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On-call work and physicians' well-being: testing the potential mediators

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Background	On-call duties have been rated to be among the most stressful aspects of physicians' work. On-call work has been associated, for example, with medical errors, injuries and lower well-being. Thus, because it is not possible to remove on-call duties, measures to decrease the negative ramifications of on-call work are needed.
Aims	To examine whether working on-call would predict psychological distress, job satisfaction and work ability in a 4-year follow-up and whether sleeping problems or work interference with family (WIF) would act as mechanisms in these associations.
Methods	Questionnaires in 2006 and 2010 among physicians in Finland. The mediation analyses were conducted using methods suggested by Preacher and Hayes to examine direct and indirect effects with multiple mediators.
Results	There were 1541 respondents (60% women) of whom 52% had on-call duties. Sleeping problems and WIF acted as mechanisms in the association of existence of on-call duties with high distress, low job satisfaction and low work ability. On-call work was associated with higher levels of sleeping problems and WIF, and the number of active on-call hours was associated with higher levels of WIF, but not with sleeping problems.
Conclusions	According to our results, one way to attenuate on-call work's negative ramifications is to make it easier for on-call physicians to connect work and family lives and develop work arrangements to promote better sleep and protected sleep time.
Key words	Follow-up; on-call; physicians; sleep; work–family conflict; work-related stress.

Introduction

On-call duties have been rated to be among the most stressful aspects of physicians' work. For example, on-call was the most frequently mentioned stressor among anaesthetists in Finland and correlated strongly with various stress symptoms [1]. What makes on-call work especially strenuous is that it often combines both long work hours and night work. Long work hours have been related to increased stress levels, lower quality of life and poorer life style [2] as well as with job dissatisfaction [3]. Night work and shift work can also lead to circadian misalignment and poorer sleep [4]. Long on-call duties have been associated with risk of occupational injuries, medical errors [5] and decreased cognitive performance [6]. Night-time on-call has been found to deteriorate neuropsychological and cognitive function [7] and be associated with physical health problems [8]. Among general practitioners, high levels of on-call work have been associated with anxiety [9] and distress measured with the General Health Questionnaire [10]. In addition, physicians' mood has been shown to be significantly lower when on-call compared with off-call [11]. On-call burden has been found to be the greatest reason for sleep deprivation among Finnish anaesthetists [1]. On-call has been associated with excessive daytime sleepiness among Japanese physicians [12]. Moreover, working overtime and long hours may make connecting work and family life more difficult [13].

Being on-call is an integral part of physicians' work in Finland, especially among those working in the public sector. The number of health centres providing

round-the-clock on-call services has reduced substantially in the past 20 years [14]. The on-call services have been centralized to bigger units and also transferred to hospitals. Hospital physicians' shift length including on-call has traditionally lasted 24 h, starting from 8 a.m. Recently, it has become common in some clinics to split the 24-h period between two physicians, especially at weekends. Also other new experiments have been conducted to arrange on-call. The proportion of physicians in Finland taking part on on-call in 2012 was 71% in hospitals and 37% in primary health care [15].

The aim of this study was to examine the 4-year longitudinal effects of on-call work on distress, job satisfaction and work ability among Finnish physicians. In particular, we were interested whether sleeping problems or work interference with family (WIF) would act as mechanisms in the above-mentioned associations. Sleeping problems and WIF were chosen because, as mentioned before, on-call work may predispose an employee to these problems, and these problems in turn may affect the well-being and attitudes of employees. For example, sleeping problems and WIF have both been shown to be associated with distress, low job satisfaction, and adverse health effects. The framework of this study can be seen in Figure 1.

Methods

The study was part of the Finnish Health Care Professionals Study, in which we drew a random sample of 5000 physicians in Finland (30% of the whole physician population) from the 2006 database of physicians maintained by the Finnish Medical Association. The register covers all licensed physicians in Finland. Phase 1 data were gathered with postal questionnaires in 2006. Non-respondents were sent a reminder and a copy of the questionnaire up to two times. Responses were received from 2841 physicians (response rate 57%). The sample is representative of the eligible population in terms of age, gender and employment sector [16].

Four years later, at phase 2 in 2010, the data were gathered by using either a web-based or a traditional postal survey. At phase 1, the respondents were asked their permission to follow-up surveys and 2206 agreed to participate in future surveys. After excluding those who had died or had incorrect address information ($N = 37$), the survey was sent to 2169 physicians at phase 2. First, an e-mail invitation to participate in the web-based survey was sent which was followed by two reminders. For non-responders, the postal questionnaire was sent once. E-mail and postal addresses were obtained from the Finnish Medical Association. Ethical approval for this study was obtained from the National Institute for Health and Welfare.

The existence of on-call duties was assessed at phase 1 with a question asking whether respondent's work included on-call duties with answer options yes or no. In addition, for those who had on-call duties, it was asked how many hours they had performed on-call duties during the preceding month and how many hours of those were active on-call. Sleeping problems were measured at phase 1 with four questions derived from the Jenkins scale [17]. Respondents were asked how often during the last 4 weeks they had trouble falling asleep, were waking up several times per night, had trouble staying asleep including waking up too early and felt tired after their usual amount of sleep. The scale ranged from 1 (never) to 6 (every night). Reliability alpha coefficient for this sample was 0.77.

Work interference with family measure was derived from the measure developed by Frone, Russell and Cooper [18]. Three items ($\alpha = 0.84$) at phase 1 assessed how often the respondent's job interfered with his or her family life (e.g. How often your job or career interferes with your responsibilities at home, such as cooking, shopping, child care, home maintenance, and repairs). The items were rated on a 5-point Likert scale, ranging from 1 (never) to 5 (very often). Psychological distress was measured at phase 2 with the four items ($\alpha = 0.84$) from the GHQ-12 representing anxiety/depression factor suggested by Graetz [19] which has been suggested to be the most preferable factor model for GHQ-12. The answer options ranged from 1 to 4. In this study, the scale was used as a continuous variable. Work ability was assessed at phase 2 with an item from the Work Ability Index [20] asking: 'Assume that your work ability at its best has a value of 10 and 0 would mean that you could not work at all. How many points would you give to your current work ability (range 0–10)?' Job satisfaction was measured at phase 2 with three items ($\alpha = 0.86$) from Job Diagnostic Survey [21]. We used a scale measuring overall satisfaction with the job such as 'I am generally satisfied with my work'. The items were rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Other variables measured at phase

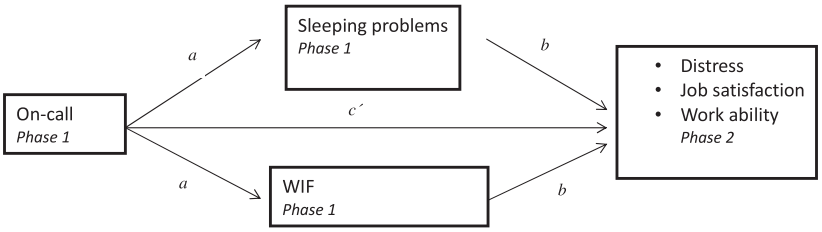

Figure 1. The framework of the present study.

2 were gender, age and employment sector (hospital = 1, primary health care = 2, private = 3, other = 4).

In general, a given variable may be seen to function as a mediator (mechanism) to the extent that it accounts for the relation between the independent variable and the dependent variable. Figure 1 shows our mediational model: on-call's causal effect can be apportioned into its indirect effect on dependent variables through mediators ($a \times b$) and into its direct effect on dependent variables (path c'). Path a represents the effect of on-call on the proposed mediator and path b is the effect of the mediator on the dependent variable partialling out the effect of on-call.

We conducted the mediation analyses using bootstrapping procedures suggested by Preacher and Hayes [22] to examine direct and indirect effects with multiple mediators. These procedures are warranted for at least three reasons: (i) multiple mediators can be used simultaneously, (ii) the likelihood of Type I error is reduced because the number of inferential tests is minimized and (iii) these procedures do not rely on the normal sampling distribution assumption. We used an SPSS multiple mediation macro developed by Preacher and Hayes [22] to conduct the analyses. The bootstrap estimates are based on 5000 bootstrap samples. In this method, the lack of an effect does not preclude the possibility of observing indirect effects—that is, significant indirect effects can occur in the absence of significant total or direct effects. If a zero was not included in the 95% confidence interval of the bootstrap estimate, the indirect effect was statistically significant [22]. Distress, job satisfaction and work ability in 2010 were entered as dependent variables (in separate analyses), existence of on-call duties (2006) was entered as independent variable, and sleeping problems and WIF in 2006 were entered as proposed mediators. Analyses were adjusted for age, gender, employment sector and response format. If the above-mentioned analyses showed evidence that a variable acted as a mediator between existence of on-call duty and outcomes, we also examined the effects of the number of on-call hours on the mediator variable among those who had on-call duties. These analyses were conducted by regression analyses adjusted for age, gender, employment sector and response format. All analyses were performed using the SPSS software version 20.0.

Results

The total number of respondents was 1705 (response rate 79%; 60% women) of who 60% (1018) answered the web-based and 40% (687) the postal questionnaire (the response format is adjusted for in the analyses). The present sample included more women (55% in eligible population) and slightly older respondents compared with eligible population. Of the respondents, 164 had incomplete data; thus, the final sample of this study included 1541 (60% women) physicians aged 24–67 (mean 48.8, SD = 9.5). Characteristics of the study sample can be seen in Table 1. About half of the respondents had on-call duties. Of them, the mean number of total on-call hours during the preceding month was 46.0 (range = 0–365, SD = 41.8) and of active on-call hours it was 23 (range = 0–160, SD = 24.2). The most popular employment places were hospitals and primary care. Of the respondents, 77% were specialists, 11% were not specialized and in 12% the specialization was ongoing.

Table 2 shows the bootstrapped results for the direct and indirect effects. On-call was significantly associated with both mediators (sleeping problems and WIF, path a). In addition, both mediators were significantly associated with all the outcomes (distress, job satisfaction and work ability; path b). On-call did not have a significant direct effect on outcomes (path c'). However, the analyses revealed that the total indirect effects of on-call duty on distress (95% CI: 0.023–0.081), job satisfaction (95% CI: −0.059 to −0.016) and work ability (95% CI: −0.122 to −0.031) through the two mediators were significant because the zero was not included in the confidence interval. This suggests that the two mediators together mediated the association between on-call duty and outcomes. The specific indirect effects of each proposed mediator, which can be seen in Table 2 ($a \times b$), showed that both sleeping problems and WIF were significant specific mediators in the associations of existence of on-call duty with distress, job satisfaction and work ability (zero was not included in the confidence interval). In summary, the bootstrap results showed that sleeping problems and WIF mediated the link between existence of on-call duties and distress, job satisfaction and work ability even though there was no direct effect of on-call duty on these outcomes.

Table 1. Characteristics of the study sample

	n (%)		
On-call duties (2006)			
No	733 (48)		
Yes	808 (52)		
Gender			
Women	927 (60)		
Men	614 (40)		
Employment sector (2010)			
Hospital	694 (45)		
Primary care	330 (21)		
Private	264 (17)		
Other	253 (17)		
	Range	Mean	SD
Age (2010)	24–67	49.80	9.49
Sleeping problems (2006)	1–6	2.30	1.00
WIF (2006)	1–5	3.35	0.92
Distress (2010)	1–4	1.83	0.66
Job satisfaction (2010)	1–5	4.03	0.83
Work ability (2010)	0–10	8.57	1.28

Table 2. The mediational analyses

DV	MV	Effect of IV on MV (*a*)	Effect of MV on DV (*b*)	Direct effect of IV on DV (*c*´)	Indirect effect (*a* × *b*), confidence intervals	R^2
Distress	Sleeping problems	0.12*	0.18***	0.03	0.002 to 0.042	0.16***
	WIF	0.20***	0.15***		0.014 to 0.049	
Job satisfaction	Sleeping problems		−0.12***	−0.04	−0.030 to −0.002	0.06***
	WIF		−0.10***		−0.038 to −0.009	
Work ability	Sleeping problems		−0.29***	0.06	−0.071 to −0.003	0.11***
	WIF		−0.19***		−0.069 to −0.018	

Bootstrapped estimates, confidence intervals and explained variances. Independent variable (IV) = existence of on-call duties. Estimates represent unstandardized regression coefficients. Controlled variables include age, gender, employment sector and response format. DV = dependent variable; MV = mediating variable; R^2 = adjusted R^2, explained variance for on-call through the mediators.
*$P < 0.05$. ***$P < 0.001$.

The results of regression analyses for the associations of the number of on-call hours with mediators can be seen in Table 3. The number of on-call hours (both total and active) was unrelated to sleeping problems. The number of active on-call hours was associated with higher levels of WIF, but the number of total on-call hours was not related to WIF.

Table 3. The association of number of on-call hours with sleeping problems and WIF

	Total on-call hours β	Active on-call hours β
Sleeping problems	0.02	0.01
WIF	0.06	0.10*

Adjusted for age, gender, employment sector and response format.
*$P < 0.05$.

Discussion

Our results suggest that sleeping problems and WIF act as mechanisms in the link between on-call work and high distress, low job satisfaction and low work ability in a 4-year longitudinal design. According to our results, problems in sleep and alertness resulting from on-call burden seem to have many harmful ramifications for physicians such as distress, job dissatisfaction and low work ability.

This study relied on self-reported measures, which may lead to problems associated with an inflation of the strengths of relationships and with common method variance. However, to minimize problems with self-reports, we used well-known validated measures that have shown good reliability. In addition, although we controlled for age, gender, employment sector and response format, we cannot rule out the possibility of residual confounding. It is possible that other factors, such as differences in the nature of the work, may have affected variables in the analyses. For example, in certain specialities, it might be that physicians are required to work on-call and at the same time the nature of the work in that speciality might be intrinsically more stressful, which may lead to greater negative consequences. We assessed on-call work at phase 1. During the follow-up period, the working situation with respect to on-call work may have changed for some of the participants. This may have resulted in weakened associations between on-call work and well-being measured 4 years later. In addition, we only had two measurements, that is on-call status and mediators were measured at the same time and dependent variables were measured 4 years later, whereas ideally, dependent variable measurement would precede mediator measurement, which would precede independent variable measurement. Therefore, interpretation of our results should be made with caution.

Previous studies show that physicians' on-call is associated with sleep deprivation [1] and daytime sleepiness [12]. A study among junior physicians suggested that acute sleep deprivation during on-call days may lead to significant daytime sleepiness and impaired mood and worryingly it was also found that physicians are not able compensate for this sleep debt by obtaining adequate sleep during non-on-call days [23]. Besides having effects on physician's well-being, sleep problems and fatigue may also pose a risk to patient care and the physician's own safety [24].

Our results imply that on-call burden has an impact on the mental distress and well-being of physicians. Numerous previous studies have highlighted the stressfulness of on-call work and especially of night on-calls [1,7,8]. On-call work was a major source of stress and job dissatisfaction among New Zealand GPs [25]. Similarly, among paediatric hospital physicians in Ireland, the main reasons for work-related stress were long working hours and suboptimal on-call conditions [26].

Our results suggest that problems in combining work and family life are among the reasons for the negative effects of on-call work. A previous study found that poor work–life balance was the second greatest source of stress among Finnish anaesthetists [1]. In an interview among spouses of practising paediatricians, it was found that on-call had

negative effects on family life such as restrictions on lifestyle, spousal sacrifice, communication challenges and restricted involvement with children [27]. Impacts of on-call for family life also include lack of time, interruptions and leaving family responsibilities to spouses [28].

According to our results, one reason for low job satisfaction, high distress and low work ability among physicians may be on-call burden. Therefore, because it is not possible to remove on-call duties, it would be important to try to decrease on-call work's negative ramifications. According to our results, one way to do this is to support on-call physicians' family life and make working arrangements such that proper sleep would be possible. In a review of shift length, protected sleep time and night float among residents, it was concluded that support was found for the benefits of shorter shifts, but studies did not adequately address the optimal shift duration [29]. Results regarding napping, night-float systems and reducing the number of consecutive nights are still inconclusive [29]. Health care organizations should consider family friendly policies such as flexible work scheduling and providing childcare opportunities, especially for those who take part in on-call. In addition, a previous study suggests that work–family conflict could be reduced by increasing employees' opportunities for control over their work and that fair treatment and procedures in organizations seem to be directly related to less problems in combining the work and family roles [30].

To conclude, this study found evidence that sleeping problems and work–family conflicts would act as mechanisms in the association of the existence of on-call duty with high distress, low job satisfaction and low work ability in a 4-year longitudinal design. Job satisfaction has been highlighted for the well-being and retention of physicians; thus, promoting job satisfaction should be important in health care settings. We showed that one reason for low job satisfaction, high distress and low work ability among physicians may be on-call burden.

Key points

- Our results suggest that physicians' sleeping problems and work interference with family acted as mechanisms in the association between on-call duties and high distress, low job satisfaction and low work ability.
- Existence of on-call work was associated with higher levels of sleeping problems and work interference with family, and the number of active on-call hours was associated with higher levels of work interference with family, but not with sleeping problems.
- According to our results, the negative ramifications of on-call work could be attenuated by making arrangements to promote physicians' family life and proper sleep.

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Conflicts of interest

None declared.

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