ORIGINAL RESEARCH

Peter L. Rye BSc

Marc E. Reeson

Christopher M. Pekrul BA (Hons)

Nabil A. Asfour MD

Rekha Kundapur MSc, MD

Merne P. Wilson RN, MSc

Anne M. PausJenssen MD, MSc

Thomas W. Wilson MSc, MD

Department of Medicine and Cardiovascular
Risk Factor Reduction Unit, University of Sas-
katchewan

Comparing health behaviours of internal medicine residents and medical students: An observational study

Abstract

Purpose: During residency, many physicians find it difficult to maintain a healthy lifestyle; however, there is little objective data available. In this study, residents' health behaviours and cardiovascular risk status were compared with those of medical students.

Methods: Medical residents (n=55, postgraduate years 1 to 4) were compared with medical students (n=62, years 1-4). The main dependent variable was the average number of steps per day (assessed using a pedometer) at work and leisure over three days, during which subjects were not on call or post-call. In addition, all subjects completed a three day food log. Frequency of vigorous exercise was assessed by a single question.

Body mass index (BMI), waist circumference, blood pressure, total and high-density lipoprotein cholesterol, smoking habits and random blood glucose were measured, and Framingham Risk Score coronary artery disease 10 year probabilities (FRS) were calculated.

Results: Residents recorded 8344 ± 3520 steps per day while students recorded 10703 ± 3986 ($p < 0.002$). 35% of residents and 52% of students averaged more than 10,000 steps per day and senior residents took fewer steps than junior residents. Both groups frequently failed to achieve the recommended daily servings of fruits and vegetables; on average, 3.5 ± 2.0 servings for residents and 5.4 ± 2.2 for students ($p < 0.0001$). BMI and FRS were higher among the residents in comparison with the students.

Conclusion: Medical residents at our institution appear less active and consume fewer servings of fruits and vegetables than undergraduate medical students. These differences are associated with higher BMI, waist circumference and cardiovascular risk.

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Correspondence to:

Dr. TW Wilson,
Room 3544, Royal University Hospital
103 Hospital Drive
Saskatoon, SK
S7N 0W8
Email: thomas.wilson@usask.ca

Physician health is receiving increasing attention [1,2]. Not only are healthy physicians better able to withstand the rigors of practice, but they are more likely to counsel patients in healthier lifestyles [3].

Residency seems likely to be a particularly stressful time for physicians; long hours, sleep deprivation and irregular meal times all contribute to unhealthy behaviors, particularly those related to diet and exercise [4,5]. While anecdotal evidence of such problems abounds, there is little objective evidence on health behaviours of residents. Our aim was to document current health behaviours among internal medicine residents. It was hypothesized that residents have less healthy habits than undergraduate medical students. These groups are about the same age, educational achievement and exposure to healthy lifestyle advice. Pedometers were used to measure daily steps taken (our main dependent variable), a food log was used to track dietary intake, and traditional cardiovascular risk factors were measured. The resulting data allowed us to calculate and compare Framingham Risk Scores for both groups.

Materials and Methods

Setting

The University of Saskatchewan College of Medicine serves 336 undergraduate medical students and about 350 postgraduate students (residents). The main campus and teaching hospitals are located in Saskatoon. Royal University Hospital, a 391 bed tertiary care site is the main teaching hospital. Undergraduate medical students attend classes in years 1-3. Year 4 students are expected to take call, often in-house, 5-6 times per 28 day block. Medical residents provide inpatient care and consultation and take call up to 7 days per block but do not work more than 28 consecutive hours.

Subjects

An observational study compared undergraduate medical students (years 1-4) and residents on the Internal Medicine service (Post-Graduate Years, PGY,1-4). They were tested during one of three data collection periods (June-July 2010, January-April of 2011 and June-July 2011). About equal numbers of students and residents were studied at these times. Medical students (n=252) and residents (n=94) were approached via email and personal contact. Students from all four years and residents from all four years volunteered. One medical student with type 1 diabetes and three who derived much of their exercise through watersports were excluded. Students or residents assigned to sites other than Royal University Hospital were not approached for the study. Participation was voluntary and each

TABLE 1. Comparison of Undergraduate Medical Students and Residents.

	Students (n=62)	Residents (n=55)	P
Age (years)	24.3±3.2	29.1±4.7	<0.0001
Men (%)	29 (47)	30 (56)	NS
BMI (Kg/m ²)	23.0±2.8	24.7±3.9	<0.01
SBP	114±9	115±11	NS
Waist circ. men	81.7±7.2	85.2±8.5	NS
Waist circ. women	72.0±6.0	74.7±8.7	NS
TChol/HDL	3.2±1.1	3.8±1.2	<0.01
Random glucose	5.4±1.7	5.8±1.5	NS
FRS-10 year CVD risk	1.1±0.4	1.8±1.7	<0.005
Average steps per day	10703±3986	8344±3520	<0.002

BMI: body mass index; SBP: systolic blood pressure; TChol/HDL: total serum cholesterol/high density lipoprotein cholesterol; FRS: Framingham risk score. Error terms are standard deviation

subject signed a written consent. The protocol was approved by the University Biomedical Research Ethics Board.

