	6.2 (0.5)	0.14
>32 (17)	23.4 (1.5)	22.9 (1.2)	0.09	7.2 (0.8)	6.8 (0.3)	0.06

[a]The results are adjusted/least/squares mean scores with standard deviations in parentheses. Statistical comparisons were made to test for effects of the STEP group versus the control group using repeated/measures analysis of variance.
BMI, body mass index; ESE, exercise self-efficacy; STEP, step test exercise prescription; VO_{2max}, maximal aerobic power.

participation: <50%, 51% to 70%, or >70%. These analyses showed that there was a significant dose-dependent improvement in VO_{2max} for increasing level of participation (22.0±1.4; 23.6±1.1; 25.4±1.7 [p =0.001]), but not ESE, with greater self-reported compliance according to exercise opportunities in both groups.

Discussion

The STEP group experienced an 11% improvement in fitness since baseline, compared to a 4% improvement in the usual-care exercise-counseling control group. Similar differences in measures of ESE, systolic blood pressure, and BMI were observed in the STEP group compared to the control group at 12 months. These changes were notable given the absence of a maintenance program or complementary matched behavior–change strategy. Indeed, the gains made in STEP by 6 months were maintained to 12 months, whereas the control group showed no significant change at 6 and 12 months. These results suggest that STEP and the provision of an office-based exercise prescription may improve exercise counseling by primary care physicians as well as fitness among their patients.

Reinforcement in the STEP group was achieved by repeating the office-based step test prediction of VO_{2max} and prescription of a training heart rate at 6 months. Further, these results are provocative given that the intervention was accomplished without staging patients, or providing tailored messages, reminder systems, or a maintenance strategy[5,6,20] that could increase provider and patient burden and limit uptake. Implicit in the achievement of higher levels of fitness is a greater participation rate in exercise sessions during the intervention, suggesting that greater adherence to exercise counseling among patients in the STEP group can be achieved. The fact that a larger (~10%) improvement in VO_{2max} was observed in both men and women, while improvement was limited to women in the ACT, may suggest that stage-matched messages may not be the only determinant of exercise adoption.[21] Interestingly, the 4% increase in VO_{2max} in the control group was similar to the greatest change in ACT.

These results suggest that changes in fitness may be more dependent on dose than feeling confident about exercising, and that the impact of physician counseling alone can be a significant component in facilitating positive exercise behavior. While more study contacts were observed among STEP subjects compared to control subjects in addition to scheduled visits, most of these contacts were to validate proper recording of training heart rate—an important variable in this study. This potential limitation of STEP can be overcome by attention to the initial pulse-palpation instruction, or perhaps use of electronic pulse recording.

These results also suggest that STEP may be introduced in an opportunistic way at "teachable moments" at the point of care in the practice setting.[22] Elderly patients who have much to gain from higher levels of physical activity[3] visit their primary care physician many times for prevention-oriented reasons,[32] which may provide an ideal opportunity to introduce exercise advice to a large group of patients at risk.[33] The high rate of retention (85%) in STEP is higher than other lifestyle interventions,[25,31,34] and may be related to advice provided by the patients' primary care physician.

Some might argue that even 10 minutes is excessive in a busy primary care practice, and this might also be a limitation of STEP. However, other physician delivery programs that have used even shorter (2- to 4-minute) interventions[6,16,20] have not had a large impact on fitness.[35] We suggest that the potential impact of the primary care physician might have been missed in some of the earlier studies. The low-intensity, yet physicianoriented intervention used in this study may be more feasible, generalizable, and potent than a more intensive strategy that bypasses the primary care physician.

Perhaps delivery of exercise and other preventive interventions (i.e., weight loss or smoking cessation) should be compared to other therapies for chronic disease management (where lifestyle is a key strategy). For instance, hypertension guidelines suggest that measurement alone should take 6 to 10 minutes,[36] while counseling for lifestyle changes and adherence to therapy could be longer and planned over several visits. Hence, greater discussion of barriers to time constraints to lifestyle management in chronic disease at the point of care is needed.

Interventions aimed at increasing physical activity levels using behavior change counseling alone have been described[6,8,12] in the primary care setting. However, they have lacked measurement of physical performance. Further, recent studies have cast doubt on the effectiveness of these interventions alone to improve physical activity[18,19] or fitness,[20] despite high-intensity intervention. The real determining factor of STEP may be provision of the intervention by the primary care physician at the point of care. This has implications for generalizability of the intervention given its practical format in the office setting.[25]

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