

Brief Report

Physician Burnout and Its Associated Factors: A Cross-sectional Study in Shanghai

Zhihui WANG¹, Zhenyu XIE², Junming DAI¹, Liqian ZHANG¹, Yunbiao HUANG² and Bo CHEN¹

¹School of Public Health, Key Lab of Public Health Safety of the Ministry of Education, Fudan University, China and ²Pudong Center for Disease Control and Prevention, China

Abstract: Physician Burnout and Its Associated Factors: A Cross-sectional Study in Shanghai: Zhihui WANG, et al. School of Public Health, Fudan University China—Objectives: The aim of this study

was to determine the rate of burnout and the contributing factors behind it among physicians in Shanghai. **Methods:** In this cross-sectional study, a total of 457 physicians from 21 hospitals in Shanghai completed self-reported questionnaires in June 2008. The Chinese version of the job content questionnaire (C-JCQ) and the Chinese version of the effort-reward imbalance questionnaire (C-ERI) were used to measure occupational stress. The Chinese version of Maslach Burnout Inventory (C-MBI) was used to measure burnout rate. We then performed regression analysis of physician burnout. **Results:** The MBI model revealed that 277 physicians (60.6%) were experiencing a mild degree of burnout and that 27 physicians (5.9%) were experiencing a severe degree of burnout. In the assessment of occupational stress, most physicians (64.8%) had a demand/control ratio higher than 1, and 21.9% of all physicians had an effort/reward ratio higher than 1, indicating a high level of occupational stress exposure. Regression analyses showed higher levels of burnout among physicians of younger age, less work experience, longer working hours, on shift duty, or from higher-grade hospitals. Both the JCQ and ERI models showed good predictive power for physician burnout, with the ERI model performing better. **Conclusions:** Physicians in Shanghai were experiencing a high degree of burnout, which was significantly associated with occupational stress as well as distinctive personal and work characteristics. Interventions aiming at reducing job-related stress can be effective approaches to prevent burnout among physicians.

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Correspondence to: B. Chen, Address, (e-mail: chenb@fudan.edu.cn)

Zhihui Wang and Zhenyu Xie contributed equally to this study.

Key words: Burnout, Effort-reward imbalance, Job content questionnaire, Maslach Burnout Inventory, Occupational stress, Physicians

Job burnout is a psychological condition that involves a prolonged response to stressors in the workplace¹. Previous scientific research has often used the “three-dimensional” description of burnout syndrome including exhaustion, cynicism, and inefficacy that is implied in the Maslach Burnout Inventory². Maslach and Leiter³ defined six domains (work overload, control, reward, community, fairness and value) of the work environment as the sources of burnout. The mismatch of personal capacity and job requirement can result in susceptibility to burnout.

Many factors can be associated with burnout. Demographic characteristics such as age, sex, marital status and education have been proved to correlate with burnout to some degree⁴. Most importantly, studies have suggested that occupational stress is strongly associated with burnout in specific professional areas, such as nurses⁵ and teachers⁶. Physicians, as one of the most competitive professions in the world, have also been reported to experience high levels of stress and burnout⁷. Understanding the burnout levels of physicians and the contributing factors and predictors can be an effective approach to both reducing the health risks among physicians and increasing the quality of health services provided to their patients.

Stress and burnout in physicians have been studied worldwide for more than two decades^{7–9}. Compared with other professions, medical personnel have high technical expertise requirements and heavy responsibilities and workloads. Failing to cope with these stressors can impair the health of physicians¹² as well as influence the quality of patient care¹³.

In China, the physician-patient relationship is characterized as tense, without trust, and counterproduc-

tive. According to a 2004 Chinese Physician Practice Status Report, 48.4% of all participating physicians claimed that they had poor or extremely harsh working environments; this percentage increased to 63.61% in 2009¹⁴. The cause of this problem is deep-rooted in the development of the current medical system in China. China, with 20% of the world's population, only reported 3% of the world's total health expenditure. As Chen Zhu, the former Minister of Health of China, has said, the relatively low cost of health care is primarily the result of low labor costs for medical practitioners¹⁵ (600 dollars/month in 2006¹⁶). Poor investment in health resources leads to insufficient training of doctors. Doctors with poor professional ethics and communication skills have to serve demanding patients with limited medical knowledge. Furthermore, the media have not played an effective role in explaining the limitations of the health-care system, and reporting objectively and scientifically on medical disputes. The pursuit of drama over facts intensifies the disputes, putting more stress on medical professionals¹⁷. Study aimed at exploring how these factors contribute to occupational stress and burnout is beneficial for both medical professionals and the public.

