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ORIGINAL ARTICLE

Associations of psychosocial working conditions with health outcomes, quality of care and intentions to leave the profession: results from a cross-sectional study among physician assistants in Germany

Patricia Vu-Eickmann[1] · Jian Li[1] · Andreas Müller[2] · Peter Angerer[1] · Adrian Loerbroks[1]

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Abstract

Background Numerous epidemiological studies among health care staff have documented associations of adverse psychosocial working conditions with poorer health-related outcomes, a reduced quality of patient care and intentions to leave the profession. The evidence for physician assistants in Germany remains limited though.

Methods We surveyed a total of 994 physician assistants between September 2016 and April 2017. Psychosocial working conditions were measured by the established effort–reward imbalance (ERI) questionnaire and by a questionnaire specifically developed to capture psychosocial working conditions among physicians. Health outcomes (i.e., self-rated health, depression, anxiety), self-rated quality of care and the intention to leave the profession were assessed by established measures. We ran multivariable logistic regression analyses.

Results The prevalence of work stress in terms of ERI equalled 73.77%. Work stress according to the ERI model was associated with significantly poorer self-rated health [odds ratio (OR) 3.62], elevated symptoms of depression (OR 8.83) and anxiety (OR 4.95), poorer quality of care (OR for medical errors 4.04; OR for interference of work with patient care 3.88) and an increased intention to leave one's current profession (OR 3.74). The PA-specific questionnaire showed similar, albeit weaker, associations (all ORs > 1.22).

Conclusions Our results are in line with previous findings among health care staff and provide specific and novel evidence for physician assistants. Interventions aiming at the improvement of working conditions seem needed given their potential adverse consequences in terms of employee health, quality of care, and personnel policy.

Keywords Psychosocial working conditions · Health care staff · Health · Quality of care · Intention to leave

Introduction

Numerous studies among employees in the healthcare sector highlighted poor psychosocial working conditions (Bonde 2008; Backé et al. 2012; Kraatz et al. 2013). Among physicians, identified unfavorable working conditions include their high workload, time pressure and frequent interruptions, a poor job control, as well as negative interpersonal experiences with supervisors and a lack of social support (Angerer et al. 2008; Siegrist 2012; Weigl et al. 2013). Those and other adverse psychosocial working conditions have been associated with poorer health (Bonde 2008; Backé et al. 2012; Kraatz et al. 2013). In addition to health outcomes, unfavorable working conditions were also found to relate to a poorer quality of care (e.g., in terms of medical errors, patient adherence, and care outcomes) and this link is possibly mediated by impaired occupational performance (Goetz et al. 2011; Trybou et al. 2014; Angerer and Weigl 2015; Loerbroks et al. 2016).

✉ Adrian Loerbroks
adrian.loerbroks@uni-duesseldorf.de

[1] Institute of Occupational, Social and Environmental Medicine, Centre for Health and Society, Medical Faculty of the Heinrich-Heine-University Düsseldorf, Universitätsstraße 1, 40225 Düsseldorf, Germany

[2] Institute of Psychology, Work and Organizational Psychology, University of Duisburg-Essen, Universitätsstrasse 2, 45141 Essen, Germany

In Germany, physician assistants (PAs) represent one of the largest occupational groups in outpatient care. One may therefore assume that their exposure to the same working environment as physicians implies similarly pronounced stress levels. Accordingly, Viehmann et al. (2017) have shown that chronic stress level is not only considerable among primary care physicians in Germany, but also among PAs when compared to the general population (Viehmann et al. 2017). Prior qualitative work supports the notion that psychosocial working conditions of PAs are poor (Vu-Eickmann and Loerbroks 2017a) and that many PAs also perceive a negative influence of working conditions on the quality of care they provide (Vu-Eickmann and Loerbroks 2017b). This is particularly important, because PAs perform a large number of tasks in practices that are closely related to patient care (e.g., storage of medication, taking structured patient histories, X-rays, injections, laboratory diagnostics and wound care) (Kassenärztliche Bundesvereinigung and GKV-Spitzenverband 2015). The experienced workload and the level of job satisfaction are not only frequently documented determinants of the quality of care (Gavartina et al. 2013; Goetz et al. 2015), but were found to relate to health care staffs' intention to leave their profession (von dem Knesebeck et al. 2010; Mark and Smith 2012; Rössler 2012; Degen et al. 2015). This is particularly relevant, since one's intention to leave is the best predictor of actual job change (Loerbroks et al. 2014).