Protocol

Subjects were studied during the regular work week during times they were not on call or immediately post-call. Participants completed a questionnaire assessing cardiovascular disease and risk factors (see Table 1). A history of the same parameters (with the exception of smoking) was obtained for immediate relatives. For regular physical activity we asked “how many times per week do you exercise vigorously enough to sweat?” – a question which had been used previously in the Physicians Health Study [6].

Total and HDL cholesterol levels were measured using the Cholestech LDX® system. A random glucose measurement was obtained using OneTouch Ultra 2®. Both tests required only a finger prick blood sample and neither required the participant to be fasting beforehand. Height and waist circumference were measured using a stadiometer and tape measure, respectively. Weight was obtained using an electronic scale. Body Mass Index (BMI) was calculated as weight (kg)/height (m)². Blood pressure was measured in the seated position using a BPTru® machine in accordance with the manufactures directions. The 10 year Framingham Risk Score (FRS) was calculated for all cardiovascular events [7].

The subjects were provided a standardized food log and instructed to record their intake over a period of three consecutive weekdays. Serving size and food types were based upon “Eating Well with Canada’s Food Guide”, widely accepted as the Canadian standard for dietary recommendations [8]. The

FIGURE 1. Frequency of vigorous exercise.

number of servings per day of vegetables and fruits, grain products, milk and alternatives, meat and alternatives and fats and oils were calculated using averaged servings of each food group over three days. Standard drinks per day were calculated based on units of 10 grams of ethanol.

Participants wore a pedometer during the same three consecutive weekdays. A variety of brands were used but each was checked for accuracy and each was found to be within 6% of manually counted steps. Subjects were instructed to record their total number of steps for the day each evening and to reset the counter to zero each morning. Participants were instructed to wear the pedometer for all activities except for activities involving water. If errors occurred due to either pedometer malfunction or human error, the day was repeated.

Statistical analysis

The primary dependent variable was the number of steps per day averaged over three days. The sample size was calculated assuming that a clinically significant difference between the groups would be 2000 steps per day (a 20% difference from the recommended 10000 steps per day). The standard deviation, from a pilot study of medical residents, was estimated to be 3000 steps per day; therefore, 36 subjects per group were required to provide power of 80% at $\alpha=0.05$. To allow for dropouts and incomplete data, at least 50 subjects needed to be recruited per group.

Steps per day were categorized into fewer or more than 10000 as this number is recognized as “adequate” exercise [9].

Other outcomes included the Framingham Risk Score and its components, number of servings of vegetables and grains per day and the frequency of vigorous exercise.

Categorical variables were compared using Chi-squared or Fisher’s Exact Test and continuous variables with a one-way ANOVA, with Duncan’s test for multiple comparisons.

Results

Sixty-two students (21% of those contacted) and 55 residents (58% of those contacted) volunteered. Residents were much more likely to participate than students: odds ratio 5.23 (95% c.i. 3.18-8.60, $p<0.0001$). In the student cohort, 20 were in year 1, 22 in year 2, 11 in year 3 and 9 year 4. In the resident cohort 23 were in PGY 1, 16 in PGY2 and 13 in PGY3 or 4.

Cohort characteristics and the main results are shown in Table 1. Residents were older, had higher BMI and a higher ratio of total cholesterol to high density lipoprotein cholesterol, while their systolic blood pressure and random blood glucose were not significantly different. The residents’ Framingham Risk Score, while low, was significantly higher than that of the students.

None of our volunteers took medications for hypertension, dyslipidemia or diabetes and only one from each group had smoked more than one cigarette in the past month. Average alcohol intake was low in both groups: of the students 33 (54%) did not consume alcohol over three days, while 34 residents (65%) recorded zero intake. Of those who consumed alcohol, students recorded 0.8 ± 0.61 standard drinks per day and residents 1.2 ± 1.1 . One resident and five students admitted to consuming more than two standard drinks per day over the three-day period.

Residents averaged 2359 (about 22%) fewer steps per day than students (Table 1). When the steps per day data were categorized into more or fewer than 10000 steps per day, 52% of students and 35% of residents were in the higher group ($p=0.06$). Residents in the PGY1 cohort tended to take more steps per day than those in PGY3: 8965 ± 3360 vs. 6912 ± 2489 ($p=0.06$). The PGY2 cohort was intermediate at 8611 ± 4362 steps per day. There was a modest negative correlation between the average steps per day and BMI.

Figure 1 shows responses to the “frequency of exercise” question. Again, students were more likely to exercise vigorously enough to induce sweating (Chi-squared 16.3, $p=0.0061$). Among the three cohorts of residents, there was no difference in the frequency of vigorous exercise.