However, unlike many developed countries that have undertaken ample studies about the relationship of burnout and occupational stressors among doctors, only a few studies have been performed in China to examine the association¹⁸⁻²⁰. Furthermore, studies adopting multiple models of occupational stress to discuss the complementary effects of different theoretical approaches are especially limited. Among the various models examining the level of work-related stress, the job content questionnaire (JCQ) model²¹ focuses on extrinsic sources (job characteristics and workplace atmosphere), while the effort-reward imbalance questionnaire (ERI) model²² concentrates more on intrinsic sources (individual cognition of pain and gain). By combining both models in one study, the relationship between physician burnout and occupational stress would be better explained. Also, considering the low income and social respect Chinese physicians receive, we assumed that the ERI model might outperform the JCQ model in predicting burnout in China. We therefore designed a cross-sectional study to investigate physician burnout and its associated factors as demographic characteristics and occupational stressors (both the JCQ and the ERI model) in Shanghai, a metropolis in China with a booming population and shortage of medical professionals, and hoped to identify effective predictors of burnout and thereby find effective ways of reducing burnout among Chinese physicians.

Subjects and Methods

Study subjects and data collection

A cross-sectional study was carried out on 527 physicians from the Pudong district of Shanghai in June 2008. There were 41 hospitals (29 Grade I, 9 Grade II and 3 Grade III) in Pudong district at the time of the survey. The grading system of hospitals in China is based on the amount of medical resources available, such as medical facilities, equipment and personnel, to the hospital. Small local communities usually provide basic clinics or hospitals (Grade I), while larger communities or towns can afford community hospitals (Grade II). Grade III hospitals, or so-called general hospitals, are mostly located in the downtown areas of large cities. We selected half of the Grade I hospitals (14) and half of the Grade II hospitals (4) at random and all Grade III hospitals (3) as representative samples to keep the sample size across all grades balanced, yielding a total of 21 hospitals. Self-completed questionnaires were returned by 457 physicians, with the response rate being 86.7%.

The study was approved by the Ethics Committee of the School of Public Health at Fudan University. All participants signed an informed consent form.

Measures and definitions

1) Sociodemographic and work characteristics

Sociodemographic and work characteristics, including age, physical appearance, education, marital status, personal and family incomes, smoking and drinking habits, frequency of exercise, hospital type, department of work, certification background, work experience, workload, and work pattern, were all incorporated for further association analyses.

In China, physicians who graduate from medical vocational school can attend a physician qualification examination after working for 5 years under the supervision of licensed physicians. Under this situation, we grouped education into three categories: graduate (master's or doctorate), undergraduate (college) and others (below college). Also, according to the medical training system of China, a physician with a Bachelor of Medicine (MB) and 5 years of work experience or a Master of Medicine (MM) and 2 years of work experience could apply for intermediate rank. After obtaining an intermediate title, a physician with an MB and 5 more years of experience of an MM and 3 more years of experience is eligible to apply for a senior title. So the technical ranks of physicians are divided into three categories as senior, intermediate and junior.

2) Occupational stress

In occupational stress assessment, two standardized questionnaires were utilized: the job content questionnaire (JCQ) based on Karasek's DCS model²¹⁾ and the effort-reward imbalance questionnaire (ERI) based on Siegrist's ERI model²²⁾. The reliability and validity of the Chinese versions of the two questionnaires have been proved²³⁾.

The 22-question JCQ questionnaire can be divided into three scales: psychological demand (five questions), job control (nine questions) and workplace social support (eight questions). The job control scale includes two subscales: skill discretion measured by six questions and decision authority measured by four questions. The workplace social support scale includes two subscales: coworker support and supervisor support, each measured by four items. Participants answer in terms of the frequency of these feelings on a Likert scale from 1 (never) to 5 (always). The value of the demand-control ratio (D/C ratio) was derived to evaluate the balance between psychological demand and job control. The D/C ratio formula is: demand/control \times correction factor. The correction factor was introduced to correct the difference in the numbers of items of the two scales. A D/C ratio greater than 1 indicates a high-risk imbalance with high job demand and low self-control. In this study, the Cronbach's α value for all 22 items was 0.790. The Cronbach's α values for job demand, job control and workplace social support were 0.737, 0.614 and 0.784 each, which exhibited acceptable internal consistency.