Taken together, the above-mentioned evidence highlights the need to investigate the possible relationship of the psychosocial working conditions of PAs with their health, the quality of care they provide and their potential intentions to leave their profession. These findings could help to identify possible needs for intervention among PAs to improve their health, quality of delivered patient care, and career prospects.

One of the most established theoretical models in work stress research is the effort–reward imbalance (ERI) model. This model describes work stress as an imbalance of high efforts and at the same time low rewards (e.g., recognition, salary, promotion) (Siegrist et al. 2004). The ERI model has repeatedly been confirmed as a risk factor for numerous major health outcomes (e.g., coronary heart disease or depression) (Dragano et al. 2017; Rugulies et al. 2017). To our knowledge, the ERI has not yet been applied among PAs thus far. In addition, we have been able to develop and use an instrument measuring psychosocial working conditions among PAs based on our earlier qualitative work (Vu-Eickmann and Loerbroks 2017a, b). That instrument specifically captures PA-specific work stressors and resources.

In summary, the present study has the aims to examine (a) the psychosocial working conditions of PAs (i.e., in terms of ERI and our PA-specific instrument) as well as possible associations with (b) health outcomes, (c) quality of care indicators and (d) the intention to leave.

Methods

Sample

The survey (online or postal) was carried out between September 2016 and April 2017. Inclusion criteria were current PA training or holding of a PA degree. Participant recruitment was carried out nationwide in Germany with support of multipliers and various communication channels. Among others, recruitment built on the inclusion of flyers in the members' magazine of the Association of Medical Professionals (VMF e.V., which represents PAs), advertisement of our study at the Association of Statutory Health Insurance Physicians and State Medical Association via internal distribution, home pages or direct forwarding to established medical practices or professional PA schools. Recruitment of PAs was also carried out at relevant conferences and training events (see acknowledgements for details). The Ethics Committee of the Medical Faculty of the Heinrich-Heine-University of Düsseldorf approved our study.

Survey instruments

Psychosocial working conditions

The psychosocial working conditions were measured by the 17-item effort–reward imbalance questionnaire (ERI) (Siegrist et al. 2004). The ERI questionnaire maps the central dimensions of effort [6 items; Cronbach's alpha in our study (CA) 0.60] and reward [experienced/expected reward; 11 items; (CA) 0.82]. The sum scores of those subdimensions were calculated according to recommendations, including weighting of those sum scores according to the respective number of items to derive the ERI ratio. The ERI ratio reflects the degree of imbalance between effort and reward (where an ERI value > 1.0 indicates work stress) (Larisch et al. 2003; Siegrist et al. 2004; Klein et al. 2010).

We also used a PA-specific instrument. Based on prior qualitative work on the occupational stress of PAs (Vu-Eickmann and Loerbroks 2017a, b), we developed a preliminary pool of potentially suitable questionnaire items. This item pool consisted of (modified) items of established work-related stress questionnaires or items, which were newly developed by the study team. This item pool was then intensively reviewed by and discussed with PAs during 19 cognitive interviews. The optimized subsequent

item pool contained 35 items. Items were presented as statements and the level of agreement with each item was supposed to be indicated on a 4-point Likert scale (varying from "I fully agree" to "I fully disagree"). After further psychometric analyses (main component analyses with VARIMAX rotation), the questionnaire comprised 29 items grouped into the following 7 factors, each with 3–6 items: (1) workload (this factor includes aspects such as the number of patients, staff shortage, time pressure and overtime; 6 items), (2) job control (e.g., interruptions, multitasking, documentation effort and unforeseen events; 6 items), (3) collaboration with colleagues/supervisors (e.g., unfair treatment; 4 items), (4) gratification (i.e., promotion opportunities and recognition; 4 items), (5) practice organization (e.g., procedures and responsibilities; 3 items), (6) resources PA (e.g., patient interaction and variation of tasks; 3 items) and (7) characteristics of the supervisor (e.g., ability to resolve conflicts and work organization; 3 items). Cronbach's alpha for the entire questionnaire was 0.89 and ranged for the seven individual factors between 0.71 and 0.85.

