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Epidemiology

Does provider advice to increase physical activity differ by activity level among US adults with cardiovascular disease risk factors?

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Abstract

Background. Regular physical activity (PA) lowers the risk of cardiovascular disease (CVD), but few US adults meet PA guidelines. The United States Preventive Services Task Force (USPSTF) recommends primary care providers offer PA counselling for CVD prevention. We examined the association between adherence to PA guidelines and reported provider advice to increase PA among US adults with overweight/obesity and ≥1 additional CVD risk factor.

Methods. Cross-sectional data from the National Health and Nutrition Examination Survey (2011–2014) on PA and provider advice to increase PA were analysed for 4158 adults (≥20 years old) with overweight/obesity who reported ≥1 of hypertension, high cholesterol or impaired fasting glucose. Adherence to federal PA guidelines was determined using self-reported PA data from the Global Physical Activity Questionnaire. Meeting PA guidelines was defined as ≥150 minutes/week moderate intensity PA, ≥75 minutes/week vigorous intensity, or an equivalent combination. Participants self-reported provider advice to increase PA.

Results. In total, 57.7% of US adults with overweight/obesity and ≥1 additional CVD risk factor who did not meet PA guidelines reported provider advice to increase PA compared to 49.7% of adults who met PA guidelines. Adults who did not meet PA guidelines were more likely to report provider PA advice (aOR = 1.21; 95% CI = 1.00–1.47).

Conclusions. US adults with CVD risk factors who do not meet PA guidelines are more likely to receive provider advice to increase PA, but only half receive such advice. Strategies to increase provider advice are needed to improve adherence to USPSTF guidelines among US adults with overweight/obesity and additional CVD risk factors.

Key words: Internal medicine, lifestyle modification/health behaviour change, obesity, physical activity/exercise, prevention, primary care.

Introduction

Cardiovascular disease (CVD) remains pervasive among US adults (1). A strong body of evidence identifies physical activity (PA) as a key factor in stabilizing weight, lowering blood pressure, controlling blood glucose levels, and reducing CVD risk and premature death (1,2). PA has numerous health benefits for adults with CVD risk factors such as hypertension (3), dyslipidaemia (4) and/or impaired fasting glucose (5). Federal guidelines recommend that US adults engage in >150 minutes of moderate-intensity PA or 75 minutes of vigorous-intensity PA, or an equivalent combination weekly; which are consistent across individuals with CVD risk factors or pre-existing CVD (1,2). Only 50% of US adults meet these guidelines (1), and rates are lower among adults with CVD risk factors (6): 43% of adults with obesity (7), 32% with hypertension (8) and one-third with type 2 diabetes met PA guidelines (9).

Strategies are needed to increase PA among inactive adults with CVD risk factors (7–10). In 2012, the United States Preventive Services Task Force (USPSTF) found primary care PA counselling for US adults without CVD risk factors or pre-existing CVD resulted in small health benefits and suggested that primary care providers offer it at their discretion (10). An updated statement in 2014 recommended that primary care providers refer or offer PA behavioural counselling interventions specifically to US adults with overweight/obesity and at least one additional CVD risk factor, including individuals with pre-existing CVD (10,11). While this recommendation was based on a USPSTF systematic review of literature focused on this population who may greatly benefit from increased PA, other reviews cite inconsistent findings to support the cardiovascular benefits of primary care PA counselling (12). For example, while some randomized-controlled trials found primary care PA counselling increased PA among sedentary individuals, there was limited evidence for the effectiveness of exercise referral programmes compared to direct counselling and little impact on CVD (12). Other PA promotion interventions in primary care settings have observed small, positive changes in PA but inconclusive evidence to determine which intervention components were most effective (13). Thus, while PA promotion in primary care may modestly improve PA levels, conclusions about cardiometabolic changes or intervention component effectiveness cannot be made given the quality of evidence.

Despite inconsistent evidence supporting current primary care PA interventions, primary care remains a central setting to address physical inactivity because providers are well trusted and regularly see patients with chronic conditions (11,14,15). Physician trustworthiness is associated with patient adherence, satisfaction and improvements in self-reported health outcomes (15), and roughly half of primary care visits are by patients experiencing at least one chronic condition (14). Report of provider advice to increase PA improved (23% to 32%) between 2000 and 2010, and US adults with obesity reported the greatest improvement (35%–47%) (16). Similar trends were observed for adults with hypertension, CVD and diabetes (16). Another nationally representative cross-sectional analysis from 2012 found no association between sedentariness and receipt of provider advice for PA among all US adults; however, overweight adults and those with multiple comorbidities were up five times more likely to report provider advice to increase PA compared to normal weight individuals or those with no comorbidities (17).

While research describes provider advice for PA among US adults generally, among those with CVD risk factors, and sedentary individuals (6–9,17), the literature does not address provider advice for PA among active and inactive US adults with CVD risk factors. The current study seeks to extend existing knowledge by examining PA level and provider PA advice within a specific population of adults who are eligible to receive behavioural counselling per USPSTF guidelines. Documenting the proportion and likelihood of receiving provider advice for PA according to PA levels may provide primary care providers with a baseline of recent practice and emphasize the need to develop innovative and effective PA promotion strategies for a high-risk population. The aim of this study was to examine the association between reported adherence to PA guidelines and provider advice for PA among US adults with overweight/obesity and at least one additional CVD risk factor. We hypothesized that among US adults with overweight/obesity and at least one additional CVD risk factor, those not meeting PA guidelines will be more likely to report provider advice to increase PA.

Methods

The National Health and Nutrition Examination Survey (NHANES) 2011–2012 and 2013–2014 provided data for this analysis. NHANES utilizes a complex, four-stage, probability sampling design to fulfil the goal of obtaining health data for a nationally representative, civilian and community-dwelling population (18). Data were collected through in-home questionnaires and a physical examination. Each participant provided written informed consent prior to the study.

Measures

Our analytic sample was composed of overweight or obese adults (≥20 years old) with at least one additional CVD risk factor. We retained participants with a history of CVD who had ever been told by a health professional that they had coronary heart disease, heart attack, angina, stroke and/or congestive heart failure. Body mass index was calculated from measured weight and height and categorized as: underweight (<18.5 kg/m^2), normal weight (18.5–24.9 kg/m^2), overweight (25.0–29.9 kg/m^2) and obese (≥30.0 kg/m^2) (19). Following the USPSTF definition of CVD risk factors, participants were categorized as having at least one CVD risk factor if they reported ever being told by a physician or healthcare provider that they had hypertension, high cholesterol or impaired fasting glucose; the latter was determined by report of provider diagnosis of diabetes or prediabetes/impaired fasting glucose/borderline diabetes. Participants who reported 'don't know' or 'refused' for a risk factor were coded as missing.

Adherence to PA guidelines

PA questions were based on the adapted Global Physical Activity Questionnaire (20). Participants self-reported frequency (days) and duration (minutes) of moderate- and vigorous-intensity PA within three domains: (i) work, (ii) recreational and (iii) transportation. Participants who answered 'no' to participating in moderate- (MPA) or vigorous-intensity (VPA) PA within any of these three domains were defined as having 0 minutes of PA per week for that domain. Individuals who refused or responded with 'don't know' were defined as missing PA data. Total MPA and VPA were calculated by multiplying the duration by frequency reported for each intensity level and summing across domain types. Following federal PA guidelines, we calculated moderate- to vigorous-equivalent PA (MVPA) minutes by summing two times total moderate-intensity minutes with total vigorous-intensity minutes (2). Adherence to PA guidelines was dichotomized so that if participants reported ≥150 minutes per week of MPA or ≥75 minutes of VPA or an MVPA-equivalent combination were categorized as meeting PA guidelines. Participants with <150 minutes of equivalent MVPA minutes per week were categorized as not meeting PA guidelines.

Provider advice to increase physical activity

Participants who responded 'yes' to 'to lower your risk for certain diseases, during the past 12 months have you ever been told by a doctor or healthcare provider to increase your physical activity or exercise?' were categorized as having received provider advice to increase PA. Responses of 'no' were categorized as no advice received, and those who refused were categorized as missing.

Covariates

Participants self-reported demographic data including age in years, gender, race/ethnicity (non-Hispanic white, Hispanic, non-Hispanic black, other race/ethnicity including multi-racial) and income. A ratio of family income to poverty was categorized to align with federal assistance programmes: <100% poverty or 'below poverty' (PIR < 1.00), 1.00–1.30, 1.31–1.85, >1.85 (21). Past-year healthcare utilization was categorized as: none, 1–3 visits and ≥4 visits. A response of 'yes' to 'do you have difficulty walking without using any special equipment?' was categorized as having a functional impairment, 'no' if otherwise and values were reassigned as missing if participant refused to answer or replied 'don't know'.

Statistical analysis

Analyses were performed using Stata (version 13.1; StataCorp LP, College Station, TX). Sampling weights were used to produce nationally representative estimates. Descriptive statistics (unweighted counts, weighted counts, means, linearized standard errors, weighted percentages and 95% CIs) were obtained. Linear regression for continuous variables and chi-squared tests for categorical variables determined differences in descriptive statistics by adherence to PA guidelines. To evaluate the primary research question, a logistic regression model estimated the crude and multivariable-adjusted associations between meeting PA guidelines and report of provider PA advice. A list of covariates were derived from the literature (1,14,17).

Table 1. Characteristics of US adults with overweight or obesity with ≥1 cardiovascular risk factor by physical activity (PA) guideline adherence (n = 4158), NHANES 2011–2014, weighted % (95% CI).

Characteristics	Did not meet PA guidelines	Met PA guidelines
Sample (n)	1979	2179
Weighted sample (n)	38 968 653	47 794 666
Age (years)[a]	57.9 (0.3)	52.2 (0.4)
Female	59.5 (56.4–62.6)	41.3 (38.4–44.2)
Race/ethnicity		
Hispanic	11.6 (8.7–15.3)	12.4 (9.3–16.3)
Non-Hispanic black	12.7 (9.6–16.6)	11.4 (8.8–14.7)
Other race: including multi-racial	4.9 (3.8–6.4)	5.0 (4.0–6.2)
Non-Hispanic white	70.8 (65.3–75.7)	71.3 (65.7–76.3)
Ratio of family income to poverty		
<1.00	16.1 (13.4–19.2)	12.1 (10.1–14.4)
1.00–1.30	10.4 (8.5–12.5)	7.0 (5.7–8.5)
1.31–1.85	11.1 (9.1–13.4)	10.6 (8.7–12.7)
>1.85	62.5 (57.7–67.1)	70.4 (66.7–73.9)
Past-year healthcare utilization		
1–3 visits	38.6 (34.8–42.5)	48.6 (45.7–51.5)
4 visits or more	56.4 (52.1–60.6)	41.9 (39.3–44.5)
None	5.0 (3.7–6.8)	9.5 (7.8–11.5)
Functional impairment present	17.4 (15.3–19.7)	5.4 (4.3–6.8)

[a]Mean (SE).

We included in the adjusted logistic regression model those variables that were associated with PA level and/or report of provider advice to increase PA in the current sample, which included age, gender, race/ethnicity, income, past-year healthcare utilization and functional impairment.

Results

Among the 4533 adults aged ≥20 years with overweight or obesity and at least one additional CVD risk factor in NHANES (2011–2014), we excluded pregnant women (n = 20) and participants missing data on any covariates (ratio of family income to poverty [n = 353], past-year healthcare utilization [n = 1]and education [n = 1]). This resulted in an analytic sample of 4158 representing 86 763 319 US adults with overweight or obesity and at least one additional CVD risk factor. A majority were non-Hispanic white (71.1%; 95% CI = 65.8–75.8), on average 54.7 years old, and more than half (55.1%; 95% CI = 52.5–57.6) met PA guidelines. US adults who did not meet PA guidelines compared to those who did were older, women, below poverty, utilized healthcare and with a functional impairment (Table 1).

Fifty-three per cent (53.3%, 95% CI = 50.8–55.8) of US adults reported receiving provider advice to increase PA. Almost 6 in 10 (57.7%) adults who did not meet PA guidelines reported provider advice to increase PA compared to 49.7% of adults who adhered to PA guidelines (Table 2). Those who did not meet PA guidelines were more likely to report provider advice for PA (aOR = 1.21; 95% CI = 1.00–1.47; P = 0.049; Table 2) after adjusting for age, gender, race/ethnicity, income, healthcare utilization and functional impairment. Women had 44% the odds of reporting provider advice to increase PA (aOR = 1.44; 95% CI = 1.22–1.71) as compared to men. Hispanic (aOR = 2.07; 95% CI = 1.55–2.79) and non-Hispanic black (aOR = 1.68; 95% CI = 1.38–2.06) adults had increased odds as compared to non-Hispanic white adults. People who reported ≥4 visits to their provider in the past year had seven times the odds of reporting being advised to increase PA (aOR = 7.34; 95% CI = 4.12–13.10) when compared to no visits (Table 2).

Discussion

About half of US adults with overweight or obesity and at least one additional CVD risk factor reported receiving advice from their provider in the past 12 months to increase their PA. Those who did not meet PA guidelines were more likely to report provider advice to increase PA than those who did meet PA guidelines. Women, Hispanic and black adults and those who reported more regular visits to their doctor in the past year were also more likely to report receiving provider advice to increase PA.

The rate of provider advice in this study was higher compared to previous studies examining the extent to which US adults receive provider advice to increase PA. A 2001 survey of US adults (n = 1818) found that less than one-third (28%) reported receiving physician advice to increase their PA (22). While these rates have increased over time, only 32.4% and 36.3% of US adults reported receiving provider advice to increase PA in 2010 and 2012, respectively (16,17). It is important to note that the previous literature included all US adults, and our findings among US adults with overweight/obesity and one additional CVD risk factor suggest that those with a higher need for engaging in activity are more likely to report receiving advice to do so. This is consistent with previous research demonstrating increased advice for those with health conditions (22,23). For example, 46.8% of obese US adults reported receiving

Table 2. Association between meeting physical activity (PA) guidelines and report of physician PA advice among overweight/obese US adults with ≥1 additional cardiovascular risk factor (n = 4158), NHANES 2011–2014

	Reported physician/healthcare provider advice to increase PA, weighted % (95% CI)	Crude OR (95% CI)	Adjusted OR[a] (95% CI)
Physical activity guidelines			
Did not meet PA guidelines	57.7 (54.2–61.2)	1.38 (1.18–1.62)	1.21 (1.00–1.47)
Met PA guidelines	49.7 (46.8–52.6)	ref	Ref
Age			0.99 (0.99–1.00)
Gender			
Female	59.7 (56.2–63.0)		1.44 (1.22–1.71)
Male	47.1 (44.4–49.9)		(ref)
Race/ethnicity			
Hispanic	62.4 (57.0–67.5)		2.07 (1.55–2.79)
Non-Hispanic Black	62.7 (58.9–66.4)		1.68 (1.38–2.06)
Other race/ethnicity	55.2 (47.2–62.9)		1.26 (0.87–1.81)
Non-Hispanic White	50.1 (47.2–53.0)		(ref)
Ratio of family income to poverty			
<1.00	52.7 (48.5–56.8)		0.73 (0.61–0.88)
1.00–1.30	50.2 (44.6–55.8)		0.77 (0.61–0.97)
1.31–1.85	56.6 (50.6–62.4)		0.99 (0.73–1.34)
>1.85	53.3 (50.3–56.3)		(ref)
Past-year healthcare utilization			
1–3 visits	51.3 (47.7–55.0)		5.09 (3.14–8.25)
4 visits or more	60.6 (57.1–64.0)		7.34 (4.12–13.10)
None	17.6 (12.0–25.2)		(ref)
Functional Impairment			
Yes	62.2 (57.3–66.7)		1.24 (0.98–1.57)
No	52.2 (49.5–54.9)		(ref)

[a]Adjusted for covariates in the table.

provider advice in 2010 (16), 15% of sedentary persons reported being told by their provider to exercise more (23), and adults with CVD and CVD risk factors such as diabetes, high blood pressure, high cholesterol and overweight or obesity are more likely to receive a provider recommendation to increase PA (24,25).

The difference in the rates of provider recommendation between those who are active and those who are inactive concurs with a previous national survey of Australians (26), but differs from an NHANES study where inactive US adults were no more likely to receive provider advice to increase PA compared to individuals who reported being active (17,26). Our findings suggest that providers may limit their PA counselling only to patients whom they believe need it (i.e. inactive individuals), while refraining from suggesting additional activity to patients who already engage in recommended levels of PA. However, while we found a difference in the proportion of patients who report provider advice to increase PA by activity level, only 58% and 50% of US adults with overweight/obesity and at least one additional CVD risk factor reported receiving advice to increase PA, suggesting that counselling rates are suboptimal regardless of activity level.

Primary care providers may encounter several barriers to PA promotion within the clinical setting including a lack of time, reimbursement, routine PA screening, provider's PA level and skills and training (27). While we lacked the data to examine this barrier in the current study, providers may be hesitant to provide PA counselling if their own physical activity is insufficient as evidenced by research that shows that providers who are inactive are less likely to advise their patients to increase PA (28). Provider's perceived lack of skills and tools to provide adequate counselling is an often reported barrier (27). This barrier may be the result of gaps in pre- and post-graduate training as demonstrated in a review of medical school curricula that found PA content is largely absent, and that, as of 2013, more than one-half of the physicians trained in the US received no formal education on PA (29). Additionally, primary care providers may not feel equipped to help patients address barriers to PA outside the clinical setting due to lack of knowledge of referral resources in the community that support safe opportunities for PA (27).

Recent innovations may help providers overcome these barriers to offering PA counselling. The Community Guide recommends clinical decision support systems for CVD prevention (30). These systems are health information technologies designed to enhance provider decision making and efficiency within clinical workflow through tools such as alerts and evidence-based recommendations based on patient data (30). While the use of decision support systems specifically for PA promotion is understudied, previous research has found modest improvements in provider advice for PA (30) and preliminary success in improved diabetes care and outcomes (31). Despite these encouraging findings, an accompanying paradigm shift in PA is necessary to increase promotion within primary care settings.

The Exercise is Medicine (EIM) initiative is a multi-pronged approach that encourages primary care providers to include PA in treatment planning and may help providers overcome PA promotion barriers (32). Clinics that followed EIM's recommendation to treat PA as a vital sign and implemented a two-item PA questionnaire in the electronic health record found an increased likelihood of physician PA counselling, reduced weight in overweight patients, and greater declines in HbA1c levels (33). EIM also guides providers in determining patients' readiness for change, prescribing disease-specific PA and identifying local community-based PA resources (32). Although the integration of PA promotion into resident-focused curriculum is understudied, one study found a course based on EIM principles to be efficacious, feasible and a potential strategy to enhance providers' PA counselling skills (34). Increased use and sophistication

of clinical decision support systems that capture PA as a vital sign, multi-pronged approaches that include PA in primary care treatment planning, and advances to pre- and post-graduate medical training may help address providers' barriers to providing or referring eligible patients to PA counselling.

This study has limitations. First, the cross-sectional study design does not allow for establishment of temporality nor causality. Issues with temporality are possible because participants were asked to report provider advice to increase PA during the past 12 months and it may be that adults with initially low PA levels increased PA to recommended levels due to previous provider advice, which could explain our finding that people meeting PA guidelines are less likely to be counselled. Future research may consider implementing a longitudinal study that examines whether PA increases following provider advice. Second, current PA, receipt of provider PA advice, and presence of hypertension, high cholesterol or impaired fasting glucose were self-reported and subject to recall bias. While participants may have forgotten advice that was provided, only provider advice that is remembered has the potential to change behaviour. Misclassification of adherence to PA guidelines may result from participants misreporting the amount or intensity of PA, but a validation study of NHANES 2003–2004 found that self-reported PA was highly correlated with objectively measured PA among people engaging in PA for cholesterol control (35). It is important to note that the percentage of US adults reporting PA advice in the current study may include reports from a provider outside the primary care setting. The operational and conceptual definition of the outcome may be misaligned because report of provider PA advice was a proxy for being offered or referred to intensive behavioural counselling interventions.

This study also had several strengths. Our findings are generalizable to US adults with overweight or obesity and at least one additional CVD risk factor. To our knowledge, this is the first study to specifically examine adherence to PA guidelines and provider PA advice within a population for whom increased PA would provide significant health benefits. Federal PA guidelines indicate all PA domains can contribute to reaching adequate PA levels; therefore, our use of all domains to determine adherence to guidelines may represent a more accurate PA estimate (36).

Primary care providers have been identified as important motivators to address PA and chronic disease prevention and treatment among patients with CVD risk factors (14,15). While findings from this analysis are promising for those individuals with CVD risk factors, the percentage of eligible US adults reporting provider advice is subpar. Strategies to improve PA promotion include innovations in clinical decision supports to reduce burden and enhance clinical workflow and endorsement of the concept of PA as a vital sign. Future research is needed to better understand provider barriers to PA counselling and develop novel primary care strategies that address these barriers and to monitor the percentage of US adults with overweight/obesity and additional CVD risk factors receiving provider advice to increase PA over time.

Declaration

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Conflict of interest. The authors declare no conflicts of interest.

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