The 22-item ERI questionnaire consists of three scales including six items for job effort, eleven items for job reward and five items for overcommitment. Items for job effort and reward were scored on a Likert scale ranging from 1 (no) to 5 (yes, and I feel very distressed), and items for overcommitment were scored from 1 (strongly disagree) to 4 (strongly agree). The value of the effort-reward ratio (E/R ratio) was calculated to evaluate the balance between job effort and reward. The E/R ratio formula is: effort/reward \times correction factor. The correction factor corrects the difference in the numbers of items of the two scales. A score for the E/R ratio greater than 1 indicates a high-risk imbalance with high commitment and low reward. In this study, the Cronbach's α value for all 22 items was 0.919. The Cronbach's α values for job effort, job reward and overcommitment were 0.895, 0.882 and 0.802 each, which showed high internal consistency.

3) Job burnout

The 19-item Chinese version of the "Maslach Burnout Inventory-Human Service Survey" (MBI-HSS)

revised by Boles *et al.*²⁴⁾ was used to measure the three dimensions of burnout: emotional exhaustion (7 items), depersonalization (5 items) and reduced personal accomplishment (7 items)²⁵⁾. Items were scored on a seven-point scale ranging from 1 (never) to 7 (everyday). All items for reduced personal accomplishment were reversely coded. In this study, the Cronbach's α value for all 19 items was 0.838. The Cronbach's α values for emotional exhaustion, depersonalization and personal accomplishment were 0.857, 0.805 and 0.786 each, showing acceptable internal consistency.

In order to better describe the burnout states and to identify the burnout-associated risk factors more easily, a weighted burnout score was introduced. Structural analysis defines that exhaustion has the most consistent relationship with burnout²⁶⁾, so the equation was defined as burnout = $0.4 \times$ exhaustion + $0.3 \times$ depersonalization + $0.3 \times$ reduced personal accomplishment. The same strategy was adopted by K. Ahola *et al.*²⁷⁾ when using the Maslach Burnout Inventory-General Survey (MBI-GS), a general version of MBI questionnaires derived from the MBI-HSS. Because we used a seven-point scale, from 1 to 7 instead of from 0 to 6, the extent of burnout scores of all physicians was classified into three categories: no burnout (sum score from 1 to 2.49), mild burnout (2.50–4.49) and severe burnout (4.50–7). Physicians with mild or severe burnout were defined as "burnout cases."

Statistical analyses

Data analysis was performed using SPSS 12.0 (SPSS Inc., Chicago, IL, USA) and STATA/SE 8.0 for Microsoft Windows (Stata Corp LP, College Station, TX, USA). All statistical tests were two sided ($\alpha=0.05$). Crude and adjusted linear regression analyses were employed to calculate indexes of each burnout domain (emotional exhaustion, depersonalization, and reduced personal accomplishment). In the crude analysis, personal and job characteristics together with JCQ and ERI indexes were forced into the linear regression model one by one (single-variable model). The adjusted analysis was then performed to force all tabulated variables into the regression model (multi-variable model).

Scores were transformed into three tertiles: low, moderate and high. High scores for psychological demand, effort, and overcommitment as well as low scores for job control, workplace social support, and reward were defined as high-risk conditions. A D/C ratio (or E/R ratio) above the cutoff point of 1.00 was defined as a high-risk state of imbalance. Burnout indexes including emotional exhaustion, depersonalization and personal accomplishment were defined as dichotomized variables with a cutoff threshold at the

two-thirds percentile score.

Linear and logistic regression models were adopted to identify the most important predictors of burnout syndrome, including the sociodemographic and occupational stressors. Single-variable models were first used to identify the potential risk factors, and then the multivariable models were applied to confirm the identified associations. The standardized coefficient (β) was listed in the results according to the linear regression models, and the Exp (β) together with its 95% confidence interval (95%CI) was listed in the results according to the logistic regression models.

Results

Among the 457 respondents, 59.5% were female and 40.5% were male. The average age was 39.13 ± 9.62 years. The average work experience was 11.58 ± 9.57 years, and the weekly number of work hours on average was 48.08 ± 12.67 hours. The statistics for sociodemographic and work characteristics are shown in Table 1.

The occupational stress and burnout scores for the physicians are shown in Table 2. For the JCQ questionnaire, the mean scores were 19.18 for psychological demand, 32.11 for job control and 28.06 for workplace support. The mean D/C ratio was 1.09, and 296 respondents (64.8%) had a D/C ratio higher than 1. These results indicate that the majority of the physicians had experienced a high-risk imbalance state under high demand and low self-control. For the ERI questionnaire, the mean score was 17.03 for job effort, 44.62 for job reward and 7.25 for overcommitment. The mean E/R ratio was 0.77, and 100 respondents (21.9%) had an E/R ratio higher than 1, indicating that some of the physicians had experienced a imbalance state with high effort and low reward. For the MBI questionnaire, the mean score was 24.42 for emotional exhaustion, 11.35 for depersonalization and 35.81 for personal accomplishment.

