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High prevalence of physical inactivity among patients from the Swiss HIV Cohort Study

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ABSTRACT

Physical activity (PA) can improve cardiorespiratory status, strength, body composition and quality of life for patients infected with HIV. Evidence from HIV-uninfected populations also shows that PA is associated with a lower risk of mortality, primarily death due to cardiovascular causes. There is, however, a lack of data on how physically active HIV-infected patients are. In this study, we assessed levels of self-reported PA over time in patients enrolled in the Swiss HIV Cohort Study, a large multicentre prospective observational cohort study. We included a total of 10,540 patients who completed at least one report of PA between December 2009 and November 2014 during routine clinical follow-up (scheduled every 6 months). In the first year after December 2009 there was a higher rate of non-response so these data are of a lesser reliability. Over the next four years, the percentage of patients reporting no free-time PA at all declined from 49% to 44%. In contrast, in two "Sport Switzerland" surveys of the general population in 2008 and 2014, the percentage of individuals reporting no sports activities at all was considerably lower and relatively stable over time (27% in 2008; 26% in 2014). In our analysis, the percentage of patients reporting sedentary activity at work increased from 23% to 26% over the four years. Subgroup findings suggest differences between women and men and between patients classified by their age, stage of infection and CD4 cell count. Integrating PA counselling into the routine care of HIV-infected patients and promoting PA among this population has the potential to improve the general state of health and quality of life for HIV-infected patients and reduce their risk of cardiovascular disease.

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Introduction

Cardiovascular risk factors are prevalent among HIV-infected patients (Glass et al., 2006; Sabin et al., 2008) and cardiovascular disease (CVD) has become a major cause of morbidity and mortality in this population (Freiberg et al., 2013). Modifiable risk factors are therefore important to reduce patients' risk of CVD.

Physical activity (PA) has been shown to have a positive effect on patients' cardiovascular and psychosocial health (Bopp, Phillips, Fulk, & Hand, 2003; Dudgeon, Phillips, Bopp, & Hand, 2004; Jaggers & Hand, 2016; O'Brien, Nixon, Tynan, & Glazier, 2010; O'Brien, Nixon, Tynan, & Glazier, 2004; O'Brien, Tynan, Nixon, & Glazier, 2008; O'Brien, Tynan, Nixon, & Glazier, 2016; Yahiaoui, McGough, & Voss, 2012). Benefits include decreased blood pressure, improved blood lipids, and decreased severity of depressive symptoms. Evidence from HIV-uninfected populations also shows that PA is associated with a lower risk of mortality, primarily death due to CVD (Arem et al., 2015; Paffenbarger, Hyde, Wing, & Hsieh, 1986).

There is, however, a lack of data on PA in HIV-infected patients. In a recent systematic review, 24 observational studies were identified where the prevalence of PA was estimated (Schuelter-Trevisol et al., 2012) but the diversity of the methods used to assess PA precluded calculating a pooled estimate. The percentage of patients

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with a sedentary lifestyle or physical inactivity was reported in 13 studies and ranged from 19% to 73%.

In this study, we used data from the Swiss HIV Cohort Study (SHCS) to estimate levels of self-reported PA over time. We used this study to indirectly validate questions in the SHCS on free-time PA by comparing SHCS data with data collected in the "Sport Switzerland" 2014 survey of the general population (Lamprecht, Fischer, & Stamm, 2014).

Methods

Patients

The SHCS is a multicentre prospective observational cohort study with continuing enrolment of HIV-infected adults (Schoeni-Affolter et al., 2010). Any HIV-infected patient at least 18 years old can enrol in the SHCS. Written informed consent is required from all patients. Data collection has been approved by the local ethics committee at each participating hospital (Swiss HIV Cohort Study, 2013).

Four questions on PA were introduced into routine clinical follow-up in December 2009 (Table 1). In January 2013, the two questions on housework were replaced by an additional category in the question on work-related PA ("Housewife/househusband"). Patients were asked to respond to these questions at each follow-up visit with visits scheduled every 6 months at one of the seven hospitals or at practices of participating physicians.

