



BMJ Open is committed to open peer review. As part of this commitment we make the peer review history of every article we publish publicly available.

When an article is published we post the peer reviewers' comments and the authors' responses online. We also post the versions of the paper that were used during peer review. These are the versions that the peer review comments apply to.

The versions of the paper that follow are the versions that were submitted during the peer review process. They are not the versions of record or the final published versions. They should not be cited or distributed as the published version of this manuscript.

BMJ Open is an open access journal and the full, final, typeset and author-corrected version of record of the manuscript is available on our site with no access controls, subscription charges or pay-per-view fees (<http://bmjopen.bmj.com>).

If you have any questions on BMJ Open's open peer review process please email [info.bmjopen@bmj.com](mailto:info.bmjopen@bmj.com)

# BMJ Open

## Quality of working life of medical doctors: a cross-sectional survey in public hospitals in China

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2022-063320
Article Type:	Original research
Date Submitted by the Author:	30-Mar-2022
Complete List of Authors:	Tang, Changmin; Hubei University of Chinese Medicine, School of Management Guan, Cuilin; Hubei University of Chinese Medicine, School of Management Liu, Chaojie; La Trobe University, Public Health
Keywords:	Human resource management < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Health & safety < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, OCCUPATIONAL & INDUSTRIAL MEDICINE

SCHOLARONE™  
Manuscripts



I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our [licence](#).

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which [Creative Commons](#) licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

# Quality of working life of medical doctors: a cross-sectional survey in public hospitals in China

Changmin Tang<sup>1\*</sup>, Cuilin Guan<sup>1\*</sup>, Chaojie Liu<sup>2\*</sup>

1. School of Management, Hubei University of Chinese Medicine, Wuhan, Hubei, China

2. School of Psychology and Public Health, La Trobe University, Melbourne, VIC 3086, Australia

\* Correspondence author:

Changmin Tang: tangcm@hbtcn.edu.cn, school of Management, Hubei University of Chinese Medicine;

Cuilin Guan: guancl@hbtcn.edu.cn, school of Management, Hubei University of Chinese Medicine;

Chaojie Liu: c.liu@latrobe.edu.au +613 94791715, school of Psychology and Public Health, La Trobe University.

# Quality of working life of medical doctors: a cross-sectional survey in public hospitals in China

## Abstract

**Objectives:** Medical doctors in public hospitals in China work under great pressures arising from high patient flow, high patient expectations and overcrowded environments. This study aimed to assess their quality of working life (QWL).

**Methods:** A cross-sectional questionnaire survey of 2915 medical doctors was conducted in 48 hospitals across six provinces of China. The QWL-7-32 scale was adopted to assess seven domains of QWL, including physical health, mental health, job and career satisfaction, work passion and initiative, professional pride, professional competence, and balance between work and family. ANOVA tests were performed to identify the sociodemographic characteristics and work experience factors associated with QWL, followed by confirmation from multivariate linear regression analyses.

**Results:** On average, the respondents reported an overall QWL score of 92.51 (SD=17.74) out of a highest possible of 160. Over 35% of respondents reported more than 60 hours of weekly working time; 59.9% experienced night sleep deprivation frequently; 16.6% encountered workplace violence frequently. The multivariate regression models revealed that eastern region, shorter working hours, less frequent night sleep deprivation, higher income, and less frequent encounters of workplace violence were significant predictors of higher QWL.

**Conclusion:** Low QWL of medical doctors working in public hospitals in China is evident, which is associated with high workloads, low rewards, and workplace violence. There are also significant regional differences in the QWL of medical doctors, with the eastern developed region featuring better QWL.

**Keywords:** Quality of working life; Medical doctors; Public hospitals; cross-sectional survey; China

## Strengths and Limitations of this study

The study focused on the quality of working life of medical doctors.

The quality of working life measuring seven domains, including physical health, mental health, job

and career satisfaction, work passion and initiative, professional pride, professional competence and balance between work and family.

The cross-sectional survey was conducted in 48 hospitals across six provinces of China.

The study adopted a cross-sectional design. No casual relationships should be assumed.

Data was collected through a self-reporting questionnaire, which was subject to recall and reporting bias.

## Introduction

Over the past few decades, quality of working life (QWL) has attracted increasing attention in the healthcare industry<sup>1-2</sup>. QWL is a term that has been used to describe the broad job-related experience of an individual. High levels of QWL are important for health care organisations to attract and motivate employees that lead to good work performance<sup>3-5</sup>. Low QWL is not only detrimental to the physical and mental health of employees<sup>6</sup>, but may also be linked to poor work performance<sup>27</sup>. In the health industry, there have been increasing concerns about the link between low QWL and poor quality of patient care<sup>8</sup>.

However, our understanding about the QWL of medical doctors is quite limited. Most existing QWL studies in the health industry have been conducted in western countries and seem to have a focus on nurses<sup>9-11</sup>. This is likely to be associated with the high prevalence of private practice of medical doctors in the study countries and their over-emphasis on professional autonomy in medicine<sup>12</sup>. In a publicly dominated system where medical doctors are hired as employees of hospitals, however, medical doctors are usually working under great pressure due to high compliance requirements from the professional body, the government, the organisation, and the public. Unlike their private counterparts, medical doctors employed by public hospitals have limited entitlement to flexible working time. They are also required to work in frontline in response to public health emergencies such as the COVID-19 pandemic<sup>13-14</sup>. This study addresses the gap in the literature by assessing QWL of medical doctors working in the public hospital system in China. Few QWL studies, if any, have ever been conducted in medical doctors in the developing countries.

The Chinese health system is a hospital-dominant one, with most hospital beds being owned by public hospitals. The rapid economic development in China over the past few decades has been

accompanied with a rapid expansion and modernisation of hospitals. They employed 56.93% of medical doctors and delivered about 78.64% of inpatient care and 43.81% of outpatient and emergency visits in 2018 in China <sup>15</sup>. Unfortunately, due to the relatively weak primary care system, workloads of medical doctors in public hospitals have remained high <sup>16</sup>. In China, patients enjoy the freedom to bypass primary care in seeking hospital services <sup>17</sup>. The daily average outpatient visits to a public hospital physician reached 7.5 in 2018 <sup>15</sup>. There is evidence that the high stress level has started to bring serious damages to the health and wellbeing of medical doctors in public hospitals <sup>18</sup>. In recent years, “Karoshi” (overwork death) of young hospital doctors has attracted extensive reporting in China <sup>18-19</sup>. Even more concerning is the deteriorating patient-doctor relationship. Workplace violence against medical doctors has been widely reported <sup>20-21</sup>, jeopardising the professional pride and job satisfaction of health workers <sup>22-23</sup>. This study aimed to assess the QWL of medical doctors in public hospitals in China and to identify the sociodemographic characteristics and work experience factors associated with QWL.

**Methods**

**Participants and sampling**

A multi-stage stratified sampling strategy was adopted to select study participants. Six provinces were purposely identified considering a balance of geographic location and economic development: Shandong and Hebei from the east (most developed), Hubei and Hunan from the central (less developed), Guizhou and Qinghai from the west (least developed). In each selected province, four tertiary hospitals in metropolitan areas and four county hospitals in rural areas were conveniently selected. In total, 48 hospitals participated in this study: 24 urban tertiary and 24 rural county hospitals. All of them were government-owned public hospitals. All medical doctors employed by the participating hospitals were eligible for this study.

**Patient involvement**

This is a cross-sectional survey in which all data were collected from medical doctors in public hospitals in China. Patients were not involved.

**Measurements**

The questionnaire was designed by the research team in Chinese language, which contains two sections. The first section collected socio-demographic characteristics and work experience data of the study participants. The second section measured QWL.

*Quality of working life (QWL)*

There exist complex interactions between working and personal lives<sup>24</sup>. Several scales have been developed to disentangle working life from personal life<sup>25,1025-26</sup>. They tend to measure working life from the perspectives of employee engagement, control at work, home-work interface, general well-being, job and career satisfaction, working conditions and stress at work. Arguably, QWL is a highly contextualised concept<sup>9</sup>. This study adopted the QWL-7-32 scale, a scale that was developed in reference to the existing scales but was adapted to the specific context of China<sup>27-28</sup>. It defines quality of working life as “*the physical and mental effects of occupation on workers and their feelings on occupation*”. The QWL-7-32 contains 32 items measuring seven domains of QWL, namely physical health (8 items), mental health (5 items), job and career satisfaction (8 items), work passion and initiative (4 items), professional pride (3 items), professional competence (2 items), and balance between work and family (2 items). Each item was rated on a five-point Likert scale, with a higher score indicating higher QWL. A summed score was calculated for the entire QWL scale and its seven domains, respectively. The reliability of the scale was tested in 248 medical doctors conveniently selected from two urban tertiary hospitals and two county hospitals. The Cronbach’s alpha coefficients indicate acceptable internal consistency for the scale and its seven domains (Table 1).

**Table 1. Cronbach’s alpha coefficients of the QWL-7-32 scale (n=248)**

Domain	Number of items	Score range	Cronbach’s alpha
Physical health	8	8-40	0.869
Mental health	5	5-25	0.876
Job and career satisfaction	8	8-40	0.922
Work passion and initiative	4	4-20	0.670
Professional pride	3	3-15	0.780
Professional competence	2	2-10	0.800
Balance between work and family	2	2-10	0.746
Overall QWL	32	32-160	0.950

#### *Sociodemographic characteristics and work experience*

Selection of the variables measuring sociodemographic characteristics and work experience was guided by the existing literature. QWL is associated with both intrinsic and extrinsic factors<sup>29-31</sup>. In this study, sociodemographic characteristics of the study participants (including gender, age and marital status) reflected the intrinsic factors associated with QWL. Work-related extrinsic factors measured in



this study included salary, professional title, workload, night sleep deprivation, and experience of violence against health workers. Empirical evidence shows that low income is associated low employee satisfaction <sup>32</sup>. High workload is usually blamed for driving the deterioration of QWL <sup>228</sup>. Professional title is deemed as a proxy indicator of career success. Workplace violence against health workers has become a serious issue of concern in the hospital sector over the past few years in China <sup>20-21</sup>, which as a profound impact on the QWL of health workers. We also considered regional variations and urban-rural differences in QWL, a common theme studied in health services research <sup>33</sup>.