Health outcomes (health, depression, anxiety)

Information on the overall health status was collected by the item "How is your health status in general" (five-step response format: very good = 1, good = 2, average = 3, bad = 4, very bad = 5) (Lampert et al. 2013). The cut-off value for poor health status was set at ≥ 3. Symptoms of depression or anxiety were measured by the German versions of the patient health questionnaire (PHQ-2) and the generalized anxiety disorder questionnaire (GAD-2) (Kroenke et al. 2010). Responses are provided on a four-point Likert scale, which inquires after the frequency of symptoms (from "not at all" = 0 to "almost every day" = 3) with possible sum scores ranging between 0 and 6 points per instrument. Values ≥ 3 indicate depressive symptoms (PHQ-2) or severe anxiety symptoms (GAD-2), respectively (Kroenke et al. 2010). These cut-offs were used accordingly in this study.

Quality of care indicators (i.e., medical errors and interference of work with care)

Quality of care was measured by two separate items, these were: (i) "Are you concerned that you have made a major medical error in the last three months?" (yes/no) (West et al. 2006) and (ii) "How often do you think work stress affects your work with and on patients?" (answer format: never, rarely, occasionally, mostly, always). In the case of the latter item, the reply "mostly" and "always" were considered to signal interference of work with patient care.

Intention to leave the profession

The item "How often during the last 12 months have you thought about giving up your position as a PA and starting another professional activity?" was used in previous studies to measure intentions to leave among different occupational groups (Li et al. 2011, 2013a). The response options were: never, several times a year, several times a month, several times a week, every day. In line with previous studies (Li et al. 2011, 2013a), intention to leave was considered present whenever participants reported that the corresponding thoughts arise at least several times a month.

Statistical analysis

SPSS 24.0 was used to carry out descriptive analyses (see Table 1) and to extract the frequency of PA-specific stressors and resources (see Table 2). In the next step, multivariable logistic regression analyses were carried out separately for effort, reward and ERI as well as for all seven factors of the PA-specific questionnaire. Some items were reversed prior to the analyses to ensure that the answers could be interpreted consistently (i.e., higher scores consistently indicating higher stressor exposure) (see Tables 3, 4, 5). The ERI ratio was dichotomized based on its theory-based cut-off (> 1.0 vs ≤ 1.0). To harmonize the number of categories across exposures, we decided to dichotomize all the other work stress variables based on the respective tertile into high (top tertile) vs low (remaining tertiles) in keeping with previous research (Klein et al. 2011; Loerbroks et al. 2016). The outcome variables (i.e., health parameters, quality of care indicators, intention to leave) were also dichotomized (see above). Possible correlations were estimated by means of logistic regression and are reported as odds ratios (OR) with 95% confidence intervals (CI). All regression analyses were corrected for age and gender (Model 1[a]) and additionally for leadership position, smoking status and body mass index (Model 2[b]).

Results

In total, 994 PAs participated in our survey. Those reporting to be currently employed were included in the present analyses ($n = 887$). Participants were on average 39.23 years old [standard deviation (SD) 11.43] and 98.41% were female. Full-time employment was reported by 57.69%. On average, the PAs had been working in their profession for 17.26 years

(SD 11.26). The prevalence of work stress according to the ERI ratio was 73.77%. Agreement was particularly high with occupational stressors related to poor job control (≥ 85.1%) (see Table 2). Positive work-related aspects (i.e., resources) were also frequently reported (≥ 89.5%) (see Table 2).

The multivariable logistic regression analyses showed significant associations between high work stress on the one hand and poorer self-rated health, higher depressiveness and anxiety on the other hand (see Table 3). With regard to ERI, the ERI ratio showed a particularly strong relationship with depressiveness (OR 8.83; 95% CI 4.02–9.43). Similar associations were observed with high effort (ORs ≥ 2.5 across all health outcomes) and correspondingly inverse associations with high rewards (ORs ≤ 0.46 across all health outcomes). With regard to the PA-specific work stress, it seemed that each factor was linked to either health outcome. Particularly pronounced relationships were observed between workload and depressiveness or anxiety (ORs ≥ 3.7) as well as among collaboration with depressiveness and anxiety (ORs ≥ 5.0).