PA may be work related or during the patient's free time. We therefore combined the information from two questions to give a derived measure of a patient's overall PA. Patients were classified as having either a sedentary, moderately active, or highly active lifestyle. The sedentary group comprised patients with: (1) free-time PA at most 1–2 times per month and (2) either not working or sedentary activity at work. The highly active group comprised patients with: (1) free-time PA at least 5 times per week or (2) intense work-related PA. Moderately active patients were those not in one of the other two groups. After January 2013, we re-classified the work-related PA category "Housewife/husband" as "Doesn't work" to bridge the change in the way questions were asked and create categories that were consistent over time.

Table 1. Questions on PA introduced into routine clinical follow-up of the SHCS in December 2009.

Question	Answer options
PA in free time (in units of 10–20 min of rapid walking or fitness training)	Never 1–2 times per month 3–4 times per month 1–2 times per week 3–4 times per week ≥5 times per week
Work-related PA	Doesn't work Sedentary activity Standing activity Walks often Intense activity
Housework during last 6 months	Yes or no
If yes, number of hours of housework per week	

Note: PA, physical activity.

Comparison with the general population

To indirectly validate the question on free-time PA used in the SHCS, we included a comparison with data recently collected in the "Sport Switzerland" 2014 survey of the general population (Lamprecht et al., 2014). We considered evidence in SHCS data for three broad conclusions of the survey: (1) men are more physically active than women and young people are more physically active than older people, with clear-cut differences in PA profiles between women and men as they age; (2) individuals with higher education are more physically active than those with lower education; and (3) residents in the German-speaking regions of Switzerland are more physically active than those in the French- and Italian-speaking regions.

Statistics

We used a population-based approach to assess levels of PA over time. At each report completed by a patient between December 2009 and November 2014, the patient's age, stage of infection, CD4 cell count, and HIV RNA (viral load) were determined. We also determined CVD risk factors (smoking status and body mass index), patient history of coronary heart disease (CHD, defined as myocardial infarction or invasive cardiovascular procedure), diabetes, hypertension, and blood lipids. For patients without a history of CHD, the 10-year CHD risk was calculated according to the Framingham Point Score (Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults, 2001). We used summary statistics where we divided time since December 2009 into 12-month periods and graphs where we divided time since December 2009 into 6-month periods to explore changes in levels of PA over time. SAS 9.4 (SAS Institute Inc., Cary, NC) and R 3.3.1 (R Foundation for Statistical Computing, Vienna, Austria) and the add-on package lattice 0.20–34 (Sarkar, 2008) were used for analyses and graphics.

Results

Patients

During the study period, a total of 10,540 patients completed at least one report of PA. Over the five years since

December 2009, the median age increased from 45 to 48 years, median CD4 cell count increased from 525 to 600 cells/μl, and the percentage of patients with a suppressed viral load increased from 77% to 89%. At the same time, the prevalence of diabetes increased from 10% to 12%, prevalence of hypertension increased from 34% to 36%, and the percentage of patients with a body mass index ≥30 kg/m^2 increased from 7% to 10% (Table 2).

Levels of PA over time

In the first year after December 2009, there was a higher rate of non-response so these data are of a lesser reliability (Table 3). Over the next four years, the percentage of patients reporting no free-time PA declined from 49% to 44%. In contrast, in two "Sport Switzerland" surveys of the general population in 2008 and 2014, the percentage of individuals reporting no sports activities was lower and relatively stable over time (27% in 2008; 26% in 2014) (Lamprecht et al., 2014). In our analysis, the percentage of patients reporting sedentary activity at work increased from 23% to 26%. Subgroup findings show that the percentage of patients with either a moderately active or highly active lifestyle increased among those 65 years or older (Supplemental material, Figure S1(a)). Patients with CDC category C infection and reduced CD4 cell count were less likely to be physically active than those in an early stage of infection and with higher CD4 cell counts (Figure S1 (b)–(c)).