**Data collection**

Data were collected from January to November 2018. Trained investigators visited each participating hospital, inviting the medical doctors who were working at the time to self-complete a questionnaire. Participation in the survey was anonymous and voluntary. Respondents provided their implied informed consent prior to commencement of the survey. They were allowed to skip questions with which they felt uncomfortable.

A sample size of 2500 would enable us to detect an effect size of less than 0.01 for a multivariate linear regression analysis containing 20 predictors, with an  $\alpha$  error being set at 0.05 and a statistical power being set at 0.80 <sup>34</sup>. Considering that missing data commonly occur in questionnaire surveys, we collected at least 80 questionnaires in each urban tertiary hospital and 60 in each county hospital. A total of 2915 (86.76%) questionnaires contained no missing data and were included in data analysis. The pilot sample was not included in the final data analysis.

**Data analysis**

Data were entered into EpiData 3.0 and analysed using SPSS 19.0. In all of the analyses, a two-sided *p* value of less than 0.05 was deemed statistically significant.

Frequency distributions in different categories of the sociodemographic characteristics and work experience of the study participants were described and compared between urban and rural and across regions using Chi-square tests.

Means and standard deviations of the QWL (including its seven domains) scores were calculated. Differences in the QWL scores among the study participants with different characteristics were tested through ANOVA tests. Multivariate linear regression models were established with an Enter approach

involving all of the independent variables with a statistical significance in the univariate analyses to identify the sociodemographic and work-related predictors of QWL after adjustment for variations in other variables.

## Results

### Sociodemographic characteristics and work experience

The majority of respondents were male (53.2%) and in an age between 30 and 45 years (61.0%). Most (76.7%) were married at the time of the survey. Only 17.9% were awarded with a senior professional title, while 46.9% had a junior title. About 48% of respondents had a monthly basic salary of less than 5,000 Yuan (US\$ 785), compared with 40.9% earning 5,000-8,000 Yuan (US\$ 785-1255) and 11.2% earning more than 8,000 Yuan (US\$ 1255).

The vast majority (88.9%) of respondents reported working more than 40 hours a week. The weekly workload of 35.3% of respondents exceeded 60 hours. Night sleep deprivation was frequent in 59.9% of respondents. Over 68% of respondents reported sometimes while 16.6% reported frequent experience of workplace violence from patients and/or their family members (Table 2).

There were significant regional and urban-rural differences in the sociodemographic characteristics and work experience of the study participants. The eastern participants were more likely to be female and married, while the central participants were more likely to report higher than 60-hour weekly workload and more frequent night sleep deprivation, and the western participants were more likely to be younger, had a junior professional title, earned a basic salary in the middle range (5000-8000 Yuan), and reported experience of workplace violence more frequently. Compared with their urban counterparts, the rural participants were more likely to be married, held a lower professional title, reported workplace violence more frequently, and earned lower salary despite reporting a higher workload and more frequent night sleep deprivation (Table 2).

Table 2. Socio-demographic and work-related characteristics of study participants

Characteristics	n (%)	Eastern (n=976)				Central (n=964)				November 2022. Downloaded from <a href="http://bmjopen.bmj.com/">http://bmjopen.bmj.com/</a> on April 9, 2024 by guest. Pro	Western (n=975)			
		Urban	Rural	Total	p	Urban	Rural	Total	p		Urban	Rural	Total	p
Gender**														
Male	1550(53.2)	260(48.8)	215(48.5)	475(48.7)	0.939	359(57.6)	219(64.2)	578(60.0)	0.046	314(52.0)	183(49.3)	497(51.0)	0.420	
Female	1365(46.8)	273(51.2)	228(51.5)	501(51.3)		264(42.4)	122(35.8)	386(40.0)		290(48.0)	188(50.7)	478(49.0)		
Age (Years)**														
<30	796(27.3)	121(22.7)	81(18.3)	202(20.7)	0.015	162(26.0)	97(28.4)	259(26.9)	0.579	212(35.1)	123(33.2)	335(34.4)	0.181	
30-45	1778(61.0)	357(67.0)	291(65.7)	648(66.4)		385(61.8)	199(58.4)	584(60.6)		342(56.6)	204(55.0)	546(56.0)		
>45	341(11.7)	55(10.3)	71(16.0)	126(12.9)		76(12.2)	45(13.2)	121(12.6)		50(8.3)	44(11.9)	94(9.6)		
Marital status*														
Married	2237(76.7)	410(76.9)	368(83.1)	778(79.7)	0.017	462(74.2)	271(79.5)	733(76.0)	0.065	431(71.4)	295(79.5)	726(74.5)	0.005	
Not married	678(23.3)	123(23.1)	75(16.9)	198(20.3)		161(25.8)	70(20.5)	231(24.0)		173(28.6)	76(20.5)	249(25.5)		
Professional title**														
Junior or below	1368(46.9)	212(39.8)	171(38.6)	383(39.2)	<0.001	285(45.7)	167(49.0)	452(46.9)	0.310	315(52.2)	218(58.8)	533(54.7)	<0.001	
Middle	1024(35.1)	202(37.9)	212(47.9)	414(42.4)		205(32.9)	115(33.7)	320(33.2)		173(28.6)	117(31.5)	290(29.7)		
Senior	523(17.9)	119(22.3)	60(13.5)	179(18.3)		133(21.3)	59(17.3)	192(19.9)		116(19.2)	36(9.7)	152(15.6)		
Monthly basic salary** (Yuan)														
<5000	1395(47.9)	214(40.2)	293(66.1)	507(51.9)	<0.001	306(49.1)	177(51.9)	483(50.1)	<0.001	247(40.9)	158(42.6)	405(41.5)	0.261	
5000-8000	1193(40.9)	213(40.0)	141(31.8)	354(36.3)		209(33.5)	144(42.2)	353(36.6)		298(49.3)	188(50.7)	486(49.8)		
>8000	327(11.2)	106(19.9)	9(2.0)	115(11.8)		108(17.3)	20(5.9)	128(13.3)		59(9.8)	25(6.7)	84(8.6)		
Weekly working hour**														
≤40	324(11.1)	87(16.3)	36(8.1)	123(12.6)	<0.001	68(10.9)	10(2.9)	78(8.1)	<0.001	68(11.3)	55(14.8)	123(12.6)	<0.001	
41-60	1562(53.6)	295(55.3)	309(69.8)	604(61.9)		324(52.0)	132(38.7)	456(47.3)		345(57.1)	157(42.3)	502(51.5)		
>60	1029(35.3)	151(28.3)	98(22.1)	249(25.5)		231(37.1)	199(58.4)	430(44.6)		191(31.6)	159(42.9)	350(35.9)		
night sleep deprivation*														
Never	212(7.3)	46(8.6)	32(7.2)	78(8.0)	0.008	55(8.8)	18(5.3)	73(7.6)	<0.001	41(6.8)	20(5.4)	61(6.3)	0.603	
Sometimes	957(32.8)	206(38.6)	134(30.2)	340(34.8)		223(35.8)	62(18.2)	285(29.6)		208(34.4)	124(33.4)	332(34.1)		
Frequent	1746(59.9)	281(52.7)	277(62.5)	558(57.2)		345(55.4)	261(76.5)	606(62.9)		355(58.8)	227(61.2)	582(59.7)		
Workplace violence**														
Never	427(14.6)	108(20.3)	72(16.3)	180(18.4)	0.117	119(19.1)	25(7.3)	144(14.9)	<0.001	70(11.6)	33(8.9)	103(10.6)	<0.001	
Sometimes	2003(68.7)	368(69.0)	309(69.8)	677(69.4)		421(67.6)	237(69.5)	658(68.3)		432(71.5)	236(63.6)	668(68.5)		
Often	485(16.6)	57(10.7)	62(14.0)	119(12.2)		83(13.3)	79(23.2)	162(16.8)		102(16.9)	102(27.5)	204(20.9)		

Note: \*  $p<0.05$  and \*\*  $p<0.001$  for regional differences.

### Quality of working life

On average, the respondents reported a QWL score of 92.51 (SD=17.74) out of a highest possible of 160: 22.68±4.56 for physical health; 13.71±4.09 for mental health; 22.30±6.16 for job and career satisfaction; 13.10±2.74 for work passion and initiative; 9.24±2.32 for professional pride; 6.66±1.42 for professional competence; and 4.82±1.65 for balance between work and family, respectively (Table 3).

Overall, the respondents from rural hospitals in central area and those who aged between 30 and 45 years, were married, held a middle professional title, earned a lower income, worked longer hours, experienced more frequent night sleep deprivation, and encountered more frequent workplace violence reported lower QWL than others ( $p<0.05$ ): although urban-rural location was not associated with professional pride ( $p=0.090$ ) and professional competence ( $p=0.345$ ); marital status was not associated with work passion and initiative ( $p=0.388$ ) and professional pride ( $p=0.473$ ); professional title was not associated with job and career satisfaction ( $p=0.139$ ) and work passion and initiative ( $p=0.661$ ); and salary was not associated with work passion and initiative ( $p=0.878$ ). The male respondents had lower job and career satisfaction ( $p=0.005$ ) and work passion and initiative ( $p<0.001$ ), despite reporting higher professional competence ( $p<0.001$ ) than their female counterparts (Table 3).