With regard to the quality of care indicators, the ORs for the ERI ratio equalled 4.04 (95% CI 1.42–11.52) for important medical errors and 3.88 (95% CI 2.43–6.12) for interference of work with care performance (see Table 4). Corresponding ORs were observed for the individual effort and reward components. With regard to the PA-specific questionnaire, somewhat weaker but also consistently significant ORs emerged (see Table 4).

In addition, work stress—operationalized by either the ERI or the PA-specific instrument—was associated with increased odds of the intention to leave one's profession. For the ERI ratio, the OR was 3.74 (95% CI 2.24–6.25) (see Table 5). Effort and reward showed the corresponding ORs. Based on the PA-specific questionnaire, ORs ≥ 1.43 were observed.

Discussion

The combination of high effort with low rewards (i.e., ERI) was highly prevalent in the present study among PAs in Germany. Items that describe a high workload and low job control achieved high agreement ratings based on the PA-specific questionnaire. In addition, profession-specific resources (i.e., diversified range of activities, social components, patient interaction) were frequently reported. Overall, the ERI components as well as all PA-specific working characteristics were associated with either health outcome in the present study. Also, associations between work stressors and the quality of care and an intention to leave were observed.

Findings in light of prior research

In other studies among health care professionals, the prevalence of work stress according to the ERI ratio seemed to vary profoundly (i.e., between 20 and 80%) (Klein et al. 2011; Msaouel et al. 2012; Tsutsumi et al. 2012; Loerbroks et al. 2016). For example, prevalences of 57% could be shown among physicians (i.e., in Germany and Japan) (Tsutsumi et al. 2012; Loerbroks et al. 2016) and 81% for a mixed sample of health professionals (i.e., physicians, nurses, physiotherapists and laboratory staff in Greece) (Msaouel et al. 2012). Our prevalence of 74% is thus within the range observed in previous studies. However, the comparability of findings is hampered by cross-national differences in health care systems and varying occupational profiles. Moreover, methodological differences may contribute to discrepant findings across studies: the ERI questionnaire is available in different versions, which vary in terms of the number of items and the response format (4-point Likert scale vs 5-point Likert scale). It has been suggested that the prevalence of work stress in terms of the ERI ratio was 18.9% for the longer version with a 5-point Likert scale and 63.2% for the shorter version with a 4-point Likert scale (Kurioka et al. 2013). We have used a 4-point Likert scale and this may thus partly have contributed to our observation of a very high prevalence of work stress according to the ERI ratio among PAs.

Our study suggests that in particular a high workload (i.e., number of patients, staff shortage, time pressure, overtime) and a low level of job control (i.e., interruptions, the so-called multitasking, documentation effort, unforeseen events) are significant stressors in PAs' everyday work. Working conditions such as high labor intensity, limited room for manoeuvre, low social support at the workplace and poor rewards in relation to efforts are considered risk factors for poorer physical and mental health (Kivimaki et al. 2007; Virtanen et al. 2008; Bonde 2008; Nieuwenhuijsen et al. 2010; Rau and Henkel 2013; Dragano et al. 2017; Rugulies et al. 2017). Our findings complement previous studies among physicians and nurses, which also documented associations between ERI and poorer self-reported health, depressive symptoms and anxiety levels (Angerer et al. 2008; Klein et al. 2010; Mark and Smith 2012; Li et al. 2013b). Low social support in the workplace and low wages were also related to increased depression and anxiety in those occupational groups (Mark and Smith 2012). Work stress cannot only be accompanied by health problems (Bonde 2008; Nieuwenhuijsen et al. 2010; Rau and Henkel 2013), but also by reduced quality of patient care (von dem Knesebeck et al. 2010; Goetz et al. 2011; Angerer and Weigl 2015; Loerbroks et al. 2016). Studies among physicians also show negative correlations between ERI and the quality of

care (Loerbroks et al. 2016). A high workload, time pressure and frequent interruptions are possible reasons for a higher rate of medical errors (von dem Knesebeck et al. 2010; Loerbroks et al. 2016), while a high remuneration (i.e., recognition, salary) seems to correlate with better quality of care (Loerbroks et al. 2016). At the same time, job satisfaction, which is low in PAs with regard to their salary, is also described as a determinant of the quality of care (Goetz et al. 2011, 2015). Higher remuneration of the PAs likely contributes to higher job satisfaction and may possibly also improve quality of care (Szecsenyi et al. 2011; Gavartina et al. 2013). In addition, it has been suggested that low job satisfaction and unfavorable working conditions among physicians and nursing staff are the main reasons for a planned or implemented change of employer or occupation (Derycke et al. 2010; Mark and Smith 2012; Rössler 2012; Li et al. 2013a). Some studies show that work-related gratification crises (i.e., an ERI ratio > 1.0) predict increased thoughts of a career change (Derycke et al. 2010; Li et al. 2011, 2013a). Notably, one's expressed intention to leave represents a strong predictor for a change that is actually carried out (Loerbroks et al. 2014). In the present study among PAs, ERI was also positively associated with an intention to leave. At the same time, previous qualitative results show that PAs experience a high workload, low job satisfaction and interpersonal conflicts as the main reasons for a planned or implemented change of employer or profession (Vu-Eickmann and Loerbroks 2017a). Accordingly, up to 50% of the PAs have experienced multiple employer changes or even occupational sector changes (Kathmann and Dingeldey 2013). In summary, our observations correspond to previous findings from studies among other groups of employees in the health care sector, according to which psychosocial work stress is associated with health impairment as well as with a lower quality of care and thoughts of a career change.

Implications

Our study suggests high work stress level among PAs and correlations with various types of unfavorable outcomes. Although our observations will have to be confirmed by future longitudinal studies, our PA-specific questionnaire may be used as a basis for gaining initial profession-specific insights and to derive target areas for possible interventions. Preliminary measures could, for example, include efforts to promote social support as a resource (e.g., better team cohesion) and to enhance social recognition by the employer (e.g., value assessment, regular positive feedback), but also financial recognition (Goetz et al. 2011; Gavartina et al. 2013). The PA profession continues to be a popular training profession Statistisches Bundesamt (Destatis) 2016a, b), which implies that there are currently no recruiting problems in the outpatient sector (Kathmann and Dingeldey 2013). To further promote this in-stream of potential new talent and the positive aspects of PA professional work, also from a preventive perspective, it appears necessary to also improve working conditions.

Strengths and weaknesses

We applied for the first time the standardized ERI questionnaire to PAs, and thereby enable comparisons of their work stress levels with those of other (health) occupational groups. In addition, we were able to carry out in-depth characterization of the psychosocial working conditions specifically experienced by PAs. This information was gathered by a novel instrument, which was developed in close cooperation with PAs to model their typical stressors and resources at work, and thereby likely has high validity for this occupational group. That instrument could be a useful resource for further PA-specific studies.

Some limitations of our study deserve mentioning. Our study is cross-sectional, and consequently no conclusions can be drawn related to the direction of relationships and their possible causality. As a result, our findings must first show robustness to longitudinal investigation before well-founded implications for preventive measures can be deduced. Due to the wide dispersion of recruitment efforts, the number of PAs who were contacted could not be determined. As a result, response rate cannot be estimated. The study may have enrolled particularly dissatisfied or particularly motivated PAs. Possible selection effects can therefore not be excluded. However, these would only be relevant for the descriptive analyses (i.e., the prevalence of stressors) and would be less relevant for the association analyses (i.e., ORs), which were the main focus of our work. Moreover, there is evidence to suggest that our study sample is fairly representative of the overall PA population in Germany: first, the characteristics of our study sample in terms of age, sex and employment status are in line with PA data provided by the Federal Statistical Office of Germany [Statistisches Bundesamt (Destatis) 2017]. Second, characteristics of our study participants were comparable in many respects (e.g., age, marital status, number of persons in household, employment status and years of work experience) with those from another study among general practitioners (GPs) and PAs. The authors of that study stated that they included a representative sample of GP practices in Germany (Viehmann et al. 2017).

Conclusion

The present study shows that high work stress is associated with poorer health, lower quality of care and more frequent intention to leave one's profession among PAs. The promotion of social support and higher recognition (remuneration, appreciation) could be the first starting points for improvement. Prospective studies are needed.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent Informed consent was obtained from all individual participants included in the study.

Appendix

See Tables 1, 2, 3, 4 and 5.

Table 1 Description of the sample ($n = 887$)

Age, mean (MW) [standard deviation (SD)]	39.28 (11.43)
Sex	
Female	865 (98.41)
Male	14 (1.59)
Marital	
Married	445 (50.7)
Single	338 (38.5)
Divorced	90 (10.2)
Widowed	5 (0.6)
Persons in household	
Number of persons ≤ 3	671 (76.7)
Number of persons > 3	204 (23.3)
Employment scheme	
Full-time	510 (57.69)
Part-time	327 (37.0)
Mini-job	24 (2.71)
Other	23 (2.6)
Current employer	
Medical care center	53 (6.0)
Hospital/clinic	29 (3.3)
Rehabilitation segment	2 (0.2)
GP practice	336 (37.9)
Specialist practice	373 (42.1)
Other	48 (5.4)
Multiple answers	46 (5.1)
Professional experience	
Professional years as PA in total (0–49 years)	17.26 (11.26)
Professional years current employer (0.04–38 years)	9.13 (8.31)
	MW (SD)
Effort	
Value range 6–24, cut-off ≥ 21	18.56 (3.19)
Reward	
Value range 11–44, cut-off ≥ 31	28.25 (5.98)
ERI ratio[a]	
(Effort*11)/(Reward*6), cut-off ≥ 1.0	1.28 (0.42)
Anxiety (GAD2)[b]	
Value range 0–6, cut-off ≥ 3	1.47 (1.66)
Depression (PHQ2)[c]	
Value range 0–6, cut-off ≥ 3	1.56 (1.46)
PA[d] sub-scale workload	
Value range 6–24	17.36 (4.19)
PA sub-scale job control	
Value range 6–24	21.11 (2.71)
PA sub-scale collaboration	
Value range 4–16	8.41 (2.85)
PA sub-scale gratification crisis	
Value range 4–16	11.52 (2.66)
PA sub-scale practice organization	
Value range 3–12	6.56 (2.08)
PA sub-scale resources	
Value range 3–12	4.63 (1.71)
PA sub-scale supervisor	
Value range 3–12	8.01 (2.35)
Intention to leave	
Value range 1–5	1.96 (1.08)
Medical errors	
Value range 1–2	1.95 (0.22)
Impairment of care	
Value range 1–5	2.96 (0.94)
	N (%)
Leadership role	
Yes	421 (48.0)
Current smoker	
Yes	205 (23.27)
Body mass index	
Normal	453 (52.19)
Overweight	222 (25.58)
Obese	193 (22.24)
Work stress	
According to ERI (i.e., ratio > 1.0)	616 (73.77)
Anxiety	
According to GAD-2	177 (20.14)
Depressiveness	
According to PHQ-2	153 (17.45)
Self-reported health	
Very good/good	537 (61.37)
Intention to leave	
Yes (i.e., several times a month or more frequently)	197 (22.3)
Mistakes	
Yes	47 (5.3)
Impairment of care	
Yes (i.e., mostly/always)	235 (26.6)

[a]Effort–reward imbalance questionnaire (ERI)
[b]Generalized anxiety disorder questionnaire (GAD-2)
[c]Patient health questionnaire (PHQ-2)
[d]Physician assistants (PA)

Table 2 Agreement to the items of the physician assistant-specific work stress questionnaire ($n = 887$) by factor

Factors	Items	*n* (%) agreeing
Factor 1 workload (eigenvalue 7.565)		
	The number of patients cannot be managed in the given time	549 (62.0)
	There is a shortage of staff at my workplace	496 (56.0)
	The workload is often too high	679 (76.7)
	I have too many things to do	598 (68.0)
	Due to the high workload, there is often great time pressure	727 (82.1)
	I often need to work overtime	502 (56.7)
Factor 2 job control (eigenvalue 2.925)		
	My work requires that I constantly respond to unforeseeable events	772 (87.2)
	Over the past few years, the amount of documentation required for my work has increased	820 (92.7)
	I have a lot of things to take care of at the same time	851 (96.0)
	It happens that many people want something from me at the same time	833 (94.1)
	I am often interrupted and disturbed in my work	754 (85.1)
	I have a lot of responsibility at work	849 (96.0)
Factor 3 collaboration (eigenvalue 1.986)		
	In my area of work, working with colleagues is regularly a burden	358 (40.5)
	In my area of work, working with supervisors is regularly a burden	358 (40.5)
	I'm being treated unfairly at work	194 (21.9)
	I often feel wrongly criticized, harassed or exposed by others at work	226 (25.5)
Factor 4 gratification (eigenvalue 1.734)		
	The promotion prospects in my occupational field are poor	628 (71.0)
	When I think of my work performance and all the efforts that I have made, I think that the experienced recognition is appropriate	367 (41.4)
	When I think of my work performance and all the efforts that I have made, I consider my personal career prospects to be appropriate	381 (43.1)
	When I think of my work performance, I consider my wage to be appropriate	176 (19.9)
Factor 5 practice organization (eigenvalue 1.197)		
	In this practice, the work processes are well-structured	567 (64.1)
	Everyone in the team knows which work area they are responsible for	647 (73.1)
	In this practice, the procedures are optimally designed for the patients	592 (66.8)
Factor 6 resources (eigenvalue 1.190)		
	I enjoy the interaction with the patients	791 (89.8)
	I enjoy the fact that my profession is a social activity	811 (91.6)
	My work is varied	790 (89.5)
Factor 7 supervisor (eigenvalue 1.014)		
	I get the recognition I deserve from my supervisor	426 (48.2)
	My supervisor organizes her/his work well	371 (42.0)
	My supervisor solves conflicts well	330 (37.4)

Table 3 Associations between work stress (i.e., ERI or PA) and self-reported poor health, depression and anxiety

ERI	Poor health				Depressiveness[a]				Anxiety[b]			
	Model 1[c]		Model 2[d]		Model 1[c]		Model 2[d]		Model 1[c]		Model 2[d]	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Effort (highest tertile vs rest)	2.53	1.88–3.41	2.64	1.93–3.62	2.93	2.02–4.26	3.19	2.15–4.73	3.02	2.14–4.27	3.20	2.22–4.61
Reward (highest tertile vs rest)	0.45	0.33–0.62	0.46	0.33–0.64	0.19	0.11–0.33	0.18	0.10–0.32	0.26	0.17–0.42	0.25	0.15–0.40
ERI (> 1.0 items vs rest)	3.66	2.50–5.34	3.62	2.45–5.35	8.99	4.10–9.70	8.83	4.02–9.43	4.72	2.66–8.38	4.95	2.73–8.97
PA work stress questionnaire[e]												
Factor 1 (high) workload	2.41	1.80–3.23	2.51	1.86–3.40	4.08	2.80–5.95	4.40	2.97–6.52	3.53	2.50–5.00	3.70	2.58–5.30
Factor 2 (low) job control	1.72	1.30–2.28	1.85	1.36–2.50	1.79	1.24–2.59	2.01	1.35–2.98	1.93	1.37–2.71	2.01	1.40–2.89
Factor 3 (poor) collaboration	2.94	2.19–3.94	2.80	2.07–3.79	6.22	4.21–9.19	6.33	4.25–9.45	4.97	3.49–7.08	4.98	3.46–7.16
Factor 4 (low) gratification	1.74	1.31–2.31	1.71	1.28–2.29	2.90	2.01–4.19	2.79	1.91–4.06	1.72	1.23–2.41	1.65	1.17–2.34
Factor 5 (poor) practice organization	2.77	2.05–3.73	2.61	1.92–3.56	2.44	1.70–3.52	2.43	1.67–3.54	2.19	1.56–3.09	2.25	1.58–3.21
Factor 6 (lack of) resources	1.46	1.09–1.97	1.52	1.12–2.07	2.05	1.42–2.96	2.17	1.49–3.17	1.93	1.37–2.74	2.02	1.42–2.89
Factor 7 (poor characteristicts of) supervisor	2.64	1.93–3.60	2.49	1.81–3.42	3.66	2.51–5.33	3.67	2.49–5.41	2.34	1.64–3.32	2.33	1.62–3.35