Indirect validation of the question on free-time PA

Although the question on free-time PA used in the SHCS is simple, it reproduced data patterns of PA also seen in the general population. Men were more physically active than women, with continuously decreasing levels of free-time PA after the age of 25 (Figure S2(a)). Patients with higher completed education reported more free-time PA than those with lower completed education (Figure S2 (b)); and residents in the German-speaking regions of Switzerland showed a trend towards higher levels of free-time PA than those in the French- and Italian-speaking regions (Figure S2(c)).

Table 2. Characteristics of patients enrolled in the SHCS over time; data are taken from the first completed follow-up visit within each time period.

	Time period				
Characteristic	12/2009–11/2010	12/2010–11/2011	12/2011–11/2012	12/2012–11/2013	12/2013–11/2014
Number of patients under follow-up[a]	8104	8394	8635	8947	9162
Female (%)	30	29	29	29	29
Age, years	45	46	47	47	48
	(39, 51)	(39, 52)	(40, 53)	(40, 54)	(41, 54)
CD4 cell count, cells/μl	525	541	554	584	600
	(372, 705)	(389, 722)	(400, 735)	(422, 773)	(439, 794)
Suppressed viral load[b] (%)	77	81	85	86	89
Stage of infection (%)					
CDC category A	52	52	53	54	55
CDC category B	25	25	24	23	23
CDC category C	23	23	23	23	22
Obesity[c] (%)	7	8	9	10	10
Current smoker (%)	43	42	41	40	39
History of CHD[d] (%)	3	4	4	4	4
Diabetes[e] (%)	10	11	11	12	12
Hypertension[f] (%)	34	34	36	37	36
Total cholesterol, mmol/L	5.0	5.0	5.0	5.0	5.0
	(4.2, 5.7)	(4.3, 5.7)	(4.3, 5.7)	(4.3, 5.8)	(4.3, 5.7)
HDL cholesterol, mmol/L	1.2	1.2	1.2	1.3	1.3
	(1.0, 1.5)	(1.0, 1.5)	(1.0, 1.5)	(1.0, 1.6)	(1.0, 1.6)
Use of lipid-lowering medication (%)	12	12	13	12	11
Framingham risk score[g] (%)					
Low (<10%)	75	74	74	73	73
Moderate (10–20%)	21	23	23	24	24
High (>20%)	3	3	3	3	3

Notes: CDC, Centers for Disease Control and Prevention; CHD, coronary heart disease; HDL, high-density lipoprotein.
Data are median (interquartile range) if not stated otherwise.
[a]A patient was considered under follow-up if he/she had at least one follow-up visit in the respective time period.
[b]HIV RNA undetectable or below 50 copies/mL.
[c]Body mass index ≥30 kg/m^2.
[d]Myocardial infarction, coronary angioplasty/stenting, coronary artery by-pass grafting, carotid endarterectomy, procedures on other arteries.
[e]Clinical diagnosis, casual plasma glucose ≥11.1 mmol/L, fasting plasma glucose ≥7 mmol/L, or on antidiabetic medication or insulin.
[f]Systolic blood pressure ≥140 mmHg or diastolic blood pressure ≥90 mmHg (≥135/ ≥85 mmHg in diabetic patients) or on antihypertensive medication.
[g]Estimated risk of CHD in the next 10 years for patients without a history of CHD (Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults, 2001).

Table 3. Levels of PA of patients enrolled in the SHCS over time; data are taken from the first completed report within each time period.

