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Effects of active on-call hours on physicians' turnover intentions and well-being

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Objectives This study examined whether active on-call hours and the co-occurrence of lifestyle risk factors are associated with physicians' turnover intentions and distress.

Methods Cross-sectional survey data on randomly selected female (N=1571) and male (N=1081) physicians, aged 25 to 65 years, from The Finnish Health Care Professionals Study were used. The outcome measures were turnover intentions and distress (general health questionnaire). Smoking, heavy drinking, overweight, and low physical activity were assessed as lifestyle risk factors. Analyses of covariance were used to analyze the data.

Results After adjustment for gender, age, employment sector, and job satisfaction, the analyses showed that the physicians who had been on active call more than 40 hours per month reported more distress than the group not on call (P=0.046). The physicians with two or more risk factors also had more distress (P<0.001) than those with no risk factors or only one risk factor. There was an interaction between active on-call hours and lifestyle risk factors for turnover intentions (P=0.002). The physicians with two or more lifestyle risk factors who had been on active call more than 40 hours per month had more turnover intentions than the other physicians.

Conclusions On-call duty and the co-occurrence of lifestyle risk factors may both decrease physicians' well being and increase their intentions to leave their job.

Key terms distress; leaving; lifestyle; risk behavior.

Physician shortage and turnover are major problems worldwide. High physician turnover has many negative consequences, such as substantial financial losses, patient dissatisfaction, and worsened physician morale (1). High demands at work have been found to be associated with physicians' turnover intentions (2). Physicians' work has been shown to be very or extremely stressful (3). For example, burnout (4) and mental health problems (5) seem to be fairly common among physicians.

One important source of stress among physicians is their on-call duties. British general practitioners rated nights on call as one of the top two most stressful aspects of their work (6). Among Finnish anesthetists, being on call was the most frequently mentioned stressor; it correlated strongly with various stress symptoms and

was the greatest reason for sleep deprivation (7). What makes on-call work especially strenuous is that it often combines both long workhours and night work. Long workhours have been found to be related to increased stress levels, lower quality of life, and poorer lifestyle (8). Working overtime may lead to work-related injuries (9), health problems (10, 11), work-family interference (12), exhaustion (13), job dissatisfaction (14), and risky health behavior (15, 16). Overtime work also impairs cognitive performance in the areas of attention and executive functioning (17). Shift work and, particularly, night work can interrupt sleep patterns and lead to problems with physical and mental health (18–22). For example, long night shifts have been associated with alcohol use among nurses (23).

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Long on-call periods tire physicians and affect their work performance. Physicians on 24-hour on-call shifts are at increased risk of occupational injury, making serious or even fatal medical errors, and motor vehicle accidents on the drive home (24). After a 36-hour in-hospital call, significant decreases have been found in visual attention, short-term recall, and coding ability (25). Among residents, post-call performance during a heavy call rotation was found to be comparable to or worse than the impairment observed in relation to a 0.04 to 0.05 g% blood alcohol concentration in a test of sustained attention, vigilance, and simulated driving (26). Nighttime on call has been found to deteriorate neuropsychological and cognitive function (27) and to be associated with physical health problems (28). Eliminating interns' extended workshifts and reducing the number of hours worked per week has been found to increase sleep, decrease attentional failures, and decrease serious medical errors (26, 29).

On-call work schedules may also deteriorate mental health (30). For example, among general practitioners, the number of on-call duties undertaken and one or more nights on call per week have been found to be associated with anxiety and depression (31, 32). Among general practitioners in Leeds, England, the amount of time spent on call was associated with psychological symptoms measured with the general health questionnaire (GHQ) (28). Physicians' mood has been shown to be significantly lower when on call than when off call (33).

The on-call burden may contribute to negative coping, such as an unhealthy lifestyle, which may, in turn, further intensify the harmful effects of the on-call burden. Some previous studies have suggested that there are factors in physicians' work that may lead to unhealthy behavior. For example, heavy drinking has been shown to be a problem among physicians (34). Lifestyle risk factors, such as smoking, heavy drinking, obesity, and physical inactivity, tend to aggregate (35), and high job strain increases the likelihood of such a phenomenon (36). The combined effect of these risk factors may be synergistic rather than additive; for example, the disease risk associated with a combination of risk factors has been found to be higher than the sum of their independent, additive effects (37).

Using the GHQ, we examined the effects of the number of active on-call hours, the co-occurrence of lifestyle risk factors (smoking, heavy drinking, overweight, and low physical activity), and their interaction on turnover intentions and distress in a large sample of Finnish physicians. We adjusted for the effects of gender, age, job satisfaction, and employment sector because previous studies have shown that all of these factors may have a significant effect on intentions to leave or stay in a job (1, 38–40).