Results of the food frequency questionnaire are shown in Table 2. As a group, residents consumed fewer servings of vegetables and fruits, grain products and milk and alternatives. Only 21% of students and 6% of residents recorded the recommended number of servings per day of vegetables and fruits (7-8 for women, 8-10 per men).

TABLE 2. Average food servings per day

	Students	Residents	p-value
Vegetables/Fruits	5.4±2.2	3.5±2.0	<0.0001
Grain products	5.2±1.6	3.7±1.7	<0.0001
Meat and Alternatives	2.4±1.0	2.1±1.0	NS
Milk and alternatives	2.4±1.0	1.9±1.0	<0.02
Fats and oils	2.3±1.4	2.2±1.7	NS

Error terms are standard deviation

Discussion

These data indicate that medical residents take fewer steps, on average, than medical students and that the disparity grows as they become more senior. Further, residents are less likely to partake of vigorous exercise. In addition, their eating habits tend toward a less healthy diet. These differences are, perhaps, reflected in a higher BMI and a trend to higher waist circumference, as well as a higher (albeit still low) Framingham Risk Score. Cardiorespiratory fitness varies inversely as BMI, and BMI is a very important predictor of cardiovascular events [10]. Moreover, poor cardiorespiratory fitness predicts cardiovascular disease [11]. On the positive side, few of the residents or students smoked regularly and few admitted to risky alcohol drinking.

There are few studies with which to compare ours. Sissons and colleagues noted that university students averaged 7694 to 11294 steps daily [12], results that are comparable to ours. The Physicians Health Study, begun in 1982, studied practicing physicians aged 40-79 [13]. At baseline, 76% of physicians claimed to exercise to induce sweating at least once per week. In our study, 56% of our residents and over 95% of our medical students met this standard.

More recently, Rustagi and colleagues surveyed 433 undergraduate medical students in New Delhi, India. They found that 43% engaged in no, or only minimal, weekly physical activity [14]. Both our resident and medical student groups appeared to be more active. The New Delhi study also found only 12% consumed five or more servings of fruits and vegetables per day, midway between that of our students and our residents. Mahmood and colleagues surveyed 117 postgraduate trainees in Karachi, Pakistan [15]. The average age was 29.7±6.4 years old and two thirds were men. They found that 23% had a BMI of more than 22.9. Physical inactivity, snacking and meals outside the home were all found to be associated with obesity. Soh and colleagues asked 30 Australian practicing anesthesiologists to wear a pedometer during “normal working hours” [16]; their median steps per work period (time not specified) was 4770. Assuming an eight hour workday and

eight hours of sleep, they would have to be as active in leisure as they were at work to approach 10000 steps per day. Soh’s overall conclusion was that anesthesiologists are, in general, quite sedentary. A Scottish study of practicing anesthesiologists yielded similar results [17]. Frank and colleagues have conducted a number of questionnaire surveys of medical students and physicians in Canada [18] and the United States [19,20]. According to these questionnaire surveys, students and physicians are generally healthy people, although activity levels and diet were not measured directly.

The reasons for our residents’ less healthy behaviour, particularly lack of exercise were not explored in detail. In Soh’s study, anesthesiologists mentioned “fatigue”, “lack of time” and “family commitments” as reasons for not exercising and residents in the current study would probably give similar reasons.

Our study has limitations. Our residents were older than our students, but both groups were relatively young: with average ages of 29 and 24 years, respectively. There was no difference in gender distribution and educational attainment was similar. Secondly, all our subjects were volunteers and may not be representative of their cohorts as a whole. A lower proportion of medical students than residents volunteered, raising the possibility of a sampling error. Non-participating residents may have been more active than those who participated. Likewise, our participating undergraduate students may have been more active and health conscious compared to those who did not volunteer. Nevertheless, it seems unlikely that the two samples would differ from their cohorts in opposite directions. Thirdly, measuring physical activity with a pedometer, although widely used for activity assessments, measures only walking and other types of exercise [21], such as cycling or elliptical trainer, would not be captured. Nevertheless, pedometers have been validated in test-retest studies [22]. In addition, lower pedometer results were mirrored by less strenuous exercise, as assessed by the physical activity question. Fourthly, both groups were studied on a “non-call” day as it was felt that being “on call” would introduce another variable, making it more difficult to compare groups. Similarly, subjects were not studied on weekends. Again, weekends for both groups may be used for purposes other than exercise. Finally, our food frequency log has not been externally validated, and the very act of writing down each item consumed may change behaviour.

In summary, medical residents are less likely to achieve recommended exercise and dietary recommendations than medical students and these trends seem to be reflected in higher cardiovascular risk. Education and specific programs seem warranted. Perhaps limiting duty hours [23] would allow residents to be more active during their leisure hours.

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