Table 3 shows all linear regression coefficients. In single-variable models, emotional exhaustion of physicians was negatively correlated with increased age and work experience, workplace support and reward and positively associated with shift work, advanced hospital grade (from Grade I to III), extended working time, increased psychological demand, job effort and overcommitment. After crude analysis controlling for potential confounders listed in Tables 1 and 2, the multivariable model lessened most associations, yet intense emotional exhaustion was still significantly related to long working hours, high job effort, low reward and overcommitment.

Depersonalization of physicians was inversely related to increased age and work experience, workplace support and reward, and positively correlated with

unmarried status, high family income, advanced hospital grade, increased working hours, shift work, job demand, effort and overcommitment in single-variable models. The multivariable model after controlling for potential confounders diminished most correlations, yet advanced hospital grade, incremental job effort and reductive job reward still had substantial association with depersonalization.

For personal accomplishment of physicians, the positive correlation factors included advanced hospital grade and shift work. The negative correlation factors included psychological demand, job control, workplace support and job reward in single-variable models. The multivariable model after controlling for all confounders excluded most associations, yet shift work, job demand, control and workplace support had significant influence on personal accomplishment.

In single-variable models, the calculated scores of burnout showed positive correlation with unmarried status, increased family income, advanced hospital grade, prolonged working hours, shift work, increased psychological demand, job effort and overcommitment, while negative correlation was seen for age, work experience, work control, workplace social support and job reward. The multivariable model after controlling for all confounders excluded most related variables, yet burnout was still correlated with advanced hospital grade, enhanced job effort and overcommitment, while a negative association was observed with increased psychological demand, control and reward.

The prevalence of burnout cases (the portion of cases having mild or severe burnout in all physicians) and its association with sociodemographic and work characteristics are presented in Table 4. The prevalence of burnout cases was significantly lower among physicians over the age of 45 compared with those under the age of 35 (OR=0.34, $p<0.001$), and among those who never went to college compared with those who did (OR=0.36, $p<0.001$). The burnout prevalence was higher among unmarried physicians compared with married physicians (OR=1.76, $p<0.05$) and among those with a family income of less than 1,000 CNY/month/person than among those with an income of more than 3,000 CNY/month/person (OR=5.63, $p<0.05$).

As for job characteristics, the prevalence of burnout cases was significantly lower among those with over 15 years of work experience compared with those who had worked for less than 5 years (OR=0.41, $p<0.05$). It was higher among physicians who worked in hospitals of Grade II or Grade III than those who worked in Grade I hospitals (OR=2.55, $p<0.001$; OR=3.62, $p<0.001$); among those who worked 40–60 h/week or over 60 h/week than those who worked up to 40 h/week (OR=3.63, $p<0.001$; OR=4.54, $p<0.001$);

Table 1. Sociodemographic and work characteristics among physicians

Personal characteristics	n (%)	Job characteristics	n (%)
Sex		Hospital type	
Female	272 (59.52)	Grade I	204 (44.64)
Male	185 (40.48)	Grade II	116 (25.38)
Age		Grade III	137 (29.98)
<35	231 (50.55)	Department	
35–44	133 (29.10)	Internal medicine	202 (44.20)
>44	93 (20.35)	Surgery	103 (22.54)
Education		Specialized dept.	104 (22.76)
College	312 (68.27)	Others	48 (10.50)
Master's or doctorate	107 (23.41)	Employment	
Others	38 (8.32)	Permanent	339 (74.18)
Marital status		Fixed-term	92 (20.13)
Married	357 (78.12)	Temporary	26 (5.69)
Unmarried	92 (20.13)	Technical rank	
Others	8 (1.75)	Junior	260 (56.89)
Family income (CNY/mo/person)		Intermediate	137 (29.98)
>3,000	238 (52.08)	Senior	60 (13.13)
1,000–3,000	193 (42.23)	Work experience (years)	
<1,000	26 (5.69)	≤5	154 (33.70)
Smoking		5–15	180 (39.39)
No	446 (97.59)	>15	123 (26.91)
Yes	11 (2.41)	Working hours per week	
Alcohol drinking		≤40	229 (50.11)
No	424 (92.78)	40–60	180 (39.39)
Yes	33 (7.22)	>60	48 (10.50)
Exercise		Shift work	
No	332 (72.65)	No	167 (36.54)
Yes	125 (27.35)	Yes	290 (63.46)

CNY: Chinese yuan.

and among those who worked shift work than those who did not (OR=2.85, $p<0.001$).