Study population and methods

Study context and study population

The Finnish health care system has been described as one of the most decentralized in the world. Finland has 5.2 million inhabitants, and the country is divided into 416 municipalities, and even the smallest ones are responsible for arranging health care services for their inhabitants. Being on call is an integral part of physicians' work in Finland, especially among those working in the public sector. The organization of on-call services, especially in primary health care, has gone through significant changes in recent years. The number of health centers providing round-the-clock on-call services has decreased from 200 to 45 in the past 20 years (41). On-call services have been centralized to bigger units and also transferred to hospitals. A hospital physician's work period, which includes on-call duty, lasts normally 24 hours, starting from 0800. Recently it has become common in some clinics to split the 24-hour work period between two physicians, especially on weekends. Over half of all Finnish physicians are on call regularly, the proportion being significantly bigger among hospital physicians (74%) and health center physicians (primary health care) (65%). In 2006, 31% of the health center physicians were actively on call once a month, 35% twice a month, and 15% three times a month, whereas among hospital physicians 18% had active on call once a month, 23% had it twice a month, and 31% had it three times a month (42). In 1997, the weekly average of active on-call hours was 5.3 for male physicians and 5.6 for female physicians (43).

We drew a random sample of 5000 Finnish physicians (30% of the total physician population) from the 2006 database of physicians, maintained by the Finnish Medical Association (register covers all licensed physicians in Finland), as a part of the Finnish health care professionals study. Questionnaires were mailed in the autumn of 2006. The nonrespondents were reminded and sent the questionnaire up to two additional times. Responses were received from 2841 (57%) physicians. We excluded 189 respondents who had incomplete information; thus the final sample included 2652 physicians (1571 women and 1081 men) aged 25–65 (mean 53.0, SD 5.18) years. The sample was representative of the eligible population in terms of age, gender, and employment sector (44).

Survey

Active on-call hours were assessed with a question asking how many active on-call hours the respondent had had during the last month. On-call hours were categorized as (i) no on calls, (ii) <40 hours per month, and (iii) >40 hours per month. Turnover intentions were

assessed with the use of three questions concerning willingness to (i) change to other physician work, (ii) change to a profession other than that of a physician, and (iii) quit the present job. They were coded as 1 (no), 2 (perhaps), or 3 (yes). Psychological distress was measured with the 12-item version of the GHQ with the response options ranging from 1 to 4 (45). The reliability, as measured by Cronbach's alpha, was 0.89 for this sample. We used the mean response score in the analysis.

The examined risk factors were smoking, heavy drinking, overweight, and low physical activity. Smoking was included as a health risk and coded as 1 if a respondent (i) was a current smoker, (ii) had quit regular smoking within 5 years, or (iii) had smoked regularly for >10 years. Otherwise smoking was coded as 0. The cut-off point for overweight was a body mass index (BMI) of ≥ 25 kg/m² (46). The cut-off point for heavy drinking was a weekly consumption of ≥ 190 g of absolute alcohol for the women and >275 g for the men (47). Physical activity was measured with the mean of three questions assessing (i) the frequency of physical activity "How often do you engage in leisure-time physical activity in which you sweat or become breathless?", (ii) intensity of physical activity "How much breathlessness and sweating do you experience when you engage in physical activity and sports?", and (iii) the average duration of a physical activity session "How many hours do you usually spend in a physical activity session in which you sweat or become breathless?" The answers were coded from 1 (total inactivity) to 6 (vigorous activity). The participant was coded as being low in physical activity if the mean was ≤ 3 , which represented 20.8% of the participants. This cut-off point was chosen on the basis of previous findings showing that the prevalence of physical inactivity was 18% and 27% for Scandinavian men and women (48) and 18% and 22%, respectively, among white Americans (49).

All four risk factors were coded as binary (0/1) for the analysis. Co-occurrence was defined as the number of risk factors for which the individual participant in question had a high risk value. If a participant belonged to the high-risk group for one risk factor, the corresponding co-occurrence score was 1; if the participant belonged to two high-risk groups, the co-occurrence score was 2, and so forth. Because the number of physicians having three or four risk factors was very low (3.5% had three risks and 0.4% had four risks), we collapsed the co-occurrence score into (i) 0, (ii) 1, and (iii) ≥ 2 risk factors.

Job satisfaction was measured with 10 items from the job diagnostic survey (50). We used scales measuring satisfaction with social relations at work, satisfaction with personal growth at work, and overall satisfaction with the job (7 = very satisfied to 1 = very unsatisfied). The Cronbach's alpha was 0.81 for the reliability in this sample.

Statistical analyses

Analyses of covariance (ANCOVA) were conducted that included turnover intentions as the dependent variable and the categorized on-call variable, the co-occurrence of lifestyle risk factors, and their interaction as independent variables with control for gender, age, employment sector, and job satisfaction. A similar series of ANCOVA were generated in which distress was the dependent variable. Bonferroni-adjusted pairwise posthoc tests were carried out for significant associations. Significant interactions were graphed. Because there were no significant gender differences in the associations between on call and outcomes, the analyses were conducted in the combined sample of men and women.