	Time period				
Characteristic	12/2009–11/2010	12/2010–11/2011	12/2011–11/2012	12/2012–11/2013	12/2013–11/2014
Number of patients under follow-up[a]	8104	8394	8635	8947	9162
Free-time PA[b] (%)					
Missing data	13	0	1	1	0
Never	42	49	46	44	44
1–2 times per month	6	6	7	7	7
3–4 times per month	4	4	5	5	5
1–2 times per week	14	18	17	18	17
3–4 times per week	11	13	13	13	14
≥5 times per week	10	11	11	11	13
Work-related PA[c] (%)					
Missing data	12	0	0	1	0
Doesn't work	32	36	36	36	36
Sedentary activity	21	23	25	25	26
Standing activity	12	14	14	14	14
Walks often	18	20	19	18	18
Intense activity	6	6	6	6	6
Derived measure of overall PA[d] (%)					
Missing data	13	1	1	1	1
Sedentary lifestyle	29	33	32	33	31
Moderately active lifestyle	44	51	51	50	50
Highly active lifestyle	15	16	16	16	18

Note: PA, physical activity.
[a]A patient was considered under follow-up if he/she had at least one follow-up visit in the respective time period.
[b]In units of 10–20 minutes of rapid walking or fitness training.
[c]In January 2013 an additional category "Housewife/househusband" was introduced into the question on work-related PA. We re-classified patients reporting "Housewife/househusband" after this date as "Doesn't work" in order to bridge the change in the way questions were asked and create categories that were consistent over time.
[d]Patients were classified as either having a sedentary lifestyle, moderately active, or highly active lifestyle. The sedentary group comprised patients with: (1) free-time PA at most 1–2 times per month and (2) either not working or sedentary activity at work. The highly active group comprised patients with: (1) free-time PA ≥5 times per week or (2) intense work-related PA. Moderately active patients were those not in one of the other two groups.

Discussion

Physical inactivity is a public health concern (Kohl et al., 2012) given its detrimental effects on individuals' health (Wen & Wu, 2012) and evidence of effective PA promotion strategies (Heath et al., 2012). Our results suggest that in Switzerland HIV-infected patients engage in much less free-time PA than the general population. The questions on PA used in the SHCS do not allow an exact comparison with recommendations from the American College of Sports Medicine on the quantity and quality of exercise (Garber et al., 2011) but clearly many patients did not reach the recommendation for adults of at least 150 minutes of moderate-intensity exercise each week. Our data suggest a modest upward trend in levels of free-time PA in SHCS patients. At the same time, the percentage of patients reporting sedentary activity at work also increased. Both trends are plausible. However, as a consequence, our derived measure of a patient's overall PA was then relatively constant over time.

Evidence is growing that aerobic exercise or a combination of aerobic and resistive exercise at least 3 times per week is safe and can lead to improvements in cardiorespiratory fitness, strength, body composition, and quality of life for HIV-infected patients (O'Brien et al., 2016) but data on the prevalence of PA are scarce. The strengths of this study are a comprehensive dataset with information on PA routinely collected since December 2009 with a high response rate after the first year. There are limitations to the study. When constructing our derived measure of a patient's overall PA, we had to abandon any use of the questions on housework asked between December 2009 and January 2013. Our approach to bridging the change in the way data were collected assumes that housework is a sedentary activity, and this will underestimate PA for some patients. Further, PA was self-reported and this suggests the potential for PA to be overestimated due to a social desirability bias. External validity may be restricted to countries where both patient care and patient outcomes are similar to those in Switzerland (Lazarus et al., 2016).

Physical inactivity is an important behavioural risk factor for CVD (World Health Organization, 2009). It is therefore crucial to inform HIV-infected patients, who engage in much less free-time PA than the general population, about the health benefits of PA and motivate patients with a sedentary lifestyle to become physically active. Evidence from HIV-uninfected populations shows that PA is associated with a lower risk of mortality but that while more activity is better than less, there are diminishing returns (Arem et al., 2015). Integrating PA counselling into the routine care of HIV-infected patients and promoting PA among this population, for

example, through cost-effective behavioural skills training (Sevick et al., 2000), therefore has the potential to improve patients' general state of health and reduce their risk of CVD.

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Disclosure statement

No potential conflict of interest was reported by the authors.

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