The ORs of physician burnout and their associations with the stress indexes of the JCQ or ERI questionnaires are presented in Table 5. More significant and consistent correlation was found between ERI indexes and burnout. There were dose-response relationships between burnout and job effort (OR=1.00, 2.29 and 6.82, p for trend<0.001), job reward (OR=1.00, 3.94, and 11.82, p for trend<0.001) and overcommitment (OR=1.00, 1.68 and 9.50, p for trend<0.001). Physicians with an E/R ratio higher than 1 were 9.19 times more likely to be burned out compared with those with an E/R ratio below 1. Regarding JCQ indexes, physicians with the upper tertile of psychological demand were 2.35-fold more susceptible to burnout compared with those with the lower tertile. Physicians in the lower tertile of job control and workplace support were 1.54-fold and 2.68-fold

more susceptible to burnout than those in their upper tertiles, respectively. Physicians with a D/C ratio higher than 1 were 2.34-fold more likely to burn out compared with those with a D/C ratio below 1.

Significant sociodemographic and work characteristics (including age, education, marital status, family income, shift work, hospital type, work experience and weekly working hours) together with sources of occupational stress were combined to obtain a final model. We adopted stepwise logistic regression, which included forward selection (the entry p value was 0.05) and backward elimination (the remove p value was 0.1), to check the statistical significance of variables. The variables that remained significant in the logistic regression model were job control, job reward, overcommitment and hospital grade (shown in Table 6).

Table 2. Occupational stress and burnout scores among physicians

Occupational stress and burnout	Mean	SD	95% CI
JCQ			
Psychological demand	19.18	3.27	12.45–25.00
Job control	32.11	4.38	23.00–40.55
D/C ratio	1.09	0.19	0.72–1.80
D/C ratio > 1.00 – n (%)	296 (64.77)		
Workplace social support	28.06	4.69	19.00–37.00
ERI			
Job effort	17.03	5.62	9.00–30.00
Job reward	44.62	8.62	23.45–55.00
E/R ratio	0.77	0.46	0.31–1.96
E/R ratio > 1.00 – n (%)	100 (21.88)		
Overcommitment	7.25	2.87	2.00–15.00
MBI			
Emotional exhaustion	24.42	9.52	8.45–44.55
Depersonalization	11.35	6.21	5.00–26.00
Personal accomplishment	35.81	8.52	17.45–49.00
Burnout score	2.94	0.94	1.37–4.78
Burnout prevalence – n (%)			
No	153 (33.48)		
Mild	277 (60.61)		
Severe	27 (5.91)		

SD: standard deviation. JCQ: job content questionnaire. D/C: demand/control. E/R: effort/reward. ERI: effort-related imbalance questionnaire. MBI: Maslach Burnout Inventory.

Discussion

Stress and burnout level

In this study, 66.5% of physicians exhibited signs of burnout syndrome. Among them, 60.6% had mild burnout, and 5.9% had severe burnout.

After dividing the average score of each item for exhaustion, depersonalization and personal accomplishment into 3 levels (1.00–2.99 as the low level, 3.00–4.99 as the moderate level, 5.00–7.00 as the high level), the physicians showed a moderate level of emotional exhaustion (mean=24.42, or 3.49 per item, indicating that physicians on average felt exhaustion several times a month), a low level of depersonalization (mean=11.35, 2.27 per item, indicating that average physicians had a feeling of depersonalization several times a year) and a high level of personal accomplishment (mean=35.81, 5.12 per item, indicating that average physicians would personally accomplish something once a week). The results indicated that burnout was mainly due to emotional exhaustion. The results verified a previous theory that exhaustion is the central quality of burnout and the most obvious manifestation of this complex syndrome⁴.

Burnout and its association with physicians' sociodemographic and work characteristics

In this study, burnout indexes were mainly associated with age, education, marital status, family income, shift work, hospital type, work experience and working hours per week.

Physicians under 35 years old had a significantly higher prevalence of burnout syndrome (72.3%) than those above 45 years old (47.3%). This result was similar to those of previous studies²⁸. Older physicians benefit from rich experience and high positions which ensure them respect, reward and less time commitment. Furthermore, younger physicians also have less work experience and work more night shifts (both are main factors associated with burnout). Therefore, burnout appears to be more of a risk earlier in a physician's career⁴. Unmarried physicians are expected to have a higher level of burnout due to younger age and a lack of family support. Similar results were found in a previous survey²⁹ that demonstrated that married physicians would experience less depersonalization. Highly educated physicians usually have more responsibility, stress and expectation for promotion, which can be a possible explanation for their high rate of burnout. Physicians with

Table 3. Single (S)- and multivariable (M) linear regression standardized coefficients between burnout indexes and personal (or occupational) stressors (enter model)

Variables	Emotional exhaustion		Depersonalization		Personal accomplishment		Burnout	
	S ^a	M ^b	S ^a	M ^b	S ^a	M ^b	S ^a	M ^b
Sex	0.03	-0.07	0.07	0.02	-0.07	0.00	0.02	-0.03
Age ^c	-0.23***	-0.03	-0.23***	-0.03	-0.06	-0.06	-0.26***	-0.01
Education	-0.03	0.00	-0.05	-0.02	-0.01	0.02	-0.04	-0.02
Marital status	0.06	0.02	0.11*	0.03	-0.06	-0.06	0.10*	0.05
Family income	0.07	0.02	0.12**	0.05	-0.02	0.01	0.10*	0.03
Smoking	-0.03	-0.02	-0.06	-0.01	-0.08	0.03	-0.08	-0.03
Alcohol drinking	-0.08	-0.03	-0.06	-0.00	0.04	-0.01	-0.08	-0.01
Exercise	-0.05	0.02	-0.04	-0.01	-0.07	0.08	-0.07	-0.02
Hospital type	0.33***	0.07	0.27***	0.17**	0.10*	-0.10	0.33***	0.15**
Department	-0.06	0.04	-0.04	0.00	-0.02	0.01	-0.06	0.02
Employment	-0.01	-0.01	0.06	0.01	-0.03	0.08	0.01	-0.02
Technical rank	0.04	-0.00	-0.05	-0.03	-0.01	-0.01	0.00	-0.01
Work experience	-0.21***	-0.04	-0.25***	-0.08	-0.07	0.07	-0.25***	-0.08
Working hours per week	0.41***	0.10*	0.25***	-0.03	-0.04	0.03	0.35***	0.04
Shift work	0.26***	-0.02	0.17***	-0.03	0.13**	-0.14*	0.26***	0.03
Psychological demand ^c	0.39***	-0.02	0.19***	-0.11	-0.12*	0.14*	0.26***	-0.10*
Job control ^c	-0.09	0.00	-0.06	-0.08	-0.27***	0.16**	-0.08*	-0.10*
Workplace social support ^c	-0.12*	0.03	-0.18***	-0.01	-0.30***	0.21***	-0.26***	-0.06
Job effort ^c	0.64***	0.31***	0.47***	0.28***	-0.02	0.01	0.56***	0.28***
Job reward ^c	-0.55***	-0.24***	-0.51***	-0.32***	-0.14**	0.08	-0.58***	-0.29***
Overcommitment ^c	0.58***	0.25***	0.35***	0.06	-0.02	0.01	0.48***	0.17***
R ²		0.53***		0.37***		0.17***		0.51***
Adjusted R ²		0.51***		0.34***		0.13***		0.48***

* p value <0.05; ** p value <0.01; *** p value <0.001. ^a Only one variable entered into the regression models. ^b All the variables were forced into the multivariable regression models. ^c Psychological demand, job control, social support, job effort, job reward, and overcommitment were forced into the models as continuous variables, and the others were forced in as categorical variables.

family income lower than 1,000 CNY/month/person had a distinctively high prevalence of burnout, which may result from unsatisfied reward expectations and economic burden.

Job characteristics such as weekly working hours and work shifts were also significant in developing burnout. Extended working hours and working on a shift-based schedule can directly increase workload, which have been reported to be strongly associated with stress and burnout³⁰. Hospital type closely correlates to job burnout. Physicians of general hospitals (Grade III) suffered from a high prevalence of burnout. This phenomenon was also found in a previous study conducted on nurses in the same hospitals⁵. Possible explanations for this phenomenon are intense competition in larger hospitals and issues related to patient-physician relationships.

Burnout and its association with occupational stress in physicians

Two standardized models of stress assessments (JCQ and ERI) were utilized to measure the level of work-related stress. Conceptual and methodological overlaps existed between the two questionnaires to increase effectiveness. However, while the demand-control model was restricted to the structural aspects of the psychosocial work environment³¹, the effort-reward imbalance model made distinctions between extrinsic sources (workplace characteristics) and intrinsic sources (individual characteristics) of effort³². In this study, when comparing the ERI and JCQ models, the ERI model presented better internal consistency (higher Cronbach's α value) and stronger predictive power (higher ORs and lower p value), which was consistent with our hypothesis and similar to the results of a previous study³³.