Table 3. Sociodemographic and work-related characteristics associated with quality of working life

Characteristics	n (%)	Quality of Working Life		Physical health		Mental health		Job and career satisfaction		Work passion and initiative		Professional pride		Professional competence		Balance between work and family	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Urban or Rural		P<0.001		P<0.001		P<0.003		P<0.002		P<0.003		P=0.090		P=0.345		P<0.001	
Urban	1760(60.4)	93.39	17.40	23.05	4.51	13.89	4.03	22.58	6.08	12.97	2.68	9.30	2.25	6.68	1.41	4.92	1.64
Rural	1155(39.6)	91.16	18.16	22.13	4.58	13.43	4.17	21.86	6.26	13.28	2.81	9.15	2.41	6.63	1.45	4.67	1.67
Gender		P=0.058		P=0.998		P=0.073		P<0.005		P<0.001		P=0.339		P<0.001		P=0.251	
Male	1550(53.2)	91.92	18.47	22.68	4.72	13.58	4.10	21.99	6.35	12.92	2.82	9.20	2.50	6.76	1.49	4.79	1.69
Female	1365(46.8)	93.17	16.85	22.68	4.37	13.85	4.08	22.64	5.92	13.30	2.62	9.28	2.10	6.56	1.34	4.86	1.60
Age (Years)		P<0.001		P<0.001		P<0.001		P<0.001		P<0.001		P<0.001		P<0.001		P<0.001	
<30	796(27.3)	94.55	17.54	23.36	4.66	14.41	4.04	22.87	5.97	13.21	2.61	9.33	2.20	6.41	1.35	4.97	1.63
30-45	1778(61.0)	91.16	17.59	22.37	4.42	13.40	4.03	21.94	6.16	12.97	2.76	9.11	2.31	6.67	1.40	4.70	1.65
>45	341(11.7)	94.76	18.31	22.75	4.87	13.65	4.33	22.79	6.47	13.51	2.85	9.71	2.56	7.21	1.56	5.14	1.67
Marital status		P<0.001		P<0.001		P<0.001		P<0.001		P=0.388		P=0.473		P<0.001		P<0.001	
Married	2237(76.7)	91.74	17.69	22.41	4.49	13.48	4.06	22.06	6.19	13.07	2.78	9.22	2.37	6.75	1.44	4.76	1.65
Not married	678(23.3)	95.03	17.68	23.59	4.67	14.46	4.10	23.08	5.99	13.18	2.58	9.30	2.13	6.38	1.34	5.04	1.64
Professional title		P<0.027		P<0.006		P<0.001		P=0.139		P=0.661		P<0.016		P<0.001		P<0.001	
Junior or below	1368(46.9)	92.96	17.42	22.90	4.61	14.00	4.08	22.50	6.00	13.09	2.59	9.19	2.22	6.42	1.34	4.86	1.64
Middle	1024(35.1)	91.35	17.77	22.32	4.38	13.35	4.05	22.00	6.18	13.05	2.82	9.17	2.33	6.79	1.41	4.66	1.64
Senior	523(17.9)	93.60	18.41	22.82	4.74	13.63	4.16	22.35	6.52	13.19	2.93	9.50	2.53	7.05	1.52	5.06	1.67
Monthly basic salary (Yuan)		P<0.001		P<0.001		P<0.001		P<0.001		P=0.878		P<0.001		P<0.001		P<0.001	
<5000	1395(47.9)	91.22	18.32	22.37	4.77	13.59	4.25	21.86	6.23	13.07	2.76	9.07	2.34	6.52	1.44	4.74	1.68
5000-8000	1193(40.9)	92.56	17.19	22.63	4.35	13.60	3.94	22.34	6.15	13.12	2.75	9.30	2.30	6.78	1.39	4.78	1.61
>8000	327(11.2)	97.82	16.14	24.20	4.06	14.61	3.84	23.99	5.57	13.11	2.58	9.73	2.21	6.84	1.41	5.33	1.61
Region		P<0.001		P<0.001		P<0.001		P<0.001		P<0.001		P<0.001		P<0.001		P<0.001	
Eastern	976(33.5)	96.21	17.43	23.32	4.40	14.24	4.04	23.52	6.05	13.47	2.82	9.78	2.20	6.83	1.43	5.05	1.60
Central	964(33.1)	91.47	17.76	22.76	4.57	13.64	4.09	21.68	6.31	13.01	2.65	9.00	2.32	6.66	1.41	4.72	1.64
Western	975(33.4)	89.82	17.42	21.98	4.60	13.24	4.09	21.68	5.94	12.80	2.69	8.94	2.34	6.50	1.40	4.69	1.69
Weekly working hour		P<0.001		P<0.001		P<0.001		P<0.001		P<0.001		P<0.001		P<0.001		P=0.010	
≤40	324(11.1)	101.65	16.88	25.06	4.36	15.44	3.90	25.08	5.56	13.60	2.55	9.75	2.34	6.82	1.39	5.90	1.36
41-60	1562(53.6)	94.81	16.73	23.28	4.21	14.16	3.91	22.95	6.03	13.30	2.68	9.39	2.24	6.70	1.37	5.04	1.56
>60	1029(35.3)	86.13	17.39	21.03	4.58	12.47	4.09	20.42	6.01	12.63	2.82	8.86	2.38	6.57	1.50	4.16	1.61
Night sleep deprivation		P<0.001		P<0.001		P<0.001		P<0.001		P<0.001		P<0.001		P<0.001		P<0.001	
Never	212(7.3)	107.63	18.27	26.49	4.80	16.45	4.32	26.67	6.20	14.49	2.79	10.35	2.42	7.07	1.53	6.11	1.62
Sometimes	957(32.8)	98.65	15.34	24.38	3.77	15.00	3.68	24.14	5.57	13.42	2.54	9.55	2.14	6.71	1.34	5.45	1.45
Frequent	1746(59.9)	87.30	16.75	21.29	4.34	12.66	3.92	20.75	5.93	12.75	2.76	8.94	2.34	6.59	1.44	4.32	1.55
Workplace violence		P<0.001		P<0.001		P<0.001		P<0.001		P<0.001		P<0.001		P<0.001		P<0.001	
Never	427(14.6)	105.76	17.46	25.79	4.39	16.27	4.11	26.45	5.97	14.22	2.73	10.21	2.30	6.94	1.50	5.88	1.56
Sometimes	2003(68.7)	92.74	15.55	22.77	4.06	13.75	3.73	22.31	5.67	13.16	2.57	9.28	2.17	6.67	1.34	4.80	1.53
Often	485(16.6)	79.88	17.64	19.60	4.66	11.26	4.08	18.59	5.91	11.83	2.92	8.23	2.53	6.39	1.61	3.98	1.70
Total	2915 (100)	92.51	17.74	22.68	4.56	13.71	4.09	22.30	6.16	13.10	2.74	9.24	2.32	6.66	1.42	4.82	1.65

The multivariate regression models confirmed that eastern region, less frequent night sleep deprivation, and less frequent encounters of workplace violence were significant predictors of higher QWL across all of the seven domains after adjustment for variations of other variables. Urban location remained to be a significant predictor of lower work passion and initiative. Male gender was a significant predictor of higher physical health and professional competence, but lower work passion and initiative. A younger age was associated with higher physical health and mental health, and higher professional pride, but lower professional competence. Those who were married had lower physical health but higher professional competency than those unmarried. A junior professional title was associated with higher job and career satisfaction, but lower professional competency. Lower income was associated lower QWL, but the effects were not statistically significant in work passion and initiative, and professional competency. Less working hours was associated with higher QWL, but the effects were not statistically significant in work passion and initiative, professional pride, and professional competence (Table 4).

Table 4. Results (Beta coefficients) of multivariate linear regression models on quality of working life