Effort–reward imbalance questionnaire (ERI) or physician assistant (PA)-specific work stress questionnaire

[a]Patient health questionnaire (PHQ-2), cut-off ≥ 3

[b]Generalized anxiety disorder questionnaire (GAD-2), cut-off ≥ 3

[c]Adjusted for age and gender

[d]Adjusted for age, gender, leadership position, smoking status and body mass index

[e]Reversed items: 3 items at factor 4, all items at factor 5–7

Table 4 Associations between work stress (i.e., ERI or PA) and quality of care indicators

ERI	Errors				Interference of work with patient care			
	Model 1[a]		Model 2[b]		Model 1[a]		Model 2[b]	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Effort (highest tertile vs rest)	1.64	0.90–3.02	1.94	1.03–3.64	2.91	2.12–3.99	3.16	2.26–4.42
Reward (highest tertile vs rest)	0.23	0.09–0.60	0.23	0.09–0.60	0.39	0.27–0.56	0.38	0.26–0.56
ERI (> 1.0 items vs rest)	3.48	1.23–9.88	4.04	1.42–11.52	3.85	2.44–6.10	3.88	2.43–6.12
PA work stress questionnaire[c]								
Factor 1 (high) workload	1.16	0.62–2.16	1.27	0.68–2.38	2.89	2.11–3.95	2.96	2.14–4.10
Factor 2 (low) job control	1.34	0.74–2.43	1.71	0.92–3.19	2.45	1.79–3.35	2.86	2.04–4.01
Factor 3 (poor) collaboration	2.05	1.13–3.70	2.12	1.16–3.87	2.82	2.07–3.85	2.79	2.02–3.84
Factor 4 (low) gratification	1.66	0.92–3.00	1.61	0.88–2.93	1.54	1.13–2.09	1.55	1.13–2.12
Factor 5 (poor) practice organization	2.76	1.52–4.99	2.83	1.55–5.18	2.26	1.65–3.10	2.18	1.57–3.01
Factor 6 (lack of) resources	1.24	0.67–2.31	1.24	0.66–2.33	1.78	1.29–2.45	1.81	1.30–2.51
Factor 7 (poor characteristicts of) supervisor	1.18	0.62–2.24	1.22	0.63–2.35	2.50	1.81–3.46	2.46	1.76–3.43

Effort–reward imbalance questionnaire (ERI) or physician assistant (PA)-specific work stress questionnaire

[a]Adjusted for age and gender

[b]Adjusted for age, gender, leadership position, smoking status and body mass index

[c]Reversed items: 3 items at factor 4, all items at factor 5–7

Table 5 Associations between work stress (i.e., ERI or PA) and the intention to leave one's profession

ERI	Intention to leave			
	Model 1[a]		Model 2[b]	
	OR	95% CI	OR	95% CI
Effort (highest tertile vs rest)	2.34	1.67–3.28	2.51	1.75–3.60
Reward (highest tertile vs rest)	0.24	0.15–0.37	0.23	0.14–0.37
ERI (> 1.0 items vs rest)	3.64	2.20–6.02	3.74	2.24–6.25
PA work stress questionnaire[c]				
Factor 1 (high) workload	2.38	1.70–3.33	2.39	1.69–3.39
Factor 2 (low) job control	1.27	0.91–1.77	1.43	1.00–2.04
Factor 3 (poor) collaboration	3.12	2.24–4.36	2.94	2.09–4.14
Factor 4 (low) gratification	3.12	2.23–4.37	3.22	2.27–4.55
Factor 5 (poor) practice organization	1.98	1.42–2.77	1.74	1.23–2.46
Factor 6 (lack of) resources	2.20	1.57–3.07	2.20	1.56–3.11
Factor 7 (poor characteristicts of) supervisor	2.25	1.59–3.17	2.07	1.45–2.96

Effort–reward imbalance questionnaire (ERI) or physician assistant (PA)-specific work stress questionnaire

[a]Adjusted for age and gender

[b]Adjusted for age, gender, leadership position, smoking status and body mass index

[c]Reversed items: 3 items at factor 4, all items at factor 5–7

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