In the JCQ model, a previous study showed that the psychological demands subscale consistently contrib-

Table 4. Prevalence of burnout (mild or severe) and the odds ratio associated with sociodemographic and work characteristics among physicians

Personal characteristics	n (%)	OR (95%CI)	p	Job characteristics	n (%)	OR (95%CI)	p
Sex				Hospital type			
Female	183 (67.28)	1.00		Grade I	108 (52.94)	1.00	
Male	121 (65.41)	0.92 (0.62–1.37)	0.68	Grade II	86 (74.14)	2.55 (1.55–4.19)	<0.01
Age				Grade III	110 (80.29)	3.62 (2.19–5.99)	<0.01
<35	167 (72.29)	1.00		Department			
35–45	93 (69.92)	0.89 (0.56–1.43)	0.63	Internal medicine	140 (69.31)	1.00	
≥45	44 (47.31)	0.34 (0.21–0.57)	<0.01	Surgery	71 (68.93)	0.98 (0.59–1.64)	0.95
Education				Specialized dept.	66 (63.46)	0.77 (0.47–1.27)	0.30
College	208 (66.67)	1.00		Others	27 (56.25)	0.57 (0.30–1.08)	0.09
Master's/doctorate	80 (74.77)	1.48 (0.90–2.43)	0.12	Employment			
Others	16 (42.11)	0.36 (0.18–0.72)	<0.01	Permanent	223 (65.78)	1.00	
Marital status				Fixed-term	65 (70.65)	1.25 (0.76–2.07)	0.38
Married	230 (64.43)	1.00		Temporary	16 (61.54)	0.83 (0.37–1.89)	0.66
Unmarried	70 (76.09)	1.76 (1.04–2.97)	0.04	Technical rank			
Others	4 (50.00)	0.55 (0.14–2.25)	0.41	Junior	171 (65.77)	1.00	
Family income (CNY/mo/person)				Intermediate	92 (67.15)	1.06 (0.69–1.65)	0.78
>3,000	162 (68.07)	1.00		Senior	41 (68.33)	1.12 (0.62–2.05)	0.70
1,000–3,000	118 (61.14)	0.74 (0.50–1.10)	0.13	Work experience (years)			
<1,000	24 (92.31)	5.63 (1.30–24.44)	0.02	≤5	114 (74.03)	1.00	
Smoking				5–15	124 (68.89)	0.78 (0.48–1.25)	0.30
No	298 (66.82)	1.00		>15	66 (53.66)	0.41 (0.25–0.67)	<0.01
Yes	6 (54.55)	0.60 (0.18–1.99)	0.40	Working hours per week			
Alcohol drinking				≤40	120 (52.40)	1.00	
No	287 (67.69)	1.00		40–60	144 (80.00)	3.63 (2.32–5.69)	<0.01
Yes	17 (51.52)	0.51 (0.25–1.03)	0.06	>60	40 (83.33)	4.54 (2.04–10.13)	<0.01
Exercise				Shift work			
No	227 (68.37)	1.00		No	86 (51.50)	1.00	
Yes	77 (61.60)	0.74 (0.48–1.14)	0.17	Yes	218 (75.17)	2.85 (1.90–4.27)	<0.01

utes to adverse psychological conditions such as exhaustion and burnout³². We also found that physicians with high scores in psychological demand (the upper tertile) showed a significantly higher level of burnout by logistic analysis. As for the ERI model, the data showed higher predicting power in job reward and overcommitment than job effort. This phenomenon was also reported by Chung *et al.*³⁴. A possible explanation for this is that young physicians usually find their work to be less rewarding. They have lower pay rates but often have to work more shifts. Lack of experience also implies less respect from coworkers. People tend to focus their job duties on large projects that entail more effort, and this tendency may have interfered with the judgment of physicians concerning their job effort. However, physicians with higher overcommitment usually take on more demand-

ing duties. Consequently, overcommitment provided higher power in predicting burnout than job effort.

Most significant predictors of burnout

After removing relatively less significant factors, low job control, low reward, overcommitment, and working in large hospitals remained significant predictors of burnout.

As low control and low reward at work often accumulate within specific groups, reward also addresses the issue of distributive justice and fairness³¹. Overcommitted people take on excessive workloads, expecting more control and rewards. Thus, they are more likely to experience situations where they believe they are treated unfairly. Working in large hospitals means more work overload, especially in China, where the general public hold strong doubt

Table 5. Association of the tertile of JCQ (or ERI) with burnout indexes (logistic regression analysis)