Predictor	Standardised Beta Coefficients							
	Quality of Working Life	Physical health	Mental health	Job and career satisfaction	Work passion and initiative	Professional pride	Professional competence	Balance between work and family
Urban or Rural								
Urban(ref.)								
Rural	0.471(-0.702, 1.644)	-0.123(-0.426, 0.180)	0.120(-0.165, 0.405)	0.070(-0.356, 0.496)	0.462*** (0.260, 0.665)	-0.014(-0.185, 0.157)	-0.043(-0.151, 0.064)	0.001(-0.112, 0.112)
Gender								
Male (ref.)								
Female	0.126(-0.994, 1.246)	-0.294*(-0.582, -0.005)	0.024(-0.248, 0.296)	0.291(-0.116, 0.697)	0.296** (0.103, 0.489)	0.014(-0.149, 0.178)	-0.174** (-0.276, -0.072)	-0.032(-0.139, 0.075)
Age (Years)								
<30 (ref.)								
30-45	-1.012(-2.809, 0.785)	-0.220(-0.684, 0.244)	-0.366(-0.803, 0.070)	-0.080(-0.732, 0.573)	-0.071(-0.381, 0.239)	-0.286*(-0.548, -0.024)	-0.028(-0.192, 0.136)	0.039(-0.133, 0.210)
>45	-0.404(-3.118, 2.311)	-0.757*(-1.457, -0.056)	-0.671*(-1.331, -0.012)	0.191(-0.795, 1.176)	0.326(-0.143, 0.794)	0.095(-0.301, 0.491)	0.329** (0.081, 0.577)	0.084(-0.175, 0.343)
Marital status								
Married (ref.)								
Not married	1.040(-0.664, 2.745)	0.578* (0.138, 1.018)	0.282(-0.132, 0.696)	0.381(-0.238, 0.999)	-0.064(-0.359, 0.230)	-0.088(-0.333, 0.160)	-0.206** (-0.361, -0.050)	0.158(-0.005, 0.321)
Professional title								
Junior or below(ref.)								
Middle	-1.240(-2.758, 0.278)	-0.362(-0.753, 0.030)	-0.391*(-0.760, -0.022)	-0.534(-1.085, 0.017)	-0.028(-0.290, 0.234)	-0.053(-0.274, 0.169)	0.269*** (0.131, 0.408)	-0.142(-0.287, 0.003)
Senior	-1.288(-3.403, 0.828)	-0.333(-0.879, 0.213)	-0.402(-0.916, 0.113)	-0.961*(-1.729, -0.193)	0.006(-0.359, 0.371)	-0.001(-0.300, 0.308)	0.366*** (0.173, 0.559)	0.037(-0.165, 0.239)
Monthly basic salary (Yuan)								
<5000 (ref.)								
8000-12000	2.795*** (1.482, 4.107)	0.736*** (0.397, 1.075)	0.459** (0.139, 0.778)	0.989*** (0.512, 1.465)	0.108(-0.118, 0.335)	0.333** (0.140, 0.524)	0.081(-0.038, 0.201)	0.089(-0.037, 0.214)
>8000	4.372*** (2.283, 6.461)	1.361*** (0.822, 1.900)	0.842** (0.334, 1.350)	1.715*** (0.957, 2.473)	-0.163(-0.523, 0.198)	0.462** (0.150, 0.766)	-0.094(-0.284, 0.097)	0.248* (0.049, 0.448)
Region								
Eastern(ref.)								
Central	-2.887*** (-4.270, -1.503)	-0.149(-0.506, 0.208)	-0.249(-0.585, 0.088)	-1.285*** (-1.788, -0.783)	-0.222(-0.460, 0.017)	-0.702*** (-0.990, -0.500)	-0.142*(-0.269, -0.016)	-0.137*(-0.269, -0.005)
Western	-4.710*** (-6.110, -3.309)	-1.007*** (-1.369, -0.646)	-0.730*** (-1.070, -0.389)	-1.350*** (-1.859, -0.842)	-0.426** (-0.667, -0.184)	-0.743*** (-0.990, -0.539)	-0.245*** (-0.372, -0.117)	-0.209*** (-0.342, -0.075)
Weekly working hour								
≤40 (ref.)								
41-60	-2.638** (-4.507, -0.770)	-0.748** (-1.230, -0.266)	-0.516* (-0.971, -0.062)	-0.841* (-1.519, -0.162)	0.028(-0.294, 0.351)	-0.046(-0.318, 0.226)	-0.006(-0.176, 0.165)	-0.510*** (-0.688, -0.332)
>60	-6.478*** (-8.551, -4.406)	-1.893*** (-2.428, -1.358)	-1.332*** (-1.836, -0.828)	-1.849*** (-2.602, -1.097)	-0.241(-0.598, 0.117)	-0.147(-0.440, 0.155)	-0.006(-0.195, 0.183)	-1.011*** (-1.209, -0.813)
Night sleep deprivation								
Never (ref.)								
Sometimes	-5.366*** (-7.678, -3.053)	-1.246*** (-1.842, -0.649)	-0.713* (-1.275, -0.151)	-1.425** (-2.265, -0.586)	-0.763*** (-1.162, -0.364)	-0.570** (-0.990, -0.233)	-0.343** (-0.554, -0.132)	-0.306** (-0.527, -0.085)
Frequent	-12.616*** (-14.956, -10.276)	-3.319*** (-3.923, -2.716)	-2.281*** (-2.850, -1.712)	-3.579*** (-4.429, -2.730)	-1.130*** (-1.534, -0.727)	-0.873*** (-1.250, -0.532)	-0.382*** (-0.596, -0.169)	-1.050*** (-1.273, -0.827)
Workplace violence								
Never (ref.)								
Sometimes	-9.267*** (-10.907, -7.627)	-1.908*** (-2.332, -1.485)	-1.720*** (-2.119, -1.321)	-3.063*** (-3.659, -2.468)	-0.880*** (-1.163, -0.597)	-0.705*** (-0.990, -0.465)	-0.275*** (-0.425, -0.125)	-0.716*** (-0.873, -0.560)
Often	-18.975*** (-21.075, -16.874)	-4.180*** (-4.722, -3.638)	-3.582*** (-4.092, -3.071)	-5.828*** (-6.591, -5.066)	-2.070*** (-2.433, -1.708)	-1.544*** (-1.890, -1.238)	-0.535*** (-0.727, -0.344)	-1.235*** (-1.436, -1.034)

Note: \*p<0.05; \*\*p<0.01; \*\*\*p<0.001

## Discussion

The study participants reported an overall QWL score of 92.51 (SD=17.74) out of a highest possible of 160. This is low in comparison with primary and secondary school teachers<sup>35</sup> and oil-drilling workers<sup>36-37</sup>.

Long working hours, frequent night sleep deprivation, frequent encounters of medical violence, and low salary were found to be major predictors of lower QWL in this study. The respondents from the eastern region also reported higher QWL than their central and western counterparts. These findings are consistent with the results of previous studies<sup>38-46</sup>. Our study showed that exceedingly long working hours are particularly detrimental to physical health, mental health, job satisfaction, and work-life balance of the study participants. Indeed, long working hours have been proved to impair health<sup>38-40</sup>, leading to depressive symptoms<sup>41</sup>, low job satisfaction<sup>42</sup> and increased risks of job stress<sup>43</sup>. In addition to long working hours, empirical evidence also shows that night sleep deprivation can cause sleep disturbances and fatigue, and increase the risk of serious illness<sup>44</sup> including depression<sup>45</sup>. Frequent night sleep deprivation can even negatively influence the performance of medical doctors as indicated in this study and others<sup>46</sup>. These problems associated with high workloads can be further exacerbated by low financial rewards. Compared with medical practitioners in many other countries, doctors in China earned a much lower level of income.

Unsurprisingly, frequent encounters of workplace violence emerged as a significant predictor of lower QWL across all of the seven domains in this study. Over the past few years, China has witnessed increasing reports of incidence of violence against health workers, raising serious questions about the patient-provider relationship<sup>47-50</sup>. The deteriorating practice environment has led to increased intention of health workers to leave the industry<sup>51</sup>. In this study, 16.6% of respondents reported frequent encounters with medical violence, compared with 68.7% reporting sometimes and 14.6% never. In China, most county hospitals are classified as secondary hospitals. They have suffered the most in consumer-provider conflicts compared with their tertiary hospital and primary care counterparts<sup>52-53</sup>. However, this study showed that the rural hospital medical workers maintained a relatively higher work passion and initiative than their urban counterparts.



1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

The regional differences of QWL revealed in this study are perhaps a reflection of the widespread issue of regional disparity in China. The relatively more developed eastern region has more financial resources and invest more for health than the less developed central and western regions <sup>54-56</sup>. As a result, medical doctors in the eastern region are exposed to a better working environment, thus reporting higher QWL according to the results of this study.

The lack of urban-rural differences in QWL (except for work passion and initiative) is an interesting finding. Since the most recent round of health reform launched in 2009, a series of policies have been developed to support rural health development, in particular for county hospitals. They are deemed critical in retaining rural residents to seek medical attention locally. Empirical evidence shows that the urban-rural disparities in medical resources <sup>57</sup> and healthcare services <sup>58</sup> are indeed narrowing down in recent years.

China is facing serious challenges in maintaining a healthy and sustainable health workforce. Healthcare demands have been increasing dramatically with the rapid economic growth and population ageing over the past few decades <sup>59-61</sup>. This has imposed great burdens on the health care delivery system and the health workforce that has already been in short supply. Medical doctors have to work harder days and nights. This study revealed that 35.3% of respondents reported more than 60 hours of working time per week. About 60% experienced night sleep deprivation frequently. By contrast, less than 12% earned a basic monthly salary of over 8000 Yuan (equivalent to US \$1255). It is evident that these factors have made a significant contribution to the low QWL of medical doctors in China. Low QWL not only affects the health and wellbeing of medical workers <sup>62</sup>, but can also affect their competency and work performance. This can become a serious risk of patient safety and quality of care <sup>563</sup>.

China has recently launched a series of health system reforms, aiming at improving health care accessibility and affordability through containing hospital costs and encouraging patients to seek medical care in primary care <sup>1764</sup>. Strengthening law enforcement was also proposed to deal with workplace violence. These measures, although necessary, may not be enough to address the low QWL issue in medical doctors. Increasing attention needs to be paid to sustainable workload, proper financial and professional rewards and work-life balance of medical workers.

## Conclusion

Low QWL of medical doctors working in public hospitals in China is evident, which is associated with long working hours, frequent night sleep deprivations, frequent encounters of workplace violence, and low salary. There are also significant regional differences in the QWL of medical doctors, with the eastern developed region featuring better QWL.

**Conflict of interests:** The authors declare no conflicts of interest.

**Authors' contributions:** CT, CG and CL performed literature review, designed the project, and drafted the article. CT and CG participated in data collection and data analyses. All authors have read and approved the final article.

**Acknowledgements:** We would like to thank our colleagues who facilitated the field visits and data collection and all of the participating hospitals and study participants.

**Funding:** This study was funded by the National Natural Science Foundation of China (No. 71603077).

**Patient consent:** No required.

**Ethics approval:** Ethics approval was granted by the Research Ethics Committee of Tongji Medical College, Huazhong University of Science and Technology (No: IORG0003571).

**Data sharing statement:** The data relevant to this manuscript are available from the corresponding authors on reasonable request.

## References

- 1 T Moradi, F Maghaminejad, I Azizi-Fini. Quality of working life of nurses and its related factors. *Nurs Midwifery Stud* 2014;3(2):e19450.
- 2 AM Mosadeghrad, E Ferlie, D Rosenberg. A study of relationship between job stress, quality of working life and turnover intention among hospital employees. *Health Serv Manage Res* 2011;24(4):170-81.
- 3 H Li, Z Liu, R Liu, L Li, A Lin. The relationship between work stress and work ability among power supply workers in Guangdong, China: a cross-sectional study. *Bmc Public Health* 2016;16:123.
- 4 M Abbasi, A Zakerian, A Akbarzade, et al. Investigation of the Relationship between Work Ability and Work-related Quality of Life in Nurses. *Iran J Public Health* 2017;46(10):1404-12.
- 5 M Rastegari, A Khani, P Ghalriz, J Eslamian. Evaluation of quality of working life and its association with job performance of the nurses. *Iran J Nurs Midwifery Res* 2010;15(4):224-28.
- 6 M de Jong, AG de Boer, SJ Tamminga, MH Frings-Dresen. Quality of working life issues of employees with a chronic physical disease: a systematic review. *J Occup Rehabil* 2015;25(1):182-96.

7 AM Mosadeghrad. Quality of working life: an antecedent to employee turnover intention. *Int J Health Policy Manag* 2013;1(1):43-50.

8 GI Skoufi, GA Lialios, S Papakosta, et al. Shift Work and Quality of Personal, Professional, and Family Life among Health Care Workers in a Rehabilitation Center in Greece. *Indian J Occup Environ Med* 2017;21(3):115-20.

9 B Nowrouzi, E Giddens, B Gohar, et al. The quality of work life of registered nurses in Canada and the United States: a comprehensive literature review. *Int J Occup Environ Health* 2016;22(4):341-58.

10 X Zeng, N Chaiear, P Klainin, et al. Work-related quality of life scale among Singaporean nurses. *Asian Biomed* 2011;5(4):467-74.

11 ND Nayeri, T Salehi, AA Noghabi. Quality of work life and productivity among Iranian nurses. *Contemp Nurse* 2011;39(1):106-18.

12 C Liu, T Bartram, SG Leggat. Link of Patient Care Outcome to Occupational Differences in Response to Human Resource Management: A Cross-Sectional Comparative Study on Hospital Doctors and Nurses in China. *Int J Environ Res Public Health* 2020;17(12).

13 Y Qiu, Q Wu, R Chen, C Guan. Research on psychological stress and mental health of medical staff in COVID-19 prevention and control. *Int J Disaster Risk Reduct* 2021;65:102524.

14 M Zhang, M Zhou, F Tang, et al. Knowledge, attitude, and practice regarding COVID-19 among healthcare workers in Henan, China. *J Hosp Infect* 2020;105(2):183-87.

15 NH Commission. China Health Statistics Yearbook 2019: Peking Union Medical College 2019.

16 Y Hu, Z Zhang. Skilled doctors in tertiary hospitals are already overworked in China. *Lancet Glob Health* 2015;3(12):e737.

17 C Tang, Z Luo, P Fang, F Zhang. Do patients choose community health services (CHS) for first treatment in China? Results from a community health survey in urban areas. *J Community Health* 2013;38(5):864-72.

18 M Storman, D Storman, J Maciag. Quality of work-life among young medical doctors in Poland. *Int J Occup Saf Ergon* 2021:1-07.

19 HP Shan, XH Yang, XL Zhan, et al. Overwork is a silent killer of Chinese doctors: a review of Karoshi in China 2013-2015. *Public Health* 2017;147:98-100.

20 AJ He, J Qian. Explaining medical disputes in Chinese public hospitals: the doctor-patient relationship and its implications for health policy reforms. *Health Econ Policy Law* 2016;11(4):359-78.

21 SZ Yang, D Wu, N Wang, et al. Workplace violence and its aftermath in China's health sector: implications from a cross-sectional survey across three tiers of the health system. *Bmj Open* 2019;9(9):e31513.

22 A Kumari, T Kaur, P Ranjan, et al. Workplace violence against doctors: Characteristics, risk factors, and mitigation strategies. *J Postgrad Med* 2020;66(3):149-54.

23 T Cheung, PH Lee, P Yip. The association between workplace violence and physicians' and nurses' job satisfaction in Macau. *Plos One* 2018;13(12):e207577.

24 MH Zubair, LR Hussain, KN Williams, KJ Grannan. Work-Related Quality of Life of US General Surgery Residents: Is It Really so Bad? *J Surg Educ* 2017;74(6):e138-46.

25 P Sirisawasd, N Chaiear, NP Johns, J Khiewyoo. Validation of the Thai Version of a Work-related Quality of Life Scale in the Nursing Profession. *Saf Health Work* 2014;5(2):80-85.

26 S Lin, N Chaiear, J Khiewyoo, B Wu, NP Johns. Preliminary psychometric properties of the chinese version of the work-related quality of life scale-2 in the nursing profession. *Saf Health Work*

- 2013;4(1):37-45.
- 27 Q Zhang, YQ Xie, YJ Lan. [Development of a quality of working life scale (QWL7-32)]. *Sichuan Da Xue Xue Bao Yi Xue Ban* 2013;44(6):957-61.
  - 28 Y Zhang, XL Liu, TD Wei, YJ Lan. [Relationship of job stress with job burnout and quality of work life in workers for offshore oil platforms]. *Zhonghua Lao Dong Wei Sheng Zhi Ye Bing Za Zhi* 2017;35(3):198-202.
  - 29 JA Parise, ZA Soler. Quality of working life of call-center workers. *Rev Bras Enferm* 2016;69(4):751-56.
  - 30 B Nowrouzi, N Lightfoot, M Lariviere, et al. Occupational Stress Management and Burnout Interventions in Nursing and Their Implications for Healthy Work Environments: A Literature Review. *Workplace Health Saf* 2015;63(7):308-15.
  - 31 B Nowrouzi, E Giddens, B Gohar, et al. The quality of work life of registered nurses in Canada and the United States: a comprehensive literature review. *Int J Occup Environ Health* 2016; 22(4): 341-58.
  - 32 X Chen, M Liu, C Liu, et al. Job Satisfaction and Hospital Performance Rated by Physicians in China: A Moderated Mediation Analysis on the Role of Income and Person-Organization Fit. *Int J Environ Res Public Health* 2020;17(16).
  - 33 J Hou, Y Ke. Addressing the shortage of health professionals in rural China: issues and progress Comment on "Have health human resources become more equal between rural and urban areas after the new reform?". *Int J Health Policy Manag* 2015;4(5):327-28.
  - 34 F Faul, E Erdfelder, A Buchner, AG Lang. Statistical power analyses using G\*Power 3.1: tests for correlation and regression analyses. *Behav Res Methods* 2009;41(4):1149-60.
  - 35 Z Jian, Z Shu-shan, L Ya-jia, L Jian. Analysis on quality of working life and its influencing factors among medi-cal workers in 3 A grade hospital. *JOURNAL OF NORTH SICHUAN MEDICAL COLLEGE* 2016;31(1):112-15.
  - 36 M Jing-feng, L Ya-jia, C Xi-ning, et al. Analysis on the Influencing Factors of Quality of Working Life among oil-drilling workers. *Modern Preventive Medicine* 2011;38(2):211-14.
  - 37 Y Zhang, XL Liu, TD Wei, YJ Lan. [Relationship of job stress with job burnout and quality of work life in workers for offshore oil platforms]. *Zhonghua Lao Dong Wei Sheng Zhi Ye Bing Za Zhi* 2017;35(3):198-202.
  - 38 VH Bernstrom. Long working hours and sickness absence-a fixed effects design. *Bmc Public Health* 2018;18(1):578.
  - 39 M Kivimaki, ST Nyberg, GD Batty, I Madsen, AG Tabak. Long Working Hours and Risk of Venous Thromboembolism. *Epidemiology* 2018;29(5):e42-44.
  - 40 KS Shin, YK Chung, YJ Kwon, JS Son, SH Lee. The effect of long working hours on cerebrovascular and cardiovascular disease; A case-crossover study. *Am J Ind Med* 2017;60(9):753-61.
  - 41 R Ogawa, E Seo, T Maeno, et al. The relationship between long working hours and depression among first-year residents in Japan. *Bmc Med Educ* 2018;18(1):50.
  - 42 A Nakata. Long working hours, job satisfaction, and depressive symptoms: a community-based cross-sectional study among Japanese employees in small- and medium-scale businesses. *Oncotarget* 2017;8(32):53041-52.
  - 43 Z Li, JM Dai, D Zhang, et al. [Association between Long Working Hours and Job Stress and Depression among Employees from a State Grid Company]. *Zhonghua Lao Dong Wei Sheng Zhi Ye Bing Za Zhi* 2018;36(4):271-74.

44 PJ Stryjewski, A Kuczaj, D Domal-Kwiatkowska, U Mazurek, E Nowalany-Kozielska. [Night work and shift work - effects on the health of workers]. *Przegl Lek* 2016;73(7):513-15.

45 P Angerer, R Schmook, I Elfantel, J Li. Night Work and the Risk of Depression. *Dtsch Arztebl Int* 2017;114(24):404-11.

46 OA Meretoja. We should work less at night. *Acta Anaesthesiol Scand* 2009;53(3):277-79.

47 Y Gan, L Li, H Jiang, et al. Prevalence and Risk Factors Associated With Workplace Violence Against General Practitioners in Hubei, China. *Am J Public Health* 2018;108(9):1223-26.

48 P Li, K Xing, H Qiao, et al. Psychological violence against general practitioners and nurses in Chinese township hospitals: incidence and implications. *Health Qual Life Outcomes* 2018;16(1):117.

49 Y Tian, Y Yue, J Wang, et al. Workplace violence against hospital healthcare workers in China: a national WeChat-based survey. *Bmc Public Health* 2020;20(1):582.

50 G Sui, G Liu, L Jia, L Wang, G Yang. Associations of workplace violence and psychological capital with depressive symptoms and burn-out among doctors in Liaoning, China: a cross-sectional study. *Bmj Open* 2019;9(5):e24186.

51 T Heponiemi, A Kouvonen, M Virtanen, J Vanska, M Elovainio. The prospective effects of workplace violence on physicians' job satisfaction and turnover intentions: the buffering effect of job control. *Bmc Health Serv Res* 2014;14:19.

52 SZ Yang, D Wu, N Wang, et al. Workplace violence and its aftermath in China's health sector: implications from a cross-sectional survey across three tiers of the health system. *Bmj Open* 2019;9(9).

53 Y Tian, Y Yue, J Wang, et al. Workplace violence against hospital healthcare workers in China: a national WeChat-based survey. *Bmc Public Health* 2020;20(1):582.

54 J Ding, X Hu, X Zhang, et al. Equity and efficiency of medical service systems at the provincial level of China's mainland: a comparative study from 2009 to 2014. *Bmc Public Health* 2018;18(1):214.

55 XF Zhang, XY Tian, YL Cheng, et al. Health disparities among the western, central and eastern rural regions of China after a decade of health promotion and disease prevention programming. *J Huazhong Univ Sci Technolog Med Sci* 2015;35(4):606-14.

56 B Zha. The gap of economic development expanding between eastern China and middle, western China. *China Popul Res Newsl* 1996(1):2-03.

57 Y Wang, Y Li, S Qin, et al. The disequilibrium in the distribution of the primary health workforce among eight economic regions and between rural and urban areas in China. *Int J Equity Health* 2020;19(1):28.

58 M Ying, S Wang, C Bai, Y Li. Rural-urban differences in health outcomes, healthcare use, and expenditures among older adults under universal health insurance in China. *Plos One* 2020;15(10):e240194.

59 GG Liu, SA Vortherms, X Hong. China's Health Reform Update. *Annu Rev Public Health* 2017;38:431-48.

60 EF Fang, M Scheibye-Knudsen, HJ Jahn, et al. A research agenda for aging in China in the 21st century. *Ageing Res Rev* 2015;24(Pt B):197-205.

61 M Paiano, AE Jaques, P Nacamura, et al. Mental health of healthcare professionals in China during the new coronavirus pandemic: an integrative review. *Rev Bras Enferm* 2020;73(suppl 2):e20200338.

62 D Woo, Y Lee, S Park. Associations among working hours, sleep duration, self-rated health, and health-related quality of life in Korean men. *Health Qual Life Outcomes* 2020;18(1):287.

63 B Misiak, R Sierzantowicz, E Krajewska-Kulak, et al. Psychosocial Work-Related Hazards and Their Relationship to the Quality of Life of Nurses-a Cross-Sectional Study. *Int J Environ Res Public Health*

2020;17(3).

64 Y Zhang, Q Wang, T Jiang, J Wang. Equity and efficiency of primary health care resource allocation in mainland China. *Int J Equity Health* 2018;17(1):140.

For peer review only

STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation	Page No
Title and abstract	1	(a) Indicate the study’s design with a commonly used term in the title or the abstract	1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	1
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	2-3
Objectives	3	State specific objectives, including any prespecified hypotheses	3
Methods			
Study design	4	Present key elements of study design early in the paper	3
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	3, 5
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	3-5
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	
Bias	9	Describe any efforts to address potential sources of bias	5
Study size	10	Explain how the study size was arrived at	5
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	3-5
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	5
		(b) Describe any methods used to examine subgroups and interactions	5
		(c) Explain how missing data were addressed	5
		(d) If applicable, describe analytical methods taking account of sampling strategy	3-4
		(e) Describe any sensitivity analyses	5
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg	6-7



		numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	
		(b) Give reasons for non-participation at each stage	
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	7
		(b) Indicate number of participants with missing data for each variable of interest	
Outcome data	15*	Report numbers of outcome events or summary measures	
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	6-11
		(b) Report category boundaries when continuous variables were categorized	6-11
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	6-11
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	8-11
<b>Discussion</b>			
Key results	18	Summarise key results with reference to study objectives	12-13
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	14
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	12-13
Generalisability	21	Discuss the generalisability (external validity) of the study results	14
<b>Other information</b>			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	14



# BMJ Open

## Quality of working life of medical doctors and associated risk factors: a cross-sectional survey in public hospitals in China

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2022-063320.R1
Article Type:	Original research
Date Submitted by the Author:	15-Oct-2022
Complete List of Authors:	Tang, Changmin; Hubei University of Chinese Medicine, School of Management; Hubei Provincial Key Research Base of Humanities and Social Sciences Guan, Cuiling; Hubei University of Chinese Medicine; Hubei Provincial Key Research Base of Humanities and Social Sciences Liu, Chaojie; La Trobe University, Public Health
<b>Primary Subject Heading</b>:	Occupational and environmental medicine
Secondary Subject Heading:	Health services research
Keywords:	Human resource management < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Health & safety < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, OCCUPATIONAL & INDUSTRIAL MEDICINE

SCHOLARONE™  
Manuscripts



I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our [licence](#).

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which [Creative Commons](#) licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

# Quality of working life of medical doctors and associated risk factors: a cross-sectional survey in public hospitals in China

Changmin Tang<sup>12\*</sup>, Cuiling Guan<sup>12\*</sup>, Chaojie Liu<sup>3\*</sup>

1. School of Management, Hubei University of Chinese Medicine, Wuhan, Hubei, China

2. Hubei Provincial Key Research Base of Humanities and Social Sciences, Wuhan, Hubei, China

3. School of Psychology and Public Health, La Trobe University, Melbourne, VIC 3086, Australia

\* Correspondence author:

Changmin Tang: tangcm@hbtcn.edu.cn, school of Management, Hubei University of Chinese Medicine;

Cuiling Guan: guancl@hbtcn.edu.cn, school of Management, Hubei University of Chinese Medicine;

Chaojie Liu: c.liu@latrobe.edu.au +613 94791715, school of Psychology and Public Health, La Trobe University.

**Quality of working life of medical doctors and associated risk factors: a cross-sectional survey in public hospitals in China**

**Abstract**

**Objectives:** This study aimed to assess their quality of working life (QWL) and associated risk factors.

**Setting and participants:** A cross-sectional questionnaire survey of 2915 medical doctors was conducted in 48 hospitals across six provinces.

**Methods:** The QWL-7-32 scale was adopted to assess seven domains of QWL, including physical health, mental health, job and career satisfaction, work passion and initiative, professional pride, professional competence, and balance between work and family.

**Primary and secondary outcome measures:** Data were analysed using SPSS 19.0. ANOVA tests were performed to identify the sociodemographic characteristics and work experience factors associated with overall QWL and its seven subdomain scores respectively, followed by confirmation from multivariate linear regression analyses.

**Results:** On average, the respondents reported an overall QWL score of 92.51 (SD=17.74) out of a highest possible of 160. Over 35% of respondents reported more than 60 hours of weekly working time; 59.9% experienced night sleep deprivation frequently; 16.6% encountered workplace violence frequently. The multivariate regression models revealed that eastern region ( $\beta \leq -2.887$  for non-eastern region,  $p < 0.001$ ), shorter working hours ( $\beta \leq -2.638$  for over 40 hours a week,  $p < 0.01$ ), less frequent night sleep deprivation ( $\beta \leq -5.366$  for sometimes or frequent,  $P < 0.001$ ), higher income ( $\beta \geq 2.795$  for lower income,  $P < 0.001$ ), and less frequent encounters of workplace violence ( $\beta \leq -9.267$  for sometimes or frequent,  $P < 0.001$ ) were significant predictors of higher QWL. Night sleep deprivation and workplace violence were common predictors ( $p < 0.05$ ) for all of seven domains of QWL.

**Conclusion:** Low QWL of medical doctors working in public hospitals in China is evident, which is associated with high workloads, low rewards, and workplace violence. There are also significant regional differences in the QWL of medical doctors, with the eastern developed region featuring better QWL. Public hospitals in China are facing serious challenges in occupational health and safety, which needs be addressed through a systems approach.

### Strengths and Limitations of this study

- A large number (n=2915) of medical doctors from 48 public hospitals in China participated in the survey.
- The overall QWL and its seven domains (physical health, mental health, job and career satisfaction, work passion and initiative, professional pride, professional competence, and balance between work and family) were measure using the validated tool QWL-7-32.
- Data were collected through field visits and face-to-face interviews, with a high response rate.
- The study adopted a cross-sectional design and no casual relationships should be assumed.
- Data were subject to recall and self-reporting bias.

### Introduction

Over the past few decades, quality of working life (QWL) has attracted increasing attention in the healthcare industry <sup>[1-2]</sup>. QWL is a term that has been used to describe the broad job-related experience of an individual. High levels of QWL are important for health care organisations to attract and motivate employees that lead to good work performance <sup>[3-5]</sup>. Low QWL is not only detrimental to the physical and mental health of employees <sup>[6]</sup>, but may also be linked to poor work performance <sup>[2][7]</sup>. In the health industry, there have been increasing concerns about the link between low QWL and poor quality of patient care <sup>[8]</sup>.

However, our understanding about the QWL of medical doctors is quite limited. Most existing QWL studies in the health industry have been conducted in western countries and seem to have a focus on nurses <sup>[5][9-10]</sup>. This is likely to be associated with the high prevalence of private practice of medical doctors in the study countries and their over-emphasis on professional autonomy in medicine <sup>[11]</sup>. In a publicly dominated system where medical doctors are hired as employees of hospitals, however, medical doctors are usually working under great pressure due to high compliance requirements from the professional body, the government, the organisation, and the public. Unlike their private counterparts, medical doctors employed by public hospitals have limited entitlement to flexible working time. They are also required to work in frontline in response to public health emergencies such as the COVID-19 pandemic <sup>[12-13]</sup>. This study addresses the gap in the literature by assessing QWL of medical doctors working in the public hospital system in China. Few QWL studies, if any, have ever been conducted on medical doctors in the developing countries.

The Chinese health system is a hospital-dominant one, with most hospital beds being owned by public hospitals. The rapid economic development in China over the past few decades has been accompanied with a rapid expansion and modernisation of hospitals. They employed 56.93% of medical doctors and delivered about 78.64% of inpatient care and 43.81% of outpatient and emergency visits in 2018 <sup>[14]</sup>. Unfortunately, due to the relatively weak primary care system, workloads of medical doctors in public hospitals have remained high <sup>[15]</sup>. In China, patients enjoy the freedom to bypass primary care in seeking hospital services <sup>[16]</sup>. The daily average outpatient visits to a public hospital physician reached 7.5 in 2018 <sup>[14]</sup>. There is evidence that the high stress level has started to bring serious damages to the health and wellbeing of medical doctors in public hospitals <sup>[17-18]</sup>. In recent years, “Karoshi” (overwork death) of young hospital doctors has attracted extensive reporting in China <sup>[17][19]</sup>. Even more concerning is the deteriorating patient-doctor relationship. Workplace violence against medical doctors has been widely reported <sup>[20-21]</sup>, jeopardising the professional pride and job satisfaction of health workers <sup>[22-23]</sup>, as well as the QWL of physicians <sup>[24]</sup>. This study aimed to assess the QWL of medical doctors in public hospitals in China and to identify the sociodemographic characteristics and work experience factors associated with QWL.

**Methods**

A cross sectional survey of medical doctors in public hospitals was conducted. Ethics approval was granted by the Research Ethics Committee of Tongji Medical College, Huazhong University of Science and Technology (No: IORG0003571).

**Participants and sampling**

A multi-stage stratified sampling strategy was adopted to select study participants. Six provinces were purposely identified considering a balance of geographic location and economic development: Shandong and Hebei from the east (most developed), Hubei and Hunan from the central (less developed), Guizhou and Qinghai from the west (least developed). In each selected province, four tertiary hospitals in metropolitan areas and four county hospitals in rural areas were conveniently selected. In total, 48 hospitals participated in this study: 24 urban tertiary and 24 rural county hospitals. All of them were government-owned public hospitals. All medical doctors employed by the participating hospitals were eligible for this study.

**Patient involvement**

Data were collected from medical doctors in public hospitals in China. There was no direct patient

involvement.

## Measurements

The questionnaire was designed by the research team in Chinese language, which contains two sections. The first section collected the socio-demographic characteristics and work experience data of the study participants. The second section measured QWL (Appendix 1, in Chinese).

### *Quality of working life (QWL)*

There exist complex interactions between working and personal lives<sup>[25]</sup>. Several scales have been developed to disentangle working life from personal life<sup>[25][26-28]</sup>. They tend to measure working life from the perspectives of employee engagement, control at work, home-work interface, general well-being, job and career satisfaction, working conditions, and stress at work. Arguably, QWL is a highly contextualised concept<sup>[29]</sup>. This study adopted the QWL-7-32 scale, a scale that was developed in reference to the existing scales but was adapted to the specific context of China<sup>[30-31]</sup>. It defines quality of working life as “*the physical and mental effects of occupation on workers and their feelings on occupation*”. The QWL-7-32 contains 32 items measuring seven domains of QWL, namely physical health (8 items), mental health (5 items), job and career satisfaction (8 items), work passion and initiative (4 items), professional pride (3 items), professional competence (2 items), and balance between work and family (2 items). Each item was rated on a five-point Likert scale, with a higher score indicating higher QWL. A summed score was calculated for the entire QWL scale and its seven domains, respectively. The reliability of the scale was tested in 248 medical doctors conveniently selected from two urban tertiary hospitals and two county hospitals. The Cronbach’s alpha coefficients indicate acceptable internal consistency for the scale and its seven domains (Table 1).

**Table 1. Cronbach’s alpha coefficients of the QWL-7-32 scale (n=248)**

Domain	Number of items	Score range	Cronbach’s alpha
Physical health	8	8-40	0.869
Mental health	5	5-25	0.876
Job and career satisfaction	8	8-40	0.922
Work passion and initiative	4	4-20	0.670
Professional pride	3	3-15	0.780
Professional competence	2	2-10	0.800
Balance between work and family	2	2-10	0.746

Overall QWL	32	32-160	0.950
-------------	----	--------	-------

*Sociodemographic characteristics and work experience*

Selection of the variables measuring sociodemographic characteristics and work experience was guided by the existing literature. QWL is associated with both intrinsic and extrinsic factors<sup>[32-34]</sup>. In this study, sociodemographic characteristics of the study participants (including gender, age and marital status) reflected the intrinsic factors associated with QWL. Work-related extrinsic factors measured in this study included salary, professional title, workload, night sleep deprivation, and experience of violence against health workers. Empirical evidence shows that low income is associated low employee satisfaction<sup>[35]</sup>. High workload is usually blamed for driving the deterioration of QWL<sup>[2][31]</sup>. Professional title is deemed as a proxy indicator of career success. Workplace violence against health workers has become a serious issue of concern in the hospital sector over the past few years in China<sup>[20-21]</sup>, which has a profound impact on the QWL of health workers. We also considered regional variations and urban-rural differences in QWL, a common theme studied in health services research<sup>[36]</sup>.

**Data collection**

Data were collected from January to November 2018. Trained investigators visited each participating hospital, inviting the medical doctors who were working at the time to self-complete a paper questionnaire. Participation in the survey was anonymous and voluntary. Respondents provided their implied informed consent prior to commencement of the survey. They were allowed to skip questions with which they felt uncomfortable.

A sample size of 2500 would enable us to detect an effect size of less than 0.01 for a multivariate linear regression analysis containing 20 predictors, with an  $\alpha$  error being set at 0.05 and a statistical power being set at 0.80<sup>[37]</sup>. Considering that missing data commonly occurred in questionnaire surveys, we collected at least 80 questionnaires in each urban tertiary hospital and 60 in each county hospital. A total of 3360 questionnaires were dispatched and 3170 (94.35%) were returned. This resulted in a final sample of 2915 (86.76%) containing no missing data for data analyses. The pilot sample was not included in the final data analysis.

**Data analysis**

Data were entered into EpiData 3.0 and analysed using SPSS 19.0. In all of the analyses, a two-sided



*p* value of less than 0.05 was deemed statistically significant.

Frequency distributions in different categories of the sociodemographic characteristics and work experience of the study participants were described and compared between urban and rural and across regions using Chi-square tests.

Means and standard deviations of the QWL (including its seven domains) scores were calculated. Differences in the QWL scores among the study participants with different characteristics were tested through ANOVA tests. Multivariate linear regression models were established with an Enter approach involving all of the independent variables with a statistical significance in the univariate analyses to identify the sociodemographic and work-related predictors of QWL after adjustment for variations in other variables.

## Results

### Sociodemographic characteristics and work experience

The majority of respondents were male (53.2%) and in an age between 30 and 45 years (61.0%). Most (76.7%) were married at the time of the survey. Only 17.9% were awarded with a senior professional title, while 46.9% had a junior title. About 48% of respondents had a monthly basic salary of less than 5,000 Yuan (US\$ 785), compared with 40.9% earning 5,000-8,000 Yuan (US\$ 785-1255) and 11.2% earning more than 8,000 Yuan (US\$ 1255).

The vast majority (88.9%) of respondents reported working more than 40 hours a week. The weekly workload of 35.3% of respondents exceeded 60 hours. Night sleep deprivation was frequent in 59.9% of respondents. Over 68% of respondents reported sometimes while 16.6% reported frequent experience of workplace violence from patients and/or their family members (Table 2).

There were significant regional and urban-rural differences in the sociodemographic characteristics and work experience of the study participants. The eastern participants were more likely to be female and married, while the central participants were more likely to report higher than 60-hour weekly workload and more frequent night sleep deprivation, and the western participants were more likely to be younger, had a junior professional title, earned a basic salary in the middle range (5000-8000 Yuan), and reported experience of workplace violence more frequently. Compared with their urban counterparts, the rural participants were more likely to be married, held a lower professional title,

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

reported workplace violence more frequently, and earned lower salary despite reporting a higher workload and more frequent night sleep deprivation (Table 2).

For peer review only

Table 2. Socio-demographic and work-related characteristics of study participants

Characteristics	n (%)	Eastern (n=976)				Central (n=964)				Western (n=975)			
		Urban	Rural	Total	p	Urban	Rural	Total	p	Urban	Rural	Total	p
<b>Gender**</b>													
Male	1550(53.2)	260(48.8)	215(48.5)	475(48.7)	0.939	359(57.6)	219(64.2)	578(60.0)	0.046	314(52.0)	183(49.3)	497(51.0)	0.420
Female	1365(46.8)	273(51.2)	228(51.5)	501(51.3)		264(42.4)	122(35.8)	386(40.0)		290(48.0)	188(50.7)	478(49.0)	
<b>Age (Years)**</b>													
<30	796(27.3)	121(22.7)	81(18.3)	202(20.7)	0.015	162(26.0)	97(28.4)	259(26.9)	0.579	212(35.1)	123(33.2)	335(34.4)	0.181
30-45	1778(61.0)	357(67.0)	291(65.7)	648(66.4)		385(61.8)	199(58.4)	584(60.6)		342(56.6)	204(55.0)	546(56.0)	
>45	341(11.7)	55(10.3)	71(16.0)	126(12.9)		76(12.2)	45(13.2)	121(12.6)		50(8.3)	44(11.9)	94(9.6)	
<b>Marital status*</b>													
Married	2237(76.7)	410(76.9)	368(83.1)	778(79.7)	0.017	462(74.2)	271(79.5)	733(76.0)	0.065	431(71.4)	295(79.5)	726(74.5)	0.005
Not married	678(23.3)	123(23.1)	75(16.9)	198(20.3)		161(25.8)	70(20.5)	231(24.0)		173(28.6)	76(20.5)	249(25.5)	
<b>Professional title**</b>													
Junior or below	1368(46.9)	212(39.8)	171(38.6)	383(39.2)	<0.001	285(45.7)	167(49.0)	452(46.9)	0.310	315(52.2)	218(58.8)	533(54.7)	<0.001
Middle	1024(35.1)	202(37.9)	212(47.9)	414(42.4)		205(32.9)	115(33.7)	320(33.2)		173(28.6)	117(31.5)	290(29.7)	
Senior	523(17.9)	119(22.3)	60(13.5)	179(18.3)		133(21.3)	59(17.3)	192(19.9)		116(19.2)	36(9.7)	152(15.6)	
<b>Monthly basic salary** (Yuan)</b>													
<5000	1395(47.9)	214(40.2)	293(66.1)	507(51.9)	<0.001	306(49.1)	177(51.9)	483(50.1)	<0.001	247(40.9)	158(42.6)	405(41.5)	0.261
5000-8000	1193(40.9)	213(40.0)	141(31.8)	354(36.3)		209(33.5)	144(42.2)	353(36.6)		298(49.3)	188(50.7)	486(49.8)	
>8000	327(11.2)	106(19.9)	9(2.0)	115(11.8)		108(17.3)	20(5.9)	128(13.3)		59(9.8)	25(6.7)	84(8.6)	
<b>Weekly working hour**</b>													
≤40	324(11.1)	87(16.3)	36(8.1)	123(12.6)	<0.001	68(10.9)	10(2.9)	78(8.1)	<0.001	68(11.3)	55(14.8)	123(12.6)	<0.001
41-60	1562(53.6)	295(55.3)	309(69.8)	604(61.9)		324(52.0)	132(38.7)	456(47.3)		345(57.1)	157(42.3)	502(51.5)	
>60	1029(35.3)	151(28.3)	98(22.1)	249(25.5)		231(37.1)	199(58.4)	430(44.6)		191(31.6)	159(42.9)	350(35.9)	
<b>Night sleep deprivation*</b>													
Never	212(7.3)	46(8.6)	32(7.2)	78(8.0)	0.008	55(8.8)	18(5.3)	73(7.6)	<0.001	41(6.8)	20(5.4)	61(6.3)	0.603
Sometimes	957(32.8)	206(38.6)	134(30.2)	340(34.8)		223(35.8)	62(18.2)	285(29.6)		208(34.4)	124(33.4)	332(34.1)	
Frequent	1746(59.9)	281(52.7)	277(62.5)	558(57.2)		345(55.4)	261(76.5)	606(62.9)		355(58.8)	227(61.2)	582(59.7)	
<b>Workplace violence**</b>													
Never	427(14.6)	108(20.3)	72(16.3)	180(18.4)	0.117	119(19.1)	25(7.3)	144(14.9)	<0.001	70(11.6)	33(8.9)	103(10.6)	<0.001
Sometimes	2003(68.7)	368(69.0)	309(69.8)	677(69.4)		421(67.6)	237(69.5)	658(68.3)		432(71.5)	236(63.6)	668(68.5)	
Frequent	485(16.6)	57(10.7)	62(14.0)	119(12.2)		83(13.3)	79(23.2)	162(16.8)		102(16.9)	102(27.5)	204(20.9)	

Note: \*  $p < 0.05$  and \*\*  $p < 0.001$  for regional differences.

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

**Quality of working life**

On average, the respondents reported a QWL score of 92.51 (SD=17.74) out of a highest possible of 160: 22.68±4.56 for physical health; 13.71±4.09 for mental health; 22.30±6.16 for job and career satisfaction; 13.10±2.74 for work passion and initiative; 9.24±2.32 for professional pride; 6.66±1.42 for professional competence; and 4.82±1.65 for balance between work and family, respectively (Table 3).

Overall, the respondents from rural hospitals in central region and those who aged between 30 and 45 years, were married, held a middle professional title, earned a lower income, worked longer hours, experienced more frequent night sleep deprivation, and encountered more frequent workplace violence reported lower QWL than others ( $p<0.05$ ): although urban-rural location was not associated with professional pride ( $p=0.090$ ) and professional competence ( $p=0.345$ ); marital status was not associated with work passion and initiative ( $p=0.388$ ) and professional pride ( $p=0.473$ ); professional title was not associated with job and career satisfaction ( $p=0.139$ ) and work passion and initiative ( $p=0.661$ ); and salary was not associated with work passion and initiative ( $p=0.878$ ). The male respondents had lower job and career satisfaction ( $p=0.005$ ) and work passion and initiative ( $p<0.001$ ), despite reporting higher professional competence ( $p<0.001$ ) than their female counterparts (Table 3).

Table 3. Sociodemographic and work-related characteristics associated with quality of working life

Characteristics	n (%)	Quality of Working Life		Physical health		Mental health		Job and career satisfaction		Work passion and initiative		Professional pride		Professional competence		Balance between work and family	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
<b>Urban or Rural</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.003</b>		<b>P&lt;0.002</b>		<b>P&lt;0.003</b>		P=0.090		P=0.345		<b>P&lt;0.001</b>	
Urban	1760(60.4)	93.39	17.40	23.05	4.51	13.89	4.03	22.58	6.08	12.97	2.68	9.30	2.25	6.68	1.41	4.92	1.64
Rural	1155(39.6)	91.16	18.16	22.13	4.58	13.43	4.17	21.86	6.26	13.28	2.81	9.15	2.41	6.63	1.45	4.67	1.67
<b>Gender</b>		P=0.058		P=0.998		P=0.073		<b>P&lt;0.005</b>		<b>P&lt;0.001</b>		P=0.339		<b>P&lt;0.001</b>		P=0.251	
Male	1550(53.2)	91.92	18.47	22.68	4.72	13.58	4.10	21.99	6.35	12.92	2.82	9.20	2.50	6.76	1.49	4.79	1.69
Female	1365(46.8)	93.17	16.85	22.68	4.37	13.85	4.08	22.64	5.92	13.30	2.62	9.28	2.10	6.56	1.34	4.86	1.60
<b>Age (Years)</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>	
<30	796(27.3)	94.55	17.54	23.36	4.66	14.41	4.04	22.87	5.97	13.21	2.61	9.33	2.20	6.41	1.35	4.97	1.63
30-45	1778(61.0)	91.16	17.59	22.37	4.42	13.40	4.03	21.94	6.16	12.97	2.76	9.11	2.31	6.67	1.40	4.70	1.65
>45	341(11.7)	94.76	18.31	22.75	4.87	13.65	4.33	22.79	6.47	13.51	2.85	9.71	2.56	7.21	1.56	5.14	1.67
<b>Marital status</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		P=0.388		P=0.473		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>	
Married	2237(76.7)	91.74	17.69	22.41	4.49	13.48	4.06	22.06	6.19	13.07	2.78	9.22	2.37	6.75	1.44	4.76	1.65
Not married	678(23.3)	95.03	17.68	23.59	4.67	14.46	4.10	23.08	5.99	13.18	2.58	9.30	2.13	6.38	1.34	5.04	1.64
<b>Professional title</b>		<b>P&lt;0.027</b>		<b>P&lt;0.006</b>		<b>P&lt;0.001</b>		P=0.139		P=0.661		<b>P&lt;0.016</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>	
Junior or below	1368(46.9)	92.96	17.42	22.90	4.61	14.00	4.08	22.50	6.00	13.09	2.59	9.19	2.22	6.42	1.34	4.86	1.64
Middle	1024(35.1)	91.35	17.77	22.32	4.38	13.35	4.05	22.00	6.18	13.05	2.82	9.17	2.33	6.79	1.41	4.66	1.64
Senior	523(17.9)	93.60	18.41	22.82	4.74	13.63	4.16	22.35	6.52	13.19	2.93	9.50	2.53	7.05	1.52	5.06	1.67
<b>Monthly basic salary (Yuan)</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		P=0.878		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>	
<5000	1395(47.9)	91.22	18.32	22.37	4.77	13.59	4.25	21.86	6.23	13.07	2.76	9.07	2.34	6.52	1.44	4.74	1.68
5000-8000	1193(40.9)	92.56	17.19	22.63	4.35	13.60	3.94	22.34	6.15	13.12	2.75	9.30	2.30	6.78	1.39	4.78	1.61
>8000	327(11.2)	97.82	16.14	24.20	4.06	14.61	3.84	23.99	5.57	13.11	2.58	9.73	2.21	6.84	1.41	5.33	1.61
<b>Region</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>	
Eastern	976(33.5)	96.21	17.43	23.32	4.40	14.24	4.04	23.52	6.05	13.47	2.82	9.78	2.20	6.83	1.43	5.05	1.60
Central	964(33.1)	91.47	17.76	22.76	4.57	13.64	4.09	21.68	6.31	13.01	2.65	9.00	2.32	6.66	1.41	4.72	1.64
Western	975(33.4)	89.82	17.42	21.98	4.60	13.24	4.09	21.68	5.94	12.80	2.69	8.94	2.34	6.50	1.40	4.69	1.69
<b>Weekly working hour</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.010</b>		<b>P&lt;0.001</b>	
≤40	324(11.1)	101.65	16.88	25.06	4.36	15.44	3.90	25.08	5.56	13.60	2.55	9.75	2.34	6.82	1.39	5.90	1.36
41-60	1562(53.6)	94.81	16.73	23.28	4.21	14.16	3.91	22.95	6.03	13.30	2.68	9.39	2.24	6.70	1.37	5.04	1.56
>60	1029(35.3)	86.13	17.39	21.03	4.58	12.47	4.09	20.42	6.01	12.63	2.82	8.86	2.38	6.57	1.50	4.16	1.61
<b>Night sleep deprivation</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>	
Never	212(7.3)	107.63	18.27	26.49	4.80	16.45	4.32	26.67	6.20	14.49	2.79	10.35	2.42	7.07	1.53	6.11	1.62
Sometimes	957(32.8)	98.65	15.34	24.38	3.77	15.00	3.68	24.14	5.57	13.42	2.54	9.55	2.14	6.71	1.34	5.45	1.45
Frequent	1746(59.9)	87.30	16.75	21.29	4.34	12.66	3.92	20.75	5.93	12.75	2.76	8.94	2.34	6.59	1.44	4.32	1.55
<b>Workplace violence</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>	
Never	427(14.6)	105.76	17.46	25.79	4.39	16.27	4.11	26.45	5.97	14.22	2.73	10.21	2.30	6.94	1.50	5.88	1.56
Sometimes	2003(68.7)	92.74	15.55	22.77	4.06	13.75	3.73	22.31	5.67	13.16	2.57	9.28	2.17	6.67	1.34	4.80	1.53
Frequent	485(16.6)	79.88	17.64	19.60	4.66	11.26	4.08	18.59	5.91	11.83	2.92	8.23	2.53	6.39	1.61	3.98	1.70
<b>Total</b>	2915 (100)	92.51	17.74	22.68	4.56	13.71	4.09	22.30	6.16	13.10	2.74	9.24	2.32	6.66	1.42	4.82	1.65

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

The multivariate regression models confirmed that eastern region, less frequent night sleep deprivation, and less frequent encounters of workplace violence were significant predictors of higher QWL across all of the seven domains after adjustment for variations of other variables. Urban location remained to be a significant predictor of lower work passion and initiative. Male gender was a significant predictor of higher physical health and professional competence, but lower work passion and initiative. A younger age was associated with higher physical health and mental health, and higher professional pride, but lower professional competence. Those who were married had lower physical health but higher professional competency than those unmarried. A junior professional title was associated with higher job and career satisfaction, but lower professional competency. Lower income was associated lower QWL, but the effects were not statistically significant on work passion and initiative, and professional competency. Less working hours was associated with higher QWL, but the effects were not statistically significant on work passion and initiative, professional pride, and professional competence (Table 4).

Table 4. Results (Beta coefficients) of multivariate linear regression models on quality of working life

Predictor	Standardised Beta Coefficