



Influence of the workplace on physical activity and cardiometabolic health: Results of the multi-centre cross-sectional Champlain Nurses' study



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ARTICLE INFO

Keywords:

Cardiovascular diseases

Delivery of health care

Nurses

Motor activity

Women

Workplace

ABSTRACT

Background: Nurses are the largest professional group within the health care workforce, and their work is perceived as being physically demanding. Regular physical activity helps to prevent or ameliorate cardiometabolic conditions (e.g. cardiovascular disease, diabetes). It is not known whether Canadian nurses are meeting current physical activity guidelines.

Objective: To assess the influence of the workplace on the physical activity and cardiometabolic health of nurses from hospitals in the Champlain region of Ontario, Canada.

Design: A multi-centre, cross-sectional study.

Setting: Hospitals in the Champlain Local Health Integration Network of Ontario.

Methods: Nurses wore an ActiGraph accelerometer to objectively assess levels of moderate-to-vigorous intensity physical activity measured in minutes/day in bouts ≥ 10 min. All completed the Perceived Workplace Environment (PWE) scale and International Physical Activity Questionnaire (IPAQ). Height, body mass, waist circumference, blood pressure and heart rate were measured, and body mass index (BMI) was determined. Each nurse's 5-year cardiovascular risk was calculated using the Harvard Score.

Findings: A total of 410 nurses (94% female; mean \pm SD: age = 43 ± 12 years) from 14 hospitals participated. Nurses spent an average of 96 ± 100 min/week in bouts ≥ 10 min of moderate-to-vigorous intensity physical activity; 23% of nurses met recommended physical activity guidelines. Nurses working 8- vs. 12-h shifts (16 ± 16 vs. 10 ± 11 min/day, $p = 0.026$), fixed vs. rotating shifts (15 ± 15 vs. 12 ± 13 min/day, $p = 0.012$) and casual vs. full-time (29 ± 17 vs. 13 ± 15 min/day, $p < 0.001$) or vs. part-time (29 ± 17 vs. 13 ± 12 min/day, $p = 0.001$) accumulated more moderate-to-vigorous intensity physical activity in bouts ≥ 10 min. The average PWE score was 2.4 ± 0.9 , with no association between PWE scores and moderate-to-vigorous intensity physical activity in bouts ≥ 10 min ($p > 0.05$). Nurses working 8-h shifts, fixed shifts and in urban hospitals reported better PWE scores ($p < 0.05$). Nurses working fixed vs. rotating shifts had higher systolic blood pressure (median: 114 vs. 112 mmHg, $p = 0.043$), and nurses working in rural vs. urban hospitals had higher BMI (median: 27.8 vs. 25.6 kg/m², $p = 0.007$) and waist circumference (median: 82.3 vs. 78.6 cm, $p = 0.015$).

Conclusions: Nurses are not meeting current physical activity guidelines (150 min of moderate-to-vigorous intensity physical activity per week in 10-min bouts), yet exceeded these recommendations when examining their continuous (i.e. non bouts) physical activity levels. No association between the PWE and moderate-to-vigorous intensity physical activity was observed. Rotating vs. fixed shifts, 12- vs. 8-h shifts, and/or full-time or part-time vs. casual hours may impede nurses' ability to meet recommended physical activity levels. The low physical activity levels and poor cardiometabolic health of Canadian nurses warrant attention.

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<https://doi.org/10.1016/j.ijnurstu.2018.02.001>

Received 2 August 2017; Received in revised form 8 February 2018; Accepted 9 February 2018

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What is already known about the topic?

- Nurses are the largest professional group within the health care workforce.
- The poor self-reported health of Canadian nurses appears to contribute to high rates of absenteeism.
- Irrefutable evidence demonstrates the effectiveness of regular physical activity in the prevention and management of chronic conditions (e.g. cardiovascular disease, hypertension, high cholesterol, diabetes, osteoarthritis, osteoporosis, depression, certain cancers).

What this paper adds?

- Few nurses met the current Canadian physical activity guidelines (150 min of moderate-to-vigorous intensity physical activity per week in 10-min bouts), yet nurses exceeded these recommendations when examining their continuous (i.e. non bouts) physical activity levels.
- Nurses working 8-h shifts, fixed shifts or casually accumulated greater physical activity levels.
- Nurses working 8-h shifts, fixed shifts, in outpatient, mental health, imaging, administration and research, and in urban hospitals reported better perceived workplace environment.
- A substantial number of nurses presented with and/or reported several cardiovascular risk factors (i.e. obese/overweight, poor mental health, smoking, hypertension, high cholesterol, and diabetes).
- Most nurses had a low risk of having a fatal or non-fatal cardiovascular event in the next five years.

1. Introduction

Nurses represent the largest professional group within the health care workforce (Canadian Federation of Nurses Unions, 2013). Findings from the *National Survey of the Work and Health of Nurses in Canada* revealed that an alarming proportion of Canadian nurses report: being overweight or obese (45%), having high blood pressure (13%), smoking (11%), having high cholesterol (10%), experiencing depression (9%) or being diabetic (3%) (Shields and Wilkins, 2006) – all known modifiable risk factors for cardiovascular disease (Khawaja et al., 2009; Public Health Agency of Canada, 2009). Such poor health appears to contribute to high rates of absenteeism; more than 24,000 nurses (9%) were absent each week in 2016 as a result of personal illness or injury (Jacobson Consulting Inc, 2017). This level of absenteeism is substantially higher than the national average for all other occupations (9%) (Jacobson Consulting Inc, 2017). The annual cost of such absenteeism continues to increase and was estimated at \$989 million in 2016 (Jacobson Consulting Inc, 2017).

Irrefutable evidence demonstrates the effectiveness of regular physical activity in the prevention and management of chronic conditions (e.g. cardiovascular disease, hypertension, high cholesterol, diabetes, osteoarthritis, osteoporosis, depression, certain cancers) (Baillot et al., 2015; Haskell et al., 2007; Reed and Pipe, 2016; Warburton et al., 2010, 2006). The Canadian Society for Exercise Physiology and World Health Organization recommend that adults accumulate at least 150 min of moderate-to-vigorous intensity physical activity per week in bouts of at least 10 min (Canadian Society for Exercise Physiology, 2011; World Health Organization, 2011). The disquieting proportion of Canadian nurses reporting poor health suggests that their health behaviours, including physical activity, may be suboptimal. Several investigators in varied settings have assessed the self-reported and objective physical activity levels of nurses (e.g. Australia, Canada, Iceland, Thailand, United States) and shown low levels of physical activity (Babioulakis et al., 2015; James et al., 2013; Kaewthummanukul et al., 2006; Perry et al., 2015; Ratner and Sawatzky, 2009; Sveinsdottir and Gunnarsdottir, 2008). None have objectively measured physical activity levels using activity monitors and examined the influence of the hospital environments in which

nurses spend a substantial proportion of their waking hours. Workplaces have been shown to play an important role in employees' physical activity levels and cardiometabolic health (Morris et al., 1953; Reed et al., 2017; Tigbe et al., 2017; van der Ploeg et al., 2015). Nurses' often engage in rotating shifts, which have been associated with an increased risk of coronary heart disease (Vetter et al., 2016).

The purpose of this multi-centre, cross-sectional study was to assess the influence of the workplace (i.e. hours, shifts, work status, hospital and area location, perceived workplace physical activity environment) on physical activity levels and the cardiometabolic health of Canadian nurses from a blend of rural and urban hospitals in the Champlain region of Ontario, Canada. A secondary purpose was to examine the associations across physical activity levels, steps per day, Perceived Workplace Environment (PWE) scores and cardiometabolic health indicators. We hypothesized that the majority of nurses would present with low levels of physical activity and poor cardiometabolic health, and these, in turn, would be associated with the characteristics and perceptions of the workplace.

2. Methods

2.1. Study design

This was a multi-centre, cross-sectional study led by the University of Ottawa Heart Institute (UOHI). The study received ethics approval from 11 hospital research ethics boards (Protocol #: 20140670-01H; Protocol #: 15/22X; Protocol #: JR-21-01-15; Protocol #: 2015008; Protocol #: 15-04; Protocol #: 2014-003; Protocol #: 20140670-01H; Protocol #: none; Protocol #: 2014-1011; Protocol #: 20140670-01H; Protocol #: none). All participants provided written, informed consent prior to participation.

2.2. Recruitment of workplaces and participants

We approached 20 hospitals (a blend of rural and urban) from the Champlain Local Health Integration Network of Ontario extending an invitation to participate in this study; 14 hospitals agreed. All participants were recruited between December 2014 and January 2016. Research staff travelled to each hospital to inform nurses and nursing leaders of the study by attending nursing meetings and conferences and, distributing recruitment posters throughout the hospital (e.g. nursing lounges and stations, information boards, cafeterias). The posters contained a brief description of the study, contact information and links to the Champlain Nurses' Study social media accounts (i.e. Facebook, Twitter). Research personnel also staffed recruitment booths and provided information sessions at hospitals during National Nursing Week and the Canadian Council of Cardiovascular Nurses' spring nursing conference. Hospital administrative- and nursing-leaders assisted in distributing recruitment materials. A total of 410 nurses approached the research staff to participate in the study; screening was performed via email or telephone. Study measures were obtained from all eligible participants in each hospital by research staff.

2.3. Participants

Eligible participants were: 1) registered nurses or registered practical nurses actively working at one of the participating hospitals; 2) able to perform physical activity; 3) able and agreeable to wear an accelerometer at the waist for a 9-day recording period (a 9-day recording period was selected to cover all nursing schedule permutations); and, 4) able and willing to provide written, informed consent. Potential participants were excluded if they: 1) were unable to read and understand English or French; 2) had medical contraindications to moderate-to-vigorous intensity physical activity; or, 3) were currently pregnant or lactating.

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