Clinical Investigations

Work-Related Physical Activity Among Cardiovascular Specialists

Address for correspondence:
Thura Abd, MD, MPH
69 Jesse Hill Dr. Jr SE,
Atlanta, GA 30303
tabd@emory.edu

Thura T Abd, MD, MPH; Andrew Kobylivker, MD; Adam Perry, MD; Joseph Miller, III, MD; Laurence Sperling, MD

Department of Internal Medicine (Abd, Perry), Department of Medicine Division of Cardiology (Kobylivker), and Department of Preventive Cardiology (Sperling), Emory University School of Medicine, Atlanta, Georgia; Department Preventive Cardiology (Miller), Georgia Health Sciences University, Augusta, Georgia

ABSTRACT

Background: Strong evidence supports positive correlation of physical activity with health benefits. Current recommendations by the American Heart Association are a minimum 30 minutes of moderate physical activity 5 days per week. This goal has been equilibrated with 10,000 steps per day.

Hypothesis: Work-related physical activity of cardiovascular (CV) specialists does not meet the currently recommended daily physical activity.

Methods: Eight cardiothoracic (CT) surgeons, 7 general cardiologists, 5 procedural cardiologists, and 8 cardiac anesthesiologists (N = 28) participated in the study. Demographic information on each participant was recorded including age, resting heart rate, body mass index, and medical and social history. Subjects were asked to wear a spring-levered pedometer on their hip for 2 weeks while at work and to record the total number of steps as well as number of hours worked each day.

Results: The average daily steps walked during work were 6540, 6039, 5910, and 5553 for general cardiologists, CT surgeons, procedural cardiologists, and cardiac anesthesiologists, respectively. There were no statistically significant differences in the average number of steps taken per day among the groups. CT surgeons worked 12.4 hours per day compared to 9.3 hours by the cardiac anesthesiologists ($P = 0.03$).

Conclusions: In this small, single-center study, work-related physical activity of CV specialists did not meet the recommended guidelines. Obtaining the recommended activity level might be a challenge, given their busy work schedule. Therefore, CV specialists must engage in additional, out-of-hours exercise to achieve the recommended daily exercise.

Introduction

Strongly supportive evidence correlates physical activity to health benefits. Conversely, lack of physical activity (PA) may be correlated to adverse health. Heart disease,[1,2] hypertension,[1,3,4] diabetes,[5–7] and certain cancers including lung,[8] prostate,[9] and colon[10] cancers have all been correlated with lack of PA.[11]

Electronic pedometers provide an accurate, objective, and low-cost method of measuring walking and other ambulatory activities.[11,12] They are also a valid option for assessing PA in research and practice.[13] To promote and maintain health, the American Heart Association (AHA), the American College of Sports Medicine (ACSM), and the US surgeon general recommend moderate-intensity aerobic (endurance) PA for a minimum of 30 minutes on 5 days each week or vigorous-intensity aerobic PA for a minimum of 20 minutes on 3 days each week.[14,15] A study by Le Masurier et al found that individuals who accumulate 10 000 steps per day are more likely to meet the current PA guidelines when engaging in bouts of PA as recommended by the Centers for Disease Control and ACSM.[16]

Few studies have directly examined the effect of PA, as measured by pedometer, on health benefits. In one study, postmenopausal women with borderline/stage 1 hypertension were randomized to exercise versus usual care. Pedometers were used to measure daily activity. In the exercise group, there was a significant reduction of systolic blood pressure.[17] Another study evaluated the effects of PA on lipid panels in a group of perimenopausal and postmenopausal women ages 40 to 60 years, using a pedometer to track activity level. A higher number of daily steps was associated with both improved high density lipoprotein (HDL) cholesterol and a significantly lower total cholesterol–to–HDL cholesterol ratio.[18] A recent study demonstrated that pedometer use was associated with a significant increase in PA and subsequent decreases in both body mass index (BMI) and blood pressure.[19]

Limited occupation-related PA is a contributing factor to overall ambulatory inactivity. Not surprisingly, the type of employment has important implications in work-related

The authors have no funding, financial relationships, or conflicts of interest to disclose.

Clin. Cardiol. 35, 2, 78–82 (2012)
Published online in Wiley Online Library (wileyonlinelibrary.com)
DOI:10.1002/clc.21954

Received: September 20, 2011
Accepted with revision: November 29, 2011

PA. In a study that stratified participants by occupational category as professional, white-collar, and blue-collar workers, researchers found a significant incremental difference in occupational PA with the blue-collar workers being most active.[20]

Very little is known about the PA of health professionals.[21,22] Although many studies have examined the PA of the general population, very few have directly targeted physicians. It is now well known that the PA of doctors influences their practicing and counseling behavior.[21] Nonobese physicians are more likely to proactively address obesity with patients before related comorbidities develop and do so more aggressively than obese physicians.[23] In addition, patients of nonobese physicians have greater confidence in general health counseling and treatment of illness than those of obese physicians.[24] In this study, our goal was to objectively measure the amount of work-related PA among cardiovascular (CV) physicians and surgeons.

Methods

All participants were CV specialist physicians in the Emory Healthcare system who were recruited for the study by e-mail and phone calls. All attempts were made to recruit a balance of procedural and nonprocedural physicians. Informed consent was obtained for each participant agreeable to the study protocol, which was approved by the institutional review board. A total of 28 physicians participated in the study. There were 8 cardiothoracic surgeons (2 fellows, 6 attendings), 7 general cardiologists (3 attendings, 4 fellows), 5 procedural cardiologists (2 attendings, 3 fellows), and 8 cardiac anesthesiologists (6 attendings, 2 fellows).

Participant age, height, weight, resting heart rate, blood pressure, and waist circumference were self-reported. Medical history, including diabetes mellitus, hypertension, heart disease, hypercholesterolemia, and smoking status, was obtained through a questionnaire. The study participants were given a uniform spring-levered pedometer and asked to wear the pedometer on their hip for 2 consecutive weeks while at work. Participants were specifically instructed to begin wearing the pedometers when reaching their office each morning and to take the pedometer off when leaving the hospital at the end of the work day. Pedometer readings were not concealed, and participants were asked to keep a log of number of steps walked along with the total hours of work for each day.

Descriptive data including medians, means, and standard deviations were used to summarize the findings. Comparisons of the number of steps walked by each category of cardiac care physicians were made for participants in different occupation groups. In addition, average daily steps walked and daily work hours were compared between attending physicians and fellows. Because of the small sample size, nonparametric tests were used to test the difference between means. When 2 means were compared, the Mann-Whitney test was used; the Kruskal-Wallis test was used to test the difference among more than 2 means. The Fisher exact test was used to test for differences in categoric variables. $P < 0.05$ was designated as significant. All analyses and data management were done using SAS 9.1 for Windows (SAS Institute, Inc., Cary, NC) statistical software package.

Results

The mean age of participants was 39.5 years and mean BMI was 25.1. Only 2 women (7.1%) participated in the study. None of the participants had diabetes; however, hypertension and dyslipidemia were reported in 15.4% (4 of 28) of the study population (Tables 1 and 2). There were no significant differences in the demographics among the different specialties.

On average, CV physicians walked 6010 steps every day during work hours. General cardiologists walked the most, with an average of 6540 steps. Cardiac anesthesiologists had the lowest number, with an average of 5553 steps. When comparing the average steps daily during work hours among different groups, no statistically significant differences were noted ($P = 0.94$) (Table 2).When comparing the fellows and the attendings, the fellows took an average of 729 more steps per work day than the attending ($P = 0.503$).

There was a difference in the hours physicians worked per day. The average number of hours worked per day was 12.4 for cardiothoracic surgeons, 10.1 for the general cardiologists, 10.9 for the procedural cardiologists, and 9.4 for the cardiac anesthesiologists ($P = 0.008$). With 9.4 work hours per day, cardiac anesthesiologists worked significantly less than cardiothoracic surgeons' 12.4 hours ($P = 0.005$) and less than general cardiologists' 10.9 hours ($P = 0.05$). No other significant differences in average hours of work were noted among other groups (Table 2).

Discussion

In our study, CV physicians walked on average 6010 (range, 5553–6540) steps per day while at work. There were no significant differences in the work-related pedometer-measured daily steps walked among different types of CV physicians. Average daily work hours among the CV specialists was 10.65 hours but ranged from 9.3 hours for cardiac anesthesiologists to 12.4 hours for cardiothoracic surgeons. To our knowledge, our study is the first to report pedometer-measured work-related PA among CV physicians.

Most pedometer-measured PA studies have included nonphysician populations; there has been 1 study examining the pedometer-measured work-related PA of physicians.[25] Our study showed that activity of CV specialists is higher than the general US population. A study published in 2010 from the America On the Move study found that the average daily steps of adults in the United States is 5100 steps.[26] Our study population walked about 6100 steps during work hours only. This is about 1000 extra steps per day, not including steps taken outside work hours. This finding is not surprising. A large 2003 to 2004 National Health and Nutritional Examination Survey (NHANES) showed that (based on intensity of PA) less than 5% of US adults adhere to public health recommendations for PA.[27] On the other hand, a large survey of 471 cardiologists in the United States showed that cardiologists in general appear to follow healthier lifestyles than the general adult US population.[22] Although the survey did not include pedometer-measured work-related PA, it showed that more than 89% of the survey respondents exercised at least 1 time per week. Our study population of CV physicians walked more steps during their

Published online in Wiley Online Library (wileyonlinelibrary.com)
DOI:10.1002/clc.21954

Table 1. Demographics of the Study Population

	Total Study Population		Cardiothoracic Surgeons		Cardiac Anesthesiologists		General Cardiologists		Procedural Cardiologists		
	No.	%	No.	%	No.	%	No.	%	No.	%	*P* Value[a]
	28	100	8	28.57	8	28.57	7	25	5	17.86	
Mean age, y	39.5	—	39.4	—	41.8	—	39.4	—	37.5	—	0.53
Sex											
Male	26	92.9	8	100	7	88	7	100	4	80	0.53
Female	2	7.1	0	0	1	12	0	0	1	20	
Training level											
Attending	17	60.7	6	75	6	75	3	43	2	40	0.41
Fellow	11	39.3	2	25	2	25	4	57	3	60	
Diabetes											
Yes	0	0	0	0	0	0	0	0	0	0	NA
No	26	100	8	100	8	100	7	100	5	100	
Hypertension											
Yes	4	15.4	2	25	1	12	0	0	1	25	0.65
No	22	84.6	6	75	7	88	6	100	3	75	
CVD											
Yes	1	3.9	0	0	0	0	0	0	1	25	0.15
No	25	96.1	8	100	8	100	6	100	3	75	
Hyperlipidemia											
Yes	4	15.4	2	25	0	0	1	17	1	25	0.48
No	22	84.6	6	75	8	100	5	83	3	75	
Smoking											
Yes	1	3.9	0	0	0	0	0	0	1	25	0.15
No	25	96.1	8	100	8	100	6	100	3	75	

Abbreviations: CVD, cardiovascular disease; NA, not applicable. [a]Fisher exact test.

work hours than what the general US population walks in a total 24-hour day.

Our study results are similar to a Scottish study that looked at work-related PA measured by pedometers among 16 physicians (4 medical consultants, 4 surgical consultants, 4 medical residents, 4 surgical residents). Work-related steps taken per day during work were not different among specialties or level of training and ranged between 4647 for medical consultants to 7907 for medical residents.[25] A study from Switzerland used pedometers to measure PA of 9 resident physicians for 1 week in a teaching hospital and found that the residents walked an average of 2323 ± 627 steps per work day.[28] However, it is important to mention that the primary objective of the study was not to measure PA of the residents.

Current guidelines of the AHA and ACSM recommend 30 minutes of moderate-intensity aerobic PA 5 days a week or vigorous-intensity aerobic PA for a minimum of 20 minutes 3 days each week.[14] A number of studies have tried to translate these recommendations into numbers of steps taken per day.[16,29–31] Other studies have shown that people who walk 10 000 steps per day are more likely to meet the current PA guidelines.[16] Others suggested an extra 3000 steps per day taken in 30 minutes, 5 days a week, or 3 sets of 1000 steps in 10 minutes every day.[32] None of the CV specialists in our study achieved the 10 000 steps during work hours, falling short 3500 to 4500 steps per day to the goal of 10 000 steps per day.

Categorization of activity level based on number of steps walked per day is commonly used in adults with <5000 steps/day (sedentary); 5000 to 7499 steps/day (low active); 7500 to 9999 steps/day (somewhat active); 10 000 to 12 499 steps/day (active); and ≥12 500 steps/day (highly active).[29] Tudor-Locke et al estimated that meeting the recommended PA goal requires taking 3000 to 4000 extra steps daily if at least moderate-intensity activity is attained. (ie, ≥100 steps per minute, accumulated in at least 10-minute bouts and taken over and above some minimal level of PA below which

Published online in Wiley Online Library (wileyonlinelibrary.com)
DOI:10.1002/clc.21954

Table 2. Work-Related Physical Activity Among Cardiovascular Specialists

	Total		Cardiothoracic Surgeons, n = 8		Cardiac Anesthesiologists, n = 8		General Cardiologists, n = 7		Procedural Cardiologists, n = 5		
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	*P* Value[a]
Age, y	39.5	9.1	39.4	3.2	41.8	10.3	39.4	10.8	37.5	13.7	0.53
BMI, kg/m^2	25.1	2.2	24.9	2.2	25.3	2.3	25.7	2.7	23.97	0.9	0.57
Waist circumference, in	35.2	2.8	34.5	2.3	35.1	1.7	37.8	3.8	33	0.8	0.07
Heart rate, bpm	65.1	9.1	65	4.7	62.5	7.98	69	13.8	64	9.2	0.75
MBP, mm Hg	88.9	6.1	91.7	4.7	88.8	6.34	88.7	7.2	84	3.98	0.16
Daily steps	6010.6	1999.6	6038.8	2540	5553.3	1762	6540.1	2204.3	5910.4	1388	0.94
Hours of work	10.65	1.6	12.4	1.4	9.3	0.98	10.1	1.2	10.8	0.8	0.008
Steps per hour	574.7	168.2	478.2	177.6	594.9	173.4	683.6	160.3	542	89.3	0.26

Abbreviations: BMI, body mass index; MBP, mean blood pressure; SD, standard deviation. [a]Kruskal-Wallis test.

individuals might be classified as sedentary).[30] If work-related PA is the only source of PA for the CV physicians in this study, a daily average of 6010 steps per day would place these physicians in the category of "low active." This suggests that these physicians would still need to engage in PA outside of their work hours to meet the current PA recommendation guidelines.

Our study demonstrated that CV physicians works long hours (average, 10.65 hours per day). Therefore, it might be more difficult for them to participate in additional PA than it is for the general population. Although 89% of US cardiologists regularly exercise at least 1 time weekly,[22] it is important to recognize that work-related activity alone will not likely provide the recommended level of PA needed to maintain health and prevent adverse health outcomes in this population. Studies focusing specifically on PA outside of work hours for CV specialists are required to address this issue.

One of the strengths of our study is that it is the first study to our knowledge to use pedometers to measure work-related PA in CV physicians. A 2-week study period ensured a reliable and valid estimate of number of steps walked. The study is limited by its small sample size and the fact that we recruited physicians from a single institution, which limits the generalizability of the results. There might have been some selection bias as active, healthy physicians might have been more likely to agree to participate. Our study population has an overall good health profile as represented by young age, low BMI, and low rates of smoking, hypertension, and diabetes. Therefore, the daily average of 6010 steps per day in our study population might be an overestimate when compared to the total number of steps actually walked by all CV specialists in the general population, which is likely to be less healthy. Although pedometers have been studied extensively to measure PA,[13,33] they, unlike accelerometers, are not capable of measuring the intensity of the PA. Therefore, it is not possible to estimate how much moderate-intensity PA our study population had achieved during their work day. In addition, the study subjects were not blinded to the pedometer reading, providing another potential source of bias.

Conclusion

In this small, single-center study, work-related PA of CV specialists did not meet the recommended guidelines of PA. Obtaining the recommended activity level might be a challenge for them, given their busy work schedule. Therefore, CV specialists must engage in additional, out-of-hours exercise to achieve the recommended amount of daily exercise.

References

1. Roberts CK, Barnard RJ. Effects of exercise and diet on chronic disease. *J Applied Physiol.* 2005;98:3–30.
2. Sesso HD, Paffenbarger RS Jr, Lee I. Physical activity and coronary heart disease in men: the Harvard Alumni Health Study. *Circulation.* 2000;102:975–980.
3. Campbell NR, Burgess E, Choi BC, et al. Lifestyle modifications to prevent and control hypertension. 1. Methods and an overview of the Canadian recommendations. Canadian Hypertension Society, Canadian Coalition for High Blood Pressure Prevention and Control, Laboratory Centre for Disease Control at Health Canada, Heart and Stroke Foundation of Canada. *CMAJ.* 1999;160:S1–S6.
4. Blair SN, Goodyear NN, Gibbons LW, et al. Physical fitness and incidence of hypertension in healthy normotensive men and women. *JAMA.* 1984;252:487–490.
5. Choi BCK, Shi F. Risk factors for diabetes mellitus by age and sex: results of the National Population Health Survey. *Diabetologia.* 2001;44:1221–1231.
6. Lynch J, Helmrich SP, Lakka TA, et al. Moderately intense physical activities and high levels of cardiorespiratory fitness reduce the risk of non-insulin-dependent diabetes mellitus in middle-aged men. *Arch Intern Med.* 1996;156:1307–1314.
7. Perry IJ, Wannamethee SG, Walker MK, et al. Prospective study of risk factors for development of non-insulin dependent diabetes in middle aged British men. *BMJ.* 1995;310:560–564.
8. Lee I. Physical activity and cancer prevention-data from epidemiologic studies. *Med Sci Sports Exerc.* 2003;35:1823–1827.
9. Thune I, Furberg AS. Physical activity and cancer risk: dose-response and cancer, all sites and site-specific. *Med Sci Sports Exerc.* 2001;33:S530–S550; discussion S609–S610.
10. Tomeo C, Colditz GA, Willett WC, et al. Harvard Report on Cancer Prevention: Vol 3: Prevention of colon cancer in the United States. *Cancer Causes Control.* 1999;10:167–180.
11. Bassett DR, Strath SJ. Use of pedometers to assess physical activity. In: Welk GJ, ed. *Physical Activity Assessments for Health–Related Research.* Champaign, IL: Human Kinetics; 2002:163–177.

Published online in Wiley Online Library (wileyonlinelibrary.com)
DOI:10.1002/clc.21954

12. Welk GJ, Differding JA, Thompson RW, et al. The utility of the Digi-walker step counter to assess daily physical activity patterns. *Med Sci Sports Exerc.* 2000;32(9 Suppl):S481–S488.
13. Tudor-Locke C, Williams JE, Reis JP, et al. Utility of pedometers for assessing physical activity: convergent validity. *Sports Med.* 2002;32:795–808.
14. Haskell WL, Lee IM, Pate RR, et al. Physical activity and public health: updated recommendation for adults from the American College of Sports Medicine and the American Heart Association. *Circulation.* 2007;116:1081–1093.
15. US Department of Health and Human Services. *The Surgeon General's Vision for a Healthy and Fit Nation: A Report of the Surgeon General.* Rockville, MD: US Department of Health and Human Services, Public Health Service, Office of the Surgeon General; 2010.
16. Le Masurier GC, Sidman CL, Corbin CB. Accumulating 10,000 steps: does this meet current physical activity guidelines? *Res Q Exerc Sport.* 2003;74:389–394.
17. Moreau KL, Degarmo R, Langley J, et al. Increasing daily walking lowers blood pressure in postmenopausal women. *Med Sci Sports Exerc.* 2001;33:1825–1831.
18. Sugiura H, Sugiura H, Kajima K, et al. Effects of long-term moderate exercise and increase in number of daily steps on serum lipids in women: randomised controlled trial [ISRCTN21921919]. *BMC Women's Health.* 2002;2:3.
19. Bravata DM, Smith-Spangler C, Sundaram V, et al. Using pedometers to increase physical activity and improve health: a systematic review. *JAMA.* 2007;298:2296–2304.
20. Steele R, Mummery K. Occupational physical activity across occupational categories. *J Sci Med Sport.* 2003;6:398–407.
21. Lobelo F, Duperly J, Frank E. Physical activity habits of doctors and medical students influence their counselling practices. *Br J Sports Med.* 2009;43:89–92.
22. Abuissa H, Lavie C, Spertus J, et al. Personal health habits of American cardiologists. *Am J Cardiol.* 2006;;97:1093–1096.
23. Wells KB, Lewis CE, Leake B, et al. Do physicians preach what they practice? A study of physicians' health habits and counseling practices. *JAMA.* 1984;252:2846–2848.
24. Hash RB, Munna RK, Vogel RL, et al. Does physician weight affect perception of health advice? *Prev Med.* 2003;36:41–44.
25. Atkinson J, Goody RB, Walker CA. Walking at work: a pedometer study assessing the activity levels of doctors. *Scott Med J.* 2005;50:73–74.
26. Bassett DR Jr, Wyatt HR, Thompson H, et al. Pedometer-measured physical activity and health behaviors in United States adults. *Med Sci Sports Exerc.* 2010;42:1819–1825.
27. Troiano RP, Berrigan D, Dodd KW, et al. Physical activity in the United States measured by accelerometer. *Med Sci Sports Exerc.* 2008;40:181–188.
28. Conzett-Baumann K, Jaggi GP, Husler A, et al. The daily walking distance of young doctors and their body mass index. *Eur J Intern Med.* 2009;20:622–624.
29. Tudor-Locke C, Bassett DR Jr. How many steps/day are enough? Preliminary pedometer indices for public health. *Sports Med.* 2004;34:1–8.
30. Tudor-Locke C, Hatano Y, Pangrazi RP, et al. Revisiting "how many steps are enough?" *Med Sci Sports Exerc.* 2008;40:S537–S543.
31. Choi BC, Pak AW, Choi JC, et al. Daily step goal of 10,000 steps: a literature review. *Clin Invest Med.* 2007;30:E146–E151.
32. Marshall SJ, Levy SS, Tudor-Locke CE, et al. Translating physical activity recommendations into a pedometer-based step goal: 3000 steps in 30 minutes. *Am J Prev Med.* 2009;36:410–415.
33. Schmidt MD, Blizzard CL, Venn AJ, et al. Practical considerations when using pedometers to assess physical activity in population studies: lessons from the Burnie Take Heart Study. *Res Q Exerc Sport.* 2007;78:162–170.

Published online in Wiley Online Library (wileyonlinelibrary.com)
DOI:10.1002/clc.21954