Results

Table 1 shows the characteristics of the study sample. Over half of the participants had not been on active call the preceding month, and approximately 11% had been on active call for >40 hours. Altogether 35% were overweight (BMI ≥ 25), and the mean BMI was 24.3. A total of 12% were considered heavy drinkers, consuming >275 g (men) or 190 g (women) of absolute alcohol per week. The co-occurrence of lifestyle health risks was not very common; namely, 43% did not have any risks and 20% had two or more health risks. We also examined the responses to the GHQ for caseness, and 22% of the participants scored ≥ 4 , indicating high levels of psychological symptoms (51).

The results of the analyses of covariance are presented in table 2. On-call hours were associated with distress, and pairwise comparisons ($P=0.045$) highlighted the fact that those who had been on active call >40 hours per month had more distress than those who had not been on call at all. The main effect of on-call hours was unrelated to turnover intentions.

The co-occurrence of lifestyle risk factors was associated with turnover intentions and distress. Pairwise comparisons ($P=0.002$) highlighted that those who had two or more lifestyle risk factors had more turnover intentions than those without risk factors. In addition, pairwise comparisons showed that those who had two or more lifestyle risk factors had more distress than those who had no risk factors ($P<0.001$) and those who had one risk factor ($P=0.003$).

The interaction of active on-call hours and the co-occurrence of lifestyle risk factors was significant for turnover intentions ($F=4.14$, $P=0.002$). Figure 1 shows that the physicians who had two or more lifestyle risk factors and had been on active call >40 hours per month had more turnover intentions than the others. There was no interac-

tion between active on-call hours and the co-occurrence of lifestyle risk factors for distress ($F=0.23$, $P=0.923$).

Age and job satisfaction were negatively associated with turnover intentions. Job satisfaction was also negatively associated with distress. The employment sector was significantly associated with turnover intentions, and the pairwise comparisons ($P=0.002$) showed that the physicians working in health centers had more turnover intentions than those working in hospitals.

We also examined the responses to the GHQ for caseness with a cut-off point of $\frac{3}{4}$ (≥ 4 indicates high levels of psychological symptoms) (51) as a dependent variable with binary logistic regression analyses. The results correspond to those with continuous mean response scores. Those who had been on active call >40 hours per month had a higher risk of being over the cut-off point for psychological symptoms than those who had no on-call hours (Wald's $\chi^2=5.55$, $P=0.018$) or had <40 hours of active on call per month (Wald's $\chi^2=4.23$, $P=0.040$). Those who had two or more lifestyle risk factors were more likely to be over the cut-off point for psychological symptoms than those who had no risk factors (Wald's $\chi^2=12.99$, $P<0.001$) or those who had one risk factor (Wald's $\chi^2=12.77$, $P<0.001$). The interaction between on-call hours and the co-occurrence of lifestyle risk factors was insignificant also in these analyses.

Discussion

Our study examined the effects of on-call burden, the co-occurrence of lifestyle risk factors, and their interaction on turnover intentions and distress among Finnish physicians. Our study found that a high on-call burden was associated with high distress levels and being over the cut-off point for psychological symptoms but not with turnover intentions. In a similar way, previous studies have highlighted the stressfulness of on-call work, especially that of night on calls (6, 7, 27, 52). Moreover, our findings showed that co-occurring lifestyle risk factors were associated with higher levels of turnover intentions and distress. In addition, we found that the physicians who had two or more lifestyle risk factors and a high on-call burden had higher levels of turnover intentions than the other physicians.

Our results imply that a high on-call burden threatens the mental health and well-being of physicians. Numerous previous studies have highlighted the stressfulness of on-call work, especially that of nights on call (6, 7, 27, 28, 52). On-call work was found to be a major source of stress and job dissatisfaction among New Zealand general practitioners (53). Similarly, among Irish pediatric hospital physicians, the main reasons for work-related stress were long workhours and subopti-

Table 1. Characteristics of the study sample of Finnish physicians (N=2652—the Finnish health care professionals study. (GHQ = general health questionnaire, BMI = body mass index)

Characteristic	Mean	SD	%
Age (25–65 years)			
Job satisfaction (1–7)	5.4	0.8	.
BMI (kg/m ²)	24.3	3.5	.
Alcohol consumption (g/week)	92.3	133.7	.
Physical activity (1–6)	3.6	0.9	.
Turnover intentions (1–3)	1.6	0.6	.
Distress (GHQ 1–4)	2.0	0.4	.
Employment sector			
Hospital	.	.	45.2
Health center	.	.	21.0
Other	.	.	33.8
Active on-call hours per month			
No on calls	.	.	57.4
<40 hours	.	.	31.2
>40 hours	.	.	11.4
Smoking ^a			
Yes	.	.	12.4
No	.	.	87.6
Overweight			
BMI ≥ 25 kg/m ²	.	.	35.4
BMI <25 kg/m ²	.	.	64.6
Heavy drinking ^b			
Yes	.	.	12.4
No	.	.	87.6
Co-occurrence of lifestyle risk factors			
0 health risks	.	.	42.8
1 health risk	.	.	37.6
2 health risks	.	.	15.5
3 health risks	.	.	3.5
4 health risks	.	.	0.6

^a Smoking was included as a health risk and coded as yes if a respondent (i) was a current smoker, (ii) had quit regular smoking within 5 years, or (iii) had smoked regularly over 10 years.

^b Average weekly consumption ≥ 190 g of absolute alcohol for women and >275 g for men.

mal on-call conditions (54). Among Japanese female physicians long workhours and engaging in night duty have been found to be associated with psychological symptoms measured with the GHQ (55). In addition to mental health problems, on-call work may also induce sleepiness (52), deteriorate work performance (24–27), and impair physical health, given that nightshift workers may be at an increased risk of experiencing, for example, cardiovascular, gastrointestinal, and reproductive dysfunctions (22).

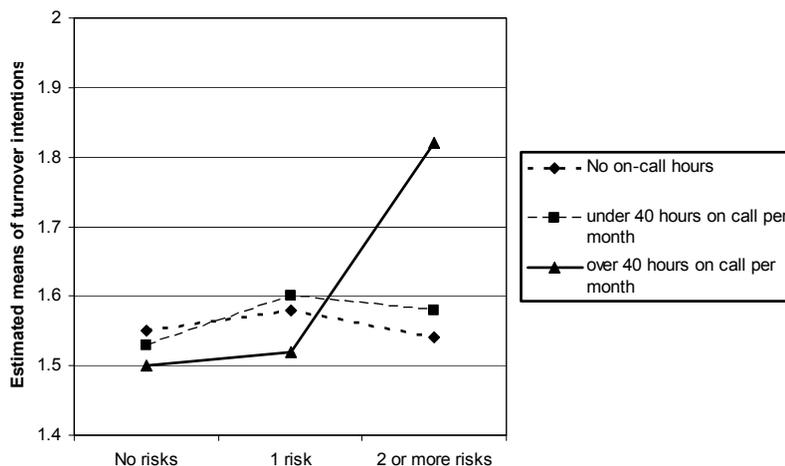
According to our results, co-occurring risky lifestyles are associated with mental health problems and turnover intentions. Especially prone to leave seem to be those who simultaneously have a high on-call burden and many lifestyle risks. Previous studies have shown that health behavior is related to mental health and job satisfaction. For example, smoking and drinking have been found to be associated with depression and job dissatisfaction

Table 2. Estimated means and their standard errors (SE) for the physicians' turnover intentions and distress according to the active on-call hours, co-occurrence of lifestyle risk factors, gender, age, job satisfaction, and employment sector among Finnish physicians (N=2652)—the Finnish health care professionals study.

	Turnover intentions (range 1-3)				Distress (range 1-4)			
	Mean	SE	F-value	P-value	Mean	SE	F-value	P-value
Active on-call hours per month	.	.	1.02	0.360	.	.	3.09	0.046
None (N=1520)	1.56	0.02	.	.	1.97	0.01	.	.
<40 hours (N=828)	1.57	0.02	.	.	1.97	0.02	.	.
>40 hours (N=304)	1.61	0.04	.	.	2.04	0.03	.	.
Co-occurrence of lifestyle risk factors ^a	.	.	5.85	0.003	.	.	8.89	<0.001
0 risks (N=1135)	1.53	0.02	.	.	1.95	0.02	.	.
1 risk (N=997)	1.57	0.02	.	.	1.97	0.02	.	.
2, 3, or 4 risks (N=520)	1.65	0.03	.	.	2.07	0.02	.	.
Gender	.	.	0.08	0.782	.	.	20.21	<0.001
Female (N=1571)	1.58	0.02	.	.	2.03	0.01	.	.
Male (N=1081)	1.59	0.02	.	.	1.96	0.02	.	.
Age ^b	.	.	114.46	<0.001	.	.	0.22	0.639
25–40 years (N=843)	1.71	0.02	.	.	1.99	0.02	.	.
41–50 years (N=852)	1.59	0.02	.	.	1.98	0.02	.	.
51–65 years (N=957)	1.47	0.02	.	.	2.00	0.02	.	.
Job satisfaction ^b	.	.	622.82	<0.001	.	.	372.38	<0.001
Lowest quartile (N=689)	1.95	0.02	.	.	2.19	0.02	.	.
Highest quartile (N=696)	1.37	0.02	.	.	1.84	0.02	.	.
Employment sector	.	.	6.11	0.002	.	.	2.48	0.084
Hospital (N=1199)	1.54	0.02	.	.	2.01	0.01	.	.
Health center (N=557)	1.62	0.02	.	.	2.01	0.02	.	.
Other (N=896)	1.59	0.02	.	.	1.97	0.02	.	.
R ²	0.25	.	.	.	0.15	.	.	.

^a The included lifestyle risk factors were smoking, overweight, heavy drinking, and low physical activity.

^b Age and job satisfaction were used in the analyses as continuous variables; therefore the F-values and P-values are for continuous variables. However, for the purposes of this table, these variables were categorized so that the means could be compared.

**Figure 1.** Association between on-call hours and lifestyle risk factors for turnover intentions among physicians.

(56–59). Moreover, physical exercise and obesity have been found to be associated with mental health (60, 61). Previous studies have also found associations between work conditions and health behavior, such as diet, physical activity, and alcohol consumption (62–64).

We found that younger physicians had more turnover intentions than their older colleagues. No consistent association has been found between age and turnover

(1), but our finding is contrary to a previous finding that the strongest predictor of both physician's intentions to leave clinical practice and actual departure was advancing age (65). One reason for the discrepancy in the results may be the fact that the aforementioned study also included retirement intentions in their measure, and it was not included in our study. Studies of the relationship between age and job satisfaction have

yielded inconsistent results as well. Earlier research has supported negative linear functions, positive linear functions, U-shaped functions, J-shaped functions, and no relationships between these aspects (66–68). Work conditions may have an influence on this relationship. One study found support that the association would be negative in unfavorable work conditions and positive or some other form in other settings (69).

In accordance with previous studies, our results suggest that job satisfaction is important for the well-being and retention of physicians (1, 28). Thus promoting job satisfaction seems to be of the utmost importance in health care settings. However, a recent study implies that, although job satisfaction among physicians is associated with intentions to quit their jobs, it is not associated with actual exit (65).

Because our study was cross-sectional, we cannot draw any causal inferences. It is possible that the studied independent factors cause increased intention to quit but also other factors, such as differences in the nature of the work, may affect both dependent and independent variables in the analyses. For example, in certain specialties, it may be that physicians are required to work more on-call hours, and, at the same time, the nature of the work in that specialty may be intrinsically more stressful, and may therefore lead to a greater use of avoidant coping strategies, such as alcohol abuse, and greater turnover intentions. In addition, when our results are interpreted, it is important to keep in mind that physicians' intentions to leave their jobs do not necessarily need to translate into action. However, intention to leave has gained support as an important predictor of actual turnover (typical correlation 0.50) (70). Buchbinder et al (71) found that physicians who reported that they were very likely to leave their current practice were 2.4 times more likely to have done so 4 years later than those who reported that they were very unlikely to leave.

The lifestyle risk factors were assessed from self-reports. It is well known that people tend to underestimate their weight and alcohol consumption. In addition, the dichotomization of risk factors may have influenced the results and perhaps reduced the statistical power. Lower cut-off points would have increased the proportion of high-risk persons. Moreover, the cut-off point for physical activity was arbitrary; we labeled the 20% with the least physical activity as being low in physical activity. We did not include all of the important lifestyle risk factors; for example, we did not have information on dietary habits. In addition, although we controlled for several confounders, we could not rule out the possibility of residual confounding.

Further research is needed to confirm that our findings are generalizable. In our present sample of Finnish physicians, 43% had no risks, 38% had one risk, and 19% had two or more co-occurring risk factors,

whereas the corresponding figures for Finnish public-sector employees have been found to be 35%, 40%, and 25% (72), respectively, and, for the members of a health maintenance organization in the United States, the corresponding figures were 31%, 21%, and 48% (35), respectively. It seems that especially heavy drinking is a common risk among Finnish physicians; this finding was also confirmed in previous studies (34). Higher rates of alcohol use than in the general population have been reported, for example, among physicians in the United States and Turkey (73, 74). However, there are also results supporting the view that physicians are not more likely to abuse alcohol than other professionals (75, 76). There can be many factors, such as country, age, gender, and occupational group, that can influence results regarding alcohol use among physicians, and these factors should be better taken into account in future studies. Our present study did not include drugs of any kind, but physicians are thought to be especially vulnerable to prescription drug abuse (77), for example, due to their good access and culture-favoring pharmacological responses to stress (78).

In conclusion, physician shortage is a worldwide problem, and physician turnover is a source of many adverse consequences (1). Our results show that Finnish physicians who have a concurrent high on-call burden and several lifestyle risks seem to be more willing to leave their jobs than other physicians. In addition, a high on-call burden was found to be associated with higher levels of distress. Similarly having many lifestyle risk factors seemed to be harmful for the physicians' mental health and intent to leave their practice. As job satisfaction, lifestyle risk factors, and on-call duties affect physicians' mental well-being and intentions to leave their practice, it would be important for health care organizations to focus some attention to these aspects. For example, promoting coworker support may help, because coworker support is directly related to physician well-being, and the two buffer the negative effects of work demands. In other words, physicians can feel less stressed when they are part of a good team (79). Coworker support might also be of importance in the case of an accumulation of lifestyle risk factors and overburden. In addition, organizations should pay attention to not overloading some physicians with too much on-call burden. Management should pay extra attention to those who have the highest workload and on-call burden and who seem to have several lifestyle risk factors.

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References

- Misra-Hebert AD, Kay R, Stoller JK. A review of physician turnover: rates, causes, and consequences. *Am J Med Qual.* 2004;19:56–66.
- Gardiner M, Sexton R, Durbridge M, Garrard K. The role of psychological well-being in retaining rural general practitioners. *Aust J Rural Health.* 2005;13:149–55.
- Henry J. OMA membership survey results confirm overwhelming level of frustration among Ontario physicians. *Ont Med Rev.* 2004;71:1–6.
- Shanafelt TD, Sloan JA, Habermann TM. The well-being of physicians. *Am J Med.* 2003;114:513–9.
- Cohen JS, Patten S. Well-being in residency training: a survey examining resident physician satisfaction both within and outside of residency training and mental health in Alberta. *BMC Med Educ.* 2005;5:21.
- Sutherland VJ, Cooper CL. Job stress, satisfaction, and mental health among general practitioners before and after introduction of new contract. *BMJ.* 1992;304:1545–8.
- Lindfors PM, Nurmi KE, Meretoja OA, Luukkonen RA, Viljanen AM, Leino TJ, et al. On-call stress among Finnish anaesthetists. *Anaesthesia.* 2006;61:856–66.
- Maruyama S, Morimoto K. Effects of long workhours on lifestyle, stress and quality of life among intermediate Japanese managers. *Scand J Work Environ Health.* 1996;22(5):353–9.
- Dembe AE, Erickson JB, Delbos R. Predictors of work-related injuries and illnesses: national survey findings. *J Occup Environ Hyg.* 2004;1:542–50.
- Hayashi T, Kobayashi Y, Yamaoka K, Yano E. Effect of overtime work on 24-hour ambulatory blood pressure. *J Occup Environ Med.* 1996;38:1007–11.
- Ettner SL, Grzywacz JG. Workers' perceptions of how jobs affect health: a social ecological perspective. *J Occup Health Psychol.* 2001;6:101–13.
- Grosch JW, Caruso CC, Rosa RR, Sauter SL. Long hours of work in the U.S.: associations with demographic and organizational characteristics, psychosocial working conditions, and health. *Am J Ind Med.* 2006;49:943–52.
- Dahlgren A, Kecklund G, Åkerstedt T. Overtime work and its effects on sleep, sleepiness, cortisol and blood pressure in an experimental field study. *Scand J Work Environ Health.* 2006;32(4):318–27.
- Van Ham I, Verhoeven AA, Groenier KH, Groothoff JW, De Haan J. Job satisfaction among general practitioners: a systematic literature review. *Eur J Gen Pract.* 2006;12:174–80.
- Shields M. Long working hours and health. *Health Reports.* 1999;11:33–48(Eng); 37–55(Fre).
- Mizoue T, Fujino Y, Yamato H, Tokunaga S, Kubo T, Reijula K. Overtime work, cigarette consumption, and addiction to cigarette among workers subject to mild smoking restrictions. *Ind Health.* 2006;44:244–9.
- Proctor SP, White RF, Robins TG, Echeverria D, Rocskay AZ. Effect of overtime work on cognitive function in automotive workers. *Scand J Work Environ Health.* 1996;22(2):124–32.
- Nurminen T. Shift work and reproductive health. *Scand J Work Environ Health.* 1998;24 suppl 3:28–34.
- Harrington JM. Health effects of shift work and extended hours of work. *Occup Environ Med.* 2001;58:68–72.
- Kuhn G. Circadian rhythm, shift work, and emergency medicine. *Ann Emerg Med.* 2001;37:88–98.
- Harrington JM. Shift work and health—a critical review of the literature on working hours. *Ann Acad Med Singapore.* 1994;23:699–705.
- Scott AJ. Shift work and health. *Prim Care.* 2000;27:1057–79.
- Trinkoff AM, Storr CL. Work schedule characteristics and substance use in nurses. *Am J Ind Med.* 1998;34:266–71.
- Lockley SW, Barger LK, Ayas NT, Rothschild JM, Czeisler CA, Landrigan CP, et al. Effects of health care provider work hours and sleep deprivation on safety and performance. *Jt Comm J Qual Patient Saf.* 2007;33:7–18.
- Rubin R, Orris P, Lau SL, Hryhorczuk DO, Furner S, Letz R. Neurobehavioral effects of the on-call experience in housestaff physicians. *J Occup Med.* 1991;33:13–8.
- Arnedt JT, Owens J, Crouch M, Stahl J, Carskadon MA. Neurobehavioral performance of residents after heavy night call vs after alcohol ingestion. *JAMA.* 2005;294:1025–33.
- Lingenfelter T, Kaschel R, Weber A, Zaiser-Kaschel H, Jakob B, Kuper J. Young hospital doctors after night duty: their task-specific cognitive status and emotional condition. *Med Educ.* 1994;28:566–72.
- Appleton K, House A, Dowell A. A survey of job satisfaction, sources of stress and psychological symptoms among general practitioners in Leeds. *Br J Gen Pract.* 1998;48:1059–63.
- Lockley SW, Cronin JW, Evans EE, Cade BE, Lee CJ, Landrigan CP, et al. Effect of reducing interns' weekly work hours on sleep and attentional failures. *N Eng J Med.* 2004;351:1829–37.
- Nicol AM, Botterill JS. On-call work and health: a review. *Environ Health.* 2004;3:15.
- Chambers R, Campbell I. Anxiety and depression in general practitioners: associations with type of practice, fundholding, gender and other personal characteristics. *Fam Pract.* 1996;13:170–3.
- Chambers R, Belcher J. Predicting mental health problems in general practitioners. *Occup Med (Oxford).* 1994;44:212–6.
- Rankin HJ, Serieys NM, Elliott-Binns CP. Determinants of mood in general practitioners. *BMJ.* 1987;294:618–20.
- Aalto M, Hyvönen S, Seppä K. Do primary care physicians' own AUDIT scores predict their use of brief alcohol intervention?: a cross-sectional survey. *Drug Alcohol Depend.* 2006;83:169–173.
- Rosal MC, Ockene JK, Ma Y, Hebert JR, Merriam PA, Matthews CE, et al. Behavioral risk factors among members of a health maintenance organization. *Prev Med.* 2001;33:586–94.
- Kouvonen A, Kivimäki M, Väänänen A, Heponiemi T, Elovainio M, Ala-Mursula L, et al. Job strain and adverse health behaviors: the Finnish Public Sector Study. *J Occup Environ Med.* 2007;49:68–74.
- Meng L, Maskarinec G, Lee J, Kolonel LN. Lifestyle factors and chronic diseases: application of a composite risk index. *Prev Med.* 1999;29:296–304.
- Hwang J, Chang H. Explaining turnover intention in Korean public community hospitals: Occupational differences. *Int J Health Plann Manag.* In press.
- Blankertz LE, Robinson SE. Turnover intentions of community mental health workers in psychosocial rehabilitation services. *Community Ment Health J.* 1997;33:517–29.
- Hart SE. Hospital ethical climates and registered nurses' turnover intentions. *J Nurs Scholarsh.* 2005;37:173–7.
- Kangas M, Vänskä J. Terveyskeskuspäivystys keskittyy ja vähenee [Health center on call centralizes and decreases]. *Suomen Lääkäril.* 2006;23:2507–2510.
- Finnish Medical Association. Lääkärikysely 2006: tilastoja [Physician survey 2006: statistics]. Helsinki: Finnish Medical Association; 2006.

