Field Study

Workplace Stressors and Lifestyle-Related Cancer Risk Factors among Female Physicians: Assessment Using the Occupational Stress Index

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Abstract: Workplace Stressors and Lifestyle-Related Cancer Risk Factors among Female Physicians: Assessment Using the Occupational Stress Index: Karen Belkić, et al. Department of Oncology and Pathology, Karolinska Institute, Sweden—This study examined the relationship between work stressors and lifestyle-related cancer risk factors (LRCRF): smoking, obesity, sedentariness and alcohol consumption, among 112 female physicians in Novi Sad, a region of high LRCRF prevalence. The participation rate was 92.6%. Participants completed the physician-specific version of the Occupational Stress Index (OSI). Self-reported data concerning LRCRF and working conditions were cross-validated with medical records, as well as with worksite measurements and expert observations. A total of 35 (31.3%) of the physicians were current smokers and 10 (8.9%) were heavy smokers (>20 cigarettes/day); 23 (20.5%) had a body mass index (BMI) of 28 or more, and 11 (9.8%) were obese (BMs>30). Only 27 (24.1%) regularly engaged in recreational physical activity (PA). Slightly over 5% consumed alcohol daily. Altogether 15 (13.4%) had a low lifestyle-related cancer risk profile (not a current smoker, BMI<28, regular recreational PA and no daily alcohol consumption). Total OSI and several OSI aspects, particularly threat avoidance alone or in combination, showed significant multivariate associations with LRCRF, as did individual OSI elements. The latter included long work hours, restricted problem-solving strategy, insufficient help with clinical difficulties and supervisory responsibility (obesity and/or sedentariness) and problems hampering patient care (smoking). There is an urgent need to lower the LRCRF among female physicians in this high risk region. Our findings suggest that diminishing the work stressor burden should be considered when developing intervention strategies aimed at these risk factors. (J Occup Health 2007; 49: 61–71)

Key words: Work stressors, Physicians, Women, Smoking, Obesity, Sedentary lifestyle, Lifestyle-related cancer risk factors, Threat avoidant vigilance, Long work hours, Occupational stress index

Lifestyle-related factors account for the major proportion of known causes of cancer. Approximately 25–35% of cancer deaths are due to cigarette smoking1). Among non-smokers, overweight/obesity may be the leading avoidable cause of cancer, particularly for women2). Alcohol consumption is also a major lifestyle-related cause of cancer, while physical exercise protects against many cancers1). Physician example and advice can pivotally impact upon lifestyle-related cancer risk factors (LRCRF), especially smoking, among their patients and the general population3). This may be particularly important for female physicians who provide standards for other women4, 5).

Unfortunately, in much of the world, the LRCRF are very prevalent in the general population and among physicians, especially women. One such region is the former Yugoslavia, particularly since the upheavals in the early 1990’s6–8). During this period, the working conditions of physicians in this region have reportedly also deteriorated markedly9).

The work environment and LRCRF: mixed findings with generic sociological models

Several studies show a relation between exposure to stressful work and LRCRF. Night shift work has been associated with obesity, current smoking and smoking...
Prospective data show a relation between going from standard to long work hours (LWH) and increased drinking in women, unhealthy weight gain for men and increased smoking (both genders). Among male professional drivers, LWH showed a significant cross-sectional association with body mass index (BMI). In a cross-sectional study of Finnish public sector employees, persons with high Effort-Reward Imbalance (ERI: lack of reciprocity between effort from high workload (extrinsic) plus over-commitment (intrinsinc), on the one hand, and low rewards (financial, esteem, security, opportunities) on the other) or low rewards were more likely to be smokers. Among smokers, an elevated odds ratio (OR) for heavy smoking was found for Job-Strain (combination of high psychological job-demands and low decision-making latitude), for ERI, and for some components (low control, low rewards) of these work stressor models. Smoking intensity was also higher for workers in passive jobs and women in active jobs. These findings suggest an association between work stress and smoking intensity among men.

There have also been null reports concerning exposure to Job-Strain and LRCRF. A cross-sectional Dutch study revealed no relation whatsoever in men or women, between smoking status, physical activity (PA) or alcohol intake, and exposure to Job-Strain or isostrain. In a review of earlier empirical investigations among women, exposure to Job-Strain was not associated with smoking, although high psychological demands were related to smoking prevalence. The reports are also mixed for obesity or sedentary lifestyle and Job-Strain exposure among women and men.

For occupations in which taxing demands are not readily apparent, e.g. professional drivers and health professionals, Job-Strain assessments using self-report instruments have often failed to yield significant findings with respect to risk-factors for cancer or cardiovascular (CV) disease. Paradoxical findings have been reported, e.g. in the aforementioned study of professional drivers, the Job-Strain index (ratio of psychological demands to control) was inversely associated with BMI. On the other hand, smoking intensity in this group was significantly and independently associated with the total work stressor burden assessed using the Occupational Stress Index (OSI).

The occupational stress index: an approach derived from cognitive ergonomics

The OSI is an additive-burden model which incorporates key aspects of the leading sociological work stress models: Job-Strain and Effort-Reward Imbalance, but it was developed from the perspective of cognitive ergonomics. Cognitive ergonomics addresses how human beings process information, make decisions and carry out actions. Assessment is made of factors such as the nature and temporal density of incoming information, how information is processed based upon complexity, completeness and coherence. Thereby, the OSI analyzes work in terms of demands on mental resources and how these are controlled by the individual, in the context of Energy-Regulation Theory. Within the OSI the work environment is viewed as a whole, including task level issues, work schedule, physical, chemical and broader organizational factors, which can all contribute to total burden. The OSI (Fig. 1) is arranged as a 2-dimensional matrix: the vertical axis composed of levels of information transmission and the stressor aspects placed along the horizontal axis. The elements are equally weighted and summed to yield the OSI aspects (underload, high demand, strictness, external time pressure, aversive physical exposures, symbolic aversiveness and conflict/uncertainty). These aspects can be summed in various combinations to assess additive burden, and altogether yield the total OSI. We emphasize the “symbolic aversiveness” (or “threat avoidance”) aspect which is incorporated into the OSI, but not into the sociological work stress models. For survival reasons, our nervous systems selectively direct mental resources to threatening stimuli. It is particularly burdensome to follow a barrage of information, being prepared to rapidly respond, with a momentary lapse, error or delay having serious, potentially fatal consequences. This threat avoidant vigilance is characteristic for e.g. physicians, nurses, professional drivers, air traffic controllers.

Occupation-specific instruments: OSI for physicians

The OSI bridges a gap between two divergent approaches in occupational psychosocial research. One, represented by theory-based, generic approaches, is often remote from actual work experiences, and therefore may not be helpful for assessing within-occupation variance, the very level at which intervention strategies are developed, in practice. The other, occupation-specific approach, provides detailed information for identifying areas for intervention. However, being focused upon one occupation, more generalizable conclusions requiring between-group analyses are often missed. This is precisely where the OSI offers a potential solution, via a series of occupation-specific instruments that are mutually compatible within the OSI theoretical framework, allowing comparisons between occupations, which are more operationalized than a single generic instrument.

A specific OSI for physicians was created and tested among our colleagues from various clinical specialties, as “by physicians for physicians”. Initial results demonstrated good reliability and face validity. Mean total OSI scores among physicians were very high, more than two times higher than among worker-based groups.
of men in building trades\textsuperscript{26} or subway guards\textsuperscript{21} and a population-based sample of women\textsuperscript{27}. Mean total demand levels among physicians were about 1.5 times greater than among professional drivers. The OSI for physicians has been applied in the clinical setting of burnout, depression, CV disease and breast cancer to help identify and ameliorate occupational stressors during the process of return-to-work for women physicians\textsuperscript{9, 21, 25, 28}. Specific OSI’s for other occupational groups have been used to identify and ameliorate work stressors as part of interventions aimed at lifestyle-related risk factors for CV disease and cancer\textsuperscript{21, 26}.

Aims of the study
In this study, we applied the physician-specific OSI among female physicians in a high LRCRF prevalence setting: the Novi Sad region of former Yugoslavia. We sought to identify associations between individual work stressors faced by these physicians and the LRCRF. We hypothesized that individual stressors in the physicians’ work environment contributing to high demand, strictness and conflict aspects, would show a strong relation to LRCRF. We also considered additive burden, examining the relation between OSI stressor aspects alone or in combination and the LRCRF. In particular, we hypothesized that the threat avoidant aspect, alone or in combination would be associated with the LRCRF among these female physicians. Our primary outcome measure is a low LRCRF status; secondary outcomes are individual risk factors. The overall aim of this study was to determine whether the work stressor burden of female physicians should be considered when developing intervention strategies aimed at these risk factors, and, if possible, to identify modifiable stressors that should be particularly targeted.

Methods
Assembly of the group of female physicians
This study was part of a larger investigation carried out in 2002–2004 among physicians with and without ischemic heart disease or hypertension\textsuperscript{26}. This encompassed physicians currently employed at the Novi Sad Clinical Center who received primary care at the Occupational Health Center, Novi Sad. The LRCRF were monitored as a routine part of care, with regular advice aimed at lowering risk profile provided by the physician colleague caregiver. The study was approved by the Novi Sad Medical School Ethics Committee. Written informed consent was obtained from all participants. Each eligible physician was told: (a) the aim was to assess working...
conditions and the health of our profession by a study designed “by physicians for physicians”; (b) the study was comprised of a questionnaire about working conditions, lifestyle and sociodemographics, and the Minnesota Multiphasic Personality Inventory (MMPI) (the latter results reported elsewhere), and included consent to verify questionnaire data with medical records; and (c) there was complete freedom to withdraw at any time with no consequences whatsoever, with all data handled confidentially. Herein, we include female physicians age 35–60, without prior CV events or structural CV disease. Altogether 121 such physicians were eligible; 3 refused because they did not wish to complete the MMPI. Another 6 did not return the questionnaire or did so with incomplete responses, and were excluded. Thus, the participation rate was 92.6%.

Measures

Sociodemographic information

Age, marital status, number of children and homeownership were noted. We asked participants whether they had a hobby and about major family problem(s). Number of working years as a physician and specialty were noted. The physicians were categorized as follows: 1) surgeons and anesthesiologists; 2) non-surgical clinical care, 3) diagnostic/preventive (e.g. radiologists, social medicine, pathologists).

Assessment of workplace stressors among physicians

The physician-specific OSI was used to assess workplace stressors. The Yugoslav version of the questionnaire was administered, prepared using translation/back-translation. Each element in the OSI (Fig. 1) has a potential score between 0 and 2 (0: “not present”, 2: “strongly present”). However, for some elements of a specific OSI the unchanging characteristics of the occupation are assigned fixed scores or the range of possible scores is narrowed. In the physician-specific OSI there are 12 fixed score elements and 27 with narrowed score ranges. Summed scores for the aspects and total OSI were calculated. Although the OSI is questionnaire-based, worksite measurements and other available data can be incorporated into the OSI to improve its accuracy and precision. In this study, information was accessible from “medical charts”, worksite measurements and expert observations about nightshift work, number of work hours, vacation time, moonlighting, exposure to physical and chemical noxins, performance of invasive procedures, emergency room work, *inter alia*. Each OSI questionnaire was cross-validated with all available data from these other sources.

Outcome variables

Each participant was asked about past and current cigarette smoking. Current smokers were asked about the number of cigarettes smoked/day. Smoking data were cross-validated with medical records. We calculated BMI from reported height and weight. Medical records were reviewed regarding obesity. We inquired about regular recreational PA (≥once/week) and daily alcohol consumption; medical records were reviewed regarding the latter. A composite dichotomous variable was created for low LRCRF, defined as: not currently smoking, BMI<28, regular recreational PA and no daily alcohol consumption.

Statistical analysis

Continuous variables were analysed with means ± standard deviation and range, categorical variables as frequencies and percentages. Means among the three physician categories were compared using 1-Way Analysis of Variance (ANOVA). Between-group differences in discrete variables were examined with χ² tests; if expected cell size was <5, by Fisher’s exact test with groups taken 2 at a time. Bivariate analysis was performed via correlation, 2-sample “t” and χ² tests, to identify confounders for which adjustment should be made in the multivariate models and for ruling out colinearity of independent variables. We performed extensive testing using multiple logistic regression (MLOGR) to identify the most parsimonious set of non-colinear individual workplace stressors and/or stressor aspects that explained the largest amount of variance for each outcome variable. When 2 or more OSI aspects were each found to be significant or near significant (p<0.1) for a given outcome variable, we tested the sum of those aspects to determine whether the combined measure provided a more powerful multivariate model. We performed MLOGR for clinically important cut-points: markedly overweight (BMI≥28) and frank obesity (BMI≥30), current smoking and heavy smoking (≥20 cigarettes/day) and for purely dichotomous outcome variables. STATISTICA software was used throughout.

Results

Univariate findings

Table 1 displays sociodemographic data and LRCRF prevalence among the female physicians. Nearly 1/3 of the participants currently smoked, ten did so heavily. Nearly 10% were obese. Fewer than one-fourth had regular recreational PA. Six consumed alcohol daily. Fifteen had a low LRCRF profile. In Table 2 the univariate data are presented for each of the OSI aspects, as well as the total OSI. Total OSI scores ranged from 46.8 to over 100, with a mean of 77.3. Selected elements of the OSI for physicians are presented in Table 3. These include workplace stressors that showed significant independent associations with the LRCRF.
Choice of covariates for multivariate analysis

Age and number of work years were very highly correlated; we chose the former as a more continuous and wider-ranging covariate in all the MLOGR models. Number of children was used to account for family burden. Since there were many significant differences in the individual work stressor variables as well as in the aspects and total OSI among the surgical, non-surgical clinical care and preventive diagnostic groups, physician category was included as a covariate in all multivariate analysis. Number of cigarettes smoked/day was included as a covariate when BMI was the endpoint, since these two variables showed a significant inverse correlation. Having a hobby showed a significant inverse association with smoking. When smoking was an outcome variable, having a hobby and BMI were also included as covariates.

Multivariate findings

Table 4 shows the multivariate findings for individual LRCRF and the low risk composite variable. The MLOGR model explaining the most variance for BMI≥28 included two work-related stressor elements: LWH and restricted problem-solving strategy. Another significant MLOGR model for BMI≥28 included the total OSI score. The sum of two OSI aspects: [threat avoidance+conflict] yielded the best model for obesity. The best MLOGR model for current smoking was provided by total threat avoidance score. Total threat avoidance score plus an individual OSI element: external problems hampering patient care yielded the strongest model for being a heavy smoker. Lack of recreational PA was significantly associated with supervisory responsibility and lack of help with clinical difficulties. No significant MLOGR models were found for daily alcohol consumption. The sum of 3
Table 2. Univariate Data for the 112 Female Physicians

<table>
<thead>
<tr>
<th>Workplace Stressor Aspects and Total Occupational Stress Index (OSI)</th>
<th>Cronbach α</th>
<th>Mean ± Sd</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underload</td>
<td>*</td>
<td>3.5 ± 0.9</td>
<td>1.0 – 6.0</td>
</tr>
<tr>
<td>High Demand</td>
<td>0.84</td>
<td>26.2 ± 5.0</td>
<td>15.8 – 34.0</td>
</tr>
<tr>
<td>Strictness</td>
<td>0.67</td>
<td>14.5 ± 2.8</td>
<td>6.0 – 18.5</td>
</tr>
<tr>
<td>Extrinsic Time Pressure</td>
<td>0.41†</td>
<td>7.9 ± 1.3</td>
<td>4.5 – 10.0</td>
</tr>
<tr>
<td>Noxious Physical Exposures</td>
<td>0.57</td>
<td>1.9 ± 1.9</td>
<td>0 – 7.5</td>
</tr>
<tr>
<td>Threat Avoidance</td>
<td>0.62</td>
<td>8.9 ± 2.4</td>
<td>4.0 – 16.0</td>
</tr>
<tr>
<td>Conflict/Uncertainty</td>
<td>0.57</td>
<td>14.3 ± 2.5</td>
<td>8.5 – 22.0</td>
</tr>
<tr>
<td>Total OSI</td>
<td>0.74‡</td>
<td>77.3 ± 11.8</td>
<td>46.8 – 103.3</td>
</tr>
</tbody>
</table>

* The Cronbach α was calculated for variable elements of each aspect of the OSI, with the exception of the underload aspect for which there were only three variable elements, two of which were not normally distributed (skewness and/or kurtosis ≥2).

†Factor analysis of the extrinsic time pressure aspect revealed two un-rotated factors that explained 63% of the variance: one comprised mainly of the input, central decision-making and output level elements: lack of control of incoming signals, making non-postponable decisions and low control over rate of task performance—these are elements related to patient load and work in the emergency setting. The second factor was comprised of the 2 elements on the general level: deadline pressure and speed up.

‡The Cronbach α for the total OSI was calculated for the 7 aspects.

Table 3. Univariate Data for the 112 Female Physicians

<table>
<thead>
<tr>
<th>Selected Specific Workplace Stressors from the OSI</th>
<th>Coding</th>
<th>Mean ± Sd</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inadequate Pay</td>
<td>0: Salary covers substantially more than basic needs</td>
<td>1.42 ± 0.56</td>
<td>0 – 2</td>
</tr>
<tr>
<td></td>
<td>2: Salary totally inadequate for basic needs of self and family</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supervisory Responsibility</td>
<td>1: Implicit only</td>
<td>1.71 ± 0.38</td>
<td>1 – 2</td>
</tr>
<tr>
<td></td>
<td>2: Explicit supervision of ≥3 persons</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Long Work Hours</td>
<td>0: ≤40 h/wk</td>
<td>1.29 ± 0.83</td>
<td>0 – 2</td>
</tr>
<tr>
<td></td>
<td>2: Frequently ≥48 h/wk or occasionally ≥60 h/wk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Restricted Problem-Solving Strategy</td>
<td>0: Not at all limited</td>
<td>0.36 ± 0.39</td>
<td>0 – 1</td>
</tr>
<tr>
<td></td>
<td>1: Limitations in planning at the institutional level and in scheduling patient admissions and appointments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>External Problems Hamper Patient Care</td>
<td>0: Rarely or never has such problems</td>
<td>1.15 ± 0.76</td>
<td>0 – 2</td>
</tr>
<tr>
<td></td>
<td>2: Frequently has such problems</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lack of Help with Clinical Difficulties</td>
<td>0: Can count on help from colleagues for clinical difficulties</td>
<td>0.40 ± 0.61</td>
<td>0 – 2</td>
</tr>
<tr>
<td></td>
<td>2: Rarely or never receives help from colleagues for clinical difficulties</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
OSI aspects [high demand + threat avoidance + conflict] yielded a significant MLOGR model for low LRCRF.

**Discussion**

Our results demonstrate a clear association between work stressors and LRCRF among these women physicians in Novi Sad. The overall burden of occupational stressors assessed by the total OSI was significantly associated with BMI of 28 or more, and the sum of threat avoidance plus conflict scores yielded a significant adjusted OR for obesity. The low LRCRF profile was associated with significantly lower total of high demands plus threat avoidance plus conflict scores. These findings illustrate the importance of assessing combined exposures to capture a broader range of stressful job experience to improve risk estimates.

The threat avoidance score alone or in combination with other OSI aspects was significantly associated with smoking. Obviously, for all physicians a wrong decision can lead to injury or fatality, and vigilance is needed to avoid these consequences. Yet there is variability in the overall amount of threat avoidance that physicians experience, as seen by the range of scores on this scale. Physicians face additional threat avoidance if they frequently encounter visually disturbing scenes, e.g. severe burns or trauma, often listen to emotionally disturbing accounts, face acute hazards from psychotic patients and/or from contact with blood and other body fluids, observe or suffer physical injury at work, have had patients commit suicide or testified in court in relation to work, especially as a defendant. Many of these exposures, although considered routine parts of medical practice, can be broadly viewed as traumatic events of various intensities. Namely, they entail experiencing or witnessing event(s) involving actual or threatened death or serious injury or a threat to the integrity of oneself or others. Smoking is identified as a risk behavior engendered by the need to regulate arousal and counteract unpleasant emotional states. Population studies demonstrate increased cigarette consumption after exposure to disastrous events. Among policemen, it is recognized that exposure to such stressors is beyond the “range of normal human experiences” and an association with tobacco consumption has been reported. Our findings suggest that such an association exists among physicians. Furthermore, these findings underscore the need to incorporate “threat avoidance/symbolic aversiveness” when assessing work stressors.

Supervisory responsibility is an OSI high demand element on the central level. The narrowed scoring range (1 to 2) indicates that all physicians implicitly perform supervision of other health professionals, staff etc., but those who are directly responsible for the work of others have an even higher decision making burden. In this study, supervisory responsibility scores were significantly associated with BMI denotes body mass index, OSI denotes the Occupational Stress Index, OR denotes odds ratio and CI denotes confidence interval. *The BMI models are adjusted for age, number of children, number of cigarettes smoked per day and physician category. †The odds ratio is given for a unit change in the value of the independent variable. ‡The smoking models are adjusted for age, number of children, body mass index, having a hobby and physician category. ′The model for lack of recreational physical activity is adjusted for age, number of children and physician category. ‖Low Lifestyle-related Cancer Risk defined as: not a current smoker, BMI <28, regular physical activity and no daily alcohol consumption. §The Low Lifestyle Related Cancer Risk model is adjusted for age, number of children, having a hobby and physician category.

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Model $\chi^2$ (p level)</th>
<th>Independent Variables</th>
<th>Adjusted OR†</th>
<th>95% CI</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI ≥28</td>
<td>16.3* (p=0.006)</td>
<td>Total OSI score</td>
<td>1.09</td>
<td>1.02 – 1.16</td>
<td>0.009</td>
</tr>
<tr>
<td>BMI ≥28</td>
<td>19.6* (p=0.003)</td>
<td>Long work hours</td>
<td>2.24</td>
<td>1.11 – 4.50</td>
<td>0.02</td>
</tr>
<tr>
<td>BMI ≥30</td>
<td>11.8* (p=0.04)</td>
<td>Restricted problem-solving strategy</td>
<td>4.96</td>
<td>1.29 – 19.0</td>
<td>0.02</td>
</tr>
<tr>
<td>Currently Smoking</td>
<td>25.5‡ (p=0.0003)</td>
<td>Total [Threat Avoidance + Conflict] Score</td>
<td>1.29</td>
<td>1.07 – 1.55</td>
<td>0.01</td>
</tr>
<tr>
<td>Heavy Smoking (&gt;20 cigarettes/d)</td>
<td>17.5‡ (p=0.01)</td>
<td>Total Threat Avoidance Score</td>
<td>1.46</td>
<td>1.01 – 2.10</td>
<td>0.045</td>
</tr>
<tr>
<td>Recreational Physical Activity: Not Regular</td>
<td>15.6* (p=0.008)</td>
<td>Supervisory responsibilities</td>
<td>4.11</td>
<td>1.21 – 13.9</td>
<td>0.02</td>
</tr>
<tr>
<td>Low Lifestyle-related Cancer Riskl</td>
<td>12.06§ (p=0.03)</td>
<td>Lack of help with clinical difficulties</td>
<td>3.13</td>
<td>1.01 – 9.72</td>
<td>0.048</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total [High Demand + Avoidance + Conflict] Score</td>
<td>0.87</td>
<td>0.80 – 0.96</td>
<td>0.006</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Model $\chi^2$ (p level)</th>
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lack of recreational PA. As noted, there are mixed results with respect to sedentary lifestyle and exposure to Job-Strain among women. However, psychological demands assessed by 2 questions about hectic and psychologically strenuous work yielded a significant OR for sedentary behavior among Swedish working women. Recreational PA requires time, planning and commitment; this is hampered by job demands that lead to fatigue and require long recovery times after work. We found that having more children was associated with lower likelihood of engaging in recreational PA; this is probably due to fatigue and time constraints required to juggle work and family obligations. But even taking the home environment burden into account, direct responsibility for the work of many others is a psychological demand that may hinder regular recreational PA among these female physicians.

Another work stressor associated with lack of PA was inadequate help with clinical difficulties. Lack of social support was the strongest predictor of being sedentary off-the-job in a study of 3,342 Europeans. Social support is recognized as important for maintaining normal body weight, especially among women. In the present study inadequate help with clinical difficulties was associated with increased BMI. Thus, although we found no direct correlation between BMI and PA, as would be expected a specific component of instrumental social support relevant to the physician's work environment was significantly associated with these two LRCRF. In the OSI lack of social support is incorporated into the conflict aspect. From the viewpoint of cognitive ergonomics, conflict/uncertainty adds a qualitatively new dimension. Task load is "not a simple summation of the load of individual processes. Interference between concurrent information processes increases task load". Thus, in contrast to a smooth work routine, in which correct decisions and actions are reinforced, conflict arises when untimely events or discrepancies disrupt work rhythm.

Another element of conflict was associated with heavy smoking: scores on external problems hampering patient care were nearly maximum for heavy smokers. The most frequently cited problems were lack of supplies and hospital beds, understaffing and administrative barriers. There are few published data on occupational factors that contribute to heavy smoking. High demands were associated with heavy smoking in a large sample of Japanese rural workers of both genders. Among male and female physicians in Finland, heavy smoking was associated with heavy alcohol consumption, the latter being correlated with career dissatisfaction. The strongest multivariate model for BMI≥28 included two OSI elements: restrictions in problem-solving strategy and LWH. As mentioned, among professional drivers, a multivariate association was also found between work hours and BMI. The mean work hours score for 258 professional drivers in Yugoslavia was 0.97 ± 0.84. Thus, the mean work hours score for physicians in this study was higher than for professional drivers from the same country (z test, p<0.001). Over half of the physicians (N=61) had the maximum work hour score: frequently >48 h/wk or sometimes > 60 h/wk. Only 21 worked no more than 40 h/wk, although this is the recommended limit for physicians in the region. LWH have been considered "a hallmark of medical education". In fact, however, LWH hamper "the development of professional values and attitudes that are an essential part of the moral curriculum of residency", and are associated with health and safety risks, including falling asleep while driving, adverse pregnancy outcome and mid-career burnout. This is the first study, to our knowledge, linking LWH among physicians to increased BMI.

Limitations of the study

For a cross-sectional study, one must be cautious in making inferences about the temporal nature of observed associations (i.e. that exposure to work stressors preceded and therefore caused the risk behaviors). The survivor effect may also be operative with this study design, and that increases the likelihood of obtaining null results. The assembly of the sample was otherwise nearly optimal, since this is a worker-based study with a very high participation rate (92.6%). Common method bias might also be possible, but we confirmed much of the self-reported data with external sources to guard against this. Moreover, the OSI queries are phrased in a concrete, neutral way, which minimizes subjectivity. While the overall reliability of the total OSI is satisfactory, a few aspects had low Cronbach alpha. This was the case for external time pressure, which did not show any significant associations. Further work to better operationalize this scale is needed. We striving to rule out confounding from home/family obligations by adjusting for number of children, but the assessment of this burden could better.

This is an exploratory study of the associations between the LRCRF and individual work stressors, work stressor aspects and their combined effects, as assessed by the OSI. We do not believe the results suffer from alpha error. The coherence between the findings for the primary outcome measure and the individual LRCRF argues that these results are not spurious. Rather, it is more probable that existing effects were undetected due to power limitations. Therefore, larger investigations along the lines of the present study are needed.

Public health implications and conclusions

Notwithstanding the limitations of our study, some plausible, substantive findings emerge, which have public
health implications. We have identified significant associations between the LRCRF and a number of individual, potentially modifiable work stressors in the work environment of these physicians. Randomized intervention trials in which the implicated work stressors were ameliorated would be a practical way to further examine their etiologic association with the LRCRF, and at the same time test the efficacy of prevention strategies. Lowering the combined work stressor burden could be tested in a similar way.

There are limited data on the effects of modifying work stressors upon LRCRF. In an observational study among men of various occupations in New York City, increases in decision latitude over 3 yr were associated with decreased cigarette smoking. Our physician-based risk factor intervention study of professional drivers showed an association between improvements in working life and intentional weight loss at 6-month follow-up. There was also a positive relation between diminishing smoking and intentional weight loss. In our experience, physician-mandated changes in the work environment, especially work schedules, together with intensive risk factor intervention yield concomitant successful smoking cessation, normalization of body weight and adherence to exercise programs among at-risk patients. In contrast to sparse data on ameliorating work stressors as a risk factor intervention strategy, behavioral interventions are well-developed and validated, including work-site health promotion efforts and attention to multiple risk factors. However, our experience with physician-based interventions among stressful occupations indicates that behavioral measures alone are often limited in bringing about changes in the LRCRF. It has been suggested that smoking cessation programs would benefit from incorporating modification of stressful features of the work environment. Our findings indicate that for these female physicians this suggestion applies to other LRCRF, as well.

There is an urgent need for programs to impact upon the LRCRF among female physicians in this high risk region. A multi-pronged approach would have the best chance for success. This should include consideration of work stressors, worksite health promotion and application of established behavioral techniques validated within the cultural context of this region. The potential benefits to this target group could bolster wider efforts aimed at the general population, which could be positively influenced by seeing healthier physicians in a healthier work environment delivering health services.

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References


47) Gabbe SG, Morgan MA, Power ML, Schulkin J and Williams SB: Duty hours and pregnancy outcome