JCQ or ERI tertile	N (%)	Single OR (95%CI)	<i>p</i>	Multi ^a OR (95%CI)	<i>p</i>	
JCQ						
Psychological demand	<18	77 (58.33)	1.00	1.00		
	18–20	92 (61.74)	1.15 (0.72–1.86)	0.56	1.28 (0.78–2.11)	0.33
	>20	135 (76.70)	2.35 (1.44–3.85)	<0.01	2.98 (1.75–5.07)	<0.01
	>34	89 (62.24)	1.00		1.00	
Job control	31–34	103 (65.19)	1.14 (0.71–1.82)	0.60	1.16 (0.70–1.91)	0.57
	<31	112 (71.79)	1.54 (0.95–2.51)	0.08	1.64 (0.95–2.83)	0.08
D/C ratio	≤1.00	87 (54.04)	1.00			
	>1.00	217 (73.31)	2.34 (1.56–3.50)	<0.01		
Workplace social support	>30	82 (57.75)	1.00	1.00		
	26–30	112 (64.00)	1.30 (0.83–2.05)	0.26	1.42 (0.88–2.29)	0.15
<26	110 (78.57)	2.68 (1.59–4.53)	<0.01	2.62 (1.50–4.59)	<0.01	
ERI						
Job effort	<14	69 (46.62)	1.00	1.00		
	14–18	104 (66.67)	2.29 (1.44–3.64)	<0.01	1.27 (0.74–2.20)	0.38
	>18	131 (85.62)	6.82 (3.91–11.88)	<0.01	1.86 (0.94–3.68)	0.08
	>50	60 (39.47)	1.00		1.00	
Job reward	42–50	113 (71.97)	3.94 (2.45–6.34)	<0.01	3.14 (1.90–5.22)	<0.01
	<42	131 (88.51)	11.82 (6.48–21.55)	<0.01	6.01 (3.08–11.71)	<0.01
E/R ratio	≤1.00	211 (59.10)	1.00			
	>1.00	93 (93.00)	9.19 (4.15–20.39)	<0.01		
Overcommitment	<11	63 (48.09)	1.00	1.00		
	11–13	109 (60.89)	1.68 (1.07–2.65)	0.03	1.12 (0.66–1.91)	0.66
>13	132 (89.80)	9.50 (5.04–17.92)	<0.01	4.01 (1.94–8.32)	<0.01	

^aPsychological demand, job control and workplace support were forced into one multivariable model, and then job effort, job reward and overcommitment were forced into another multivariable model.

Table 6. Significant predictors of high levels of burnout among physicians: logistic analyses (stepwise method)

Personal characteristics	β	Exp (β) (95%CI)	<i>p</i>
Job control			
>23		1.00	
21–23	0.37	1.44 (0.82–2.53)	0.20
<21	0.91	2.48 (1.37–4.49)	<0.01
Job reward			
>50		1.00	
42–50	1.33	3.77 (2.24–6.36)	<0.01
<42	2.03	7.63 (3.96–14.69)	<0.01
Overcommitment			
<9		1.00	
9–11	0.15	1.17 (0.70–1.96)	0.56
>11	1.49	4.45 (2.18–9.11)	<0.01
Hospital type			
Grade I		1.00	
Grade II	0.66	1.94 (1.08–3.48)	0.03
Grade III	1.26	3.54 (1.97–6.35)	<0.01

concerning the quality of primary medical care and regularly visit large hospitals for even common diseases; meanwhile, physicians in larger hospitals may also have more ideals and motivation (value) concerning their jobs. The results in this study were consistent with those of a previous study that claimed that work overload, control, reward, community, fairness and value are sources and early predictors of burnout³⁵).

Limitations

Some limitations of this study must be addressed. Firstly, the survey was conducted in a highly developed and densely populated metropolis area. Thus, the results in this study may not represent the bigger picture in China. Secondly, in order to balance the amount of physicians in different hospital types, we picked only half of the Grade I and Grade II hospitals randomly, so the sample characteristics may be different from that of the whole population. Thirdly, the organizational and managerial environments of the hospital and the personalities and job attitudes of the physicians were not taken into consideration in the questionnaires. All these factors are thought to be important in the development of burnout syndrome.

Conclusions

Physicians in Shanghai experienced a relatively high level of burnout (66.5%). Physicians who are young, have lower degree of education, are unmarried, have limited work experience, work in large hospitals, have a heavy workload and have a shift-based schedule are more susceptible to burnout. Both the ERI and JCQ models showed good internal consistency (high Cronbach's α value) and strong predictive power (high ORs and low p value), yet the ERI model outperformed the JCQ model. The most significant predictors of burnout included working in large hospitals, overcommitment, low job control and low reward. Interventions aiming at alleviating occupational stress and burnout should focus on the individual level rather than the workplace level and should be put into practice first in high-grade hospitals. Three subscales of work stress, overcommitment, job control and reward, are key points for creating intervention policy. Further research on risk factors of burnout is needed to confirm our findings. The burnout prevalence in other areas of China also needs to be studied.

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