43. Töyry S, Räsänen K, Hirvonen M, Husman K, Juntunen J, Kalimo R, et al. Lääkärien työolot ja kuormittuneisuus: taulukkoraportti [Physicians work conditions and strain: scale report]. Helsinki: Suomen Lääkäriliitto, Finnish Institute of Occupational Health; 2000.
44. Elovainio M, Heponiemi T, Vänskä J, Sinervo T, Kujala S, Laakso E, et al. Kuinka suomalainen lääkäri voi 2000-luvulla? [How well are Finnish physicians in the 21st century?]. Suomen Lääkäril. 2007;20–21:2071–6.
45. Goldberg DP. The detection of psychiatric illness by questionnaire: a technique for the identification and assessment of non-psychotic psychiatric illness. Oxford (United Kingdom): Oxford University Press; 1972.
46. World Health Organization (WHO). Physical status: the use and interpretation of anthropometry: report of a WHO Expert Consultation. Geneva: WHO; 1995. WHO technical report, no 854.
47. Kouvonen A, Kivimäki M, Cox SJ, Poikolainen K, Cox T, Vahtera J. Job strain, effort-reward imbalance, and heavy drinking: a study in 40,851 employees. J Occup Environ Med. 2005;47:503–13.
48. Lindström M, Isacson SO, Merlo J. Increasing prevalence of overweight, obesity and physical inactivity: two population-based studies 1986 and 1994. Eur J Public Health. 2003;13:306–12.
49. Centers for Disease Control and Prevention (CDC). Trends in leisure-time physical inactivity by age, sex, and race/ethnicity—United States, 1994–2004. MMWR Morb Mortal Wkly Rep. 2005;54:991–4.
50. Hackman JR, Oldham GR. Development of the Job Diagnostic Survey. J Appl Psychol. 1975;60:159–170.
51. Holi MM, Marttunen M, Aalberg V. Comparison of the GHQ-36, the GHQ-12 and the SCL-90 as psychiatric screening instruments in the Finnish population. Nord J Psychiatry. 2003;57:233–238.
52. Arnetz BB, Åkerstedt T, Anderzen I. Sleepiness in physicians on night call duty. Work Stress. 1990;4:71–73.
53. Dowell A, Hamilton S. Job satisfaction, psychological morbidity, and job stress among New Zealand general practitioners. New Zealand Med J. 2000;113:269–272.
54. Chong A, Killeen O, Clarke T. Work-related stress among paediatric non-consultant hospital doctors. Irish Med J. 2004;97:203–205.
55. Hayasaka Y, Nakamura K, Yamamoto M, Sasaki S. Work environment and mental health status assessed by the general health questionnaire in female Japanese doctors. Ind Health. 2007;45:781–6.
56. Cohen S, Schwartz JE, Bromet EJ, Parkinson DK. Mental health, stress, and poor health behaviors in two community samples. Prev Med. 1991;20:306–15.
57. Anda RF, Williamson DF, Escobedo LG, Mast EE, Giovino GA, Remington PL. Depression and the dynamics of smoking: a national perspective. JAMA. 1990;264:1541–5.
58. Alexander LL, Beck K. The smoking behaviour of military nurses: the relationship to job stress, job satisfaction and social support. J Adv Nurs. 1990;15:843–9.
59. Beltrame T, McQueen DV. Urban and rural Indian drinking patterns: the special case of the Lumbee. Int J Addict. 1979;14:533–48.
60. Glenister D. Exercise and mental health: a review. J Royal Soc Health. 1996;116:7–13.
61. McLaren L, Beck CA, Patten SB, Fick GH, Adair CE. The relationship between body mass index and mental health: a population-based study of the effects of the definition of mental health. Soc Psychiatry Psychiatr Epidemiol. 2008;43:63–71.
62. Lallukka T, Sarlio-Lähteenkorva S, Roos E, Laaksonen M, Rahkonen O, Lahelma E. Working conditions and health behaviours among employed women and men: the Helsinki Health Study. Prev Med. 2004;38:48–56.
63. Hellerstedt WL, Jeffery RW. The association of job strain and health behaviours in men and women. Int J Epidemiol. 1997;26:575–83.
64. Tsutsumi A, Kayaba K, Yoshimura M, Sawada M, Ishikawa S, Sakai K, et al. Association between job characteristics and health behaviors in Japanese rural workers. Int J Behav Med. 2003;10:125–42.
65. Rittenhouse DR, Mertz E, Keane D, Grumbach K. No exit: an evaluation of measures of physician attrition. Health Serv Res. 2004;39:1571–88.
66. Hochwarter WA, Ferris GR, Perrewe PL, Witt LA, Kiewitz C. A note on the nonlinearity of the age-job satisfaction relationship. J Appl Soc Psychol. 2001;31:1223–1237.
67. Bernal D, Snyder D, McDaniel M. The age and job satisfaction relationship: does its shape and strength still evade us? J Gerontol. 1998;53:P287–93.
68. Sterns AA, Marsh BA, McDaniel MA. Age and job satisfaction: a comprehensive review and meta-analysis. Presented at the Ninth Annual Conference of the Society of Industrial and Organizational Psychology. Nashville, TN; 1994.
69. Geyer, P. D, Daly JP. Predicting job satisfaction for relocated workers: Interaction of relocation consequences and employee age. J Psychol. 1998;132:417–426.
70. Steel RP, Ovalle NK. A review and meta-analysis of research on the relationship between behavioural intentions and employee turnover. J Appl Psychol. 1984;69:673–686.
71. Buchbinder SB, Melick CF, Powe NR. Managed care and primary care physicians' overall career satisfaction. J Health Care Finance. 2001;28:35–44.
72. Kouvonen A, Kivimäki M, Virtanen M, Heponiemi T, Elovainio M, Pentti J, et al. Effort-reward imbalance at work and the co-occurrence of lifestyle risk factors: cross-sectional survey in a sample of 36,127 public sector employees. BMC Public Health. 2006;6:24.
73. Hughes PH, Brandenburg N, Baldwin DC, Jacobson GR, Hawkins MK. Prevalence of substance abuse among US physicians. JAMA. 1992;267:2333–2339.
74. Akvardar Y, Demiral Y, Ergor G, Ergor A. Substance use among medical students and physicians in a medical school in Turkey. Soc Psychiatry Psychiatr Epidemiol. 2004;39:502–6.
75. McAuliffe WE, Rohman M, Breer P, Wyshak G, Santangelo S, Magnuson E. Alcohol use and abuse in random samples of physicians and medical students. Am J Public Health. 1991;81:177–82.
76. Niven RG, Hurt RD, Morse RM, Swenson WM. Alcoholism in physicians. Mayo Clin Proc. 1984;59:12–6.
77. O'Connor PG, Spickard A Jr. Physician impairment by substance abuse. Med Clin North Am. 1997;81:1037–52.
78. Brooke D. Why do some doctors become addicted? Addiction. 1996;91:317–9.
79. Wallace JE, Lemaire J. On physician well being—you'll get by with a little help from your friends. Soc Sci Med. 2007;64:2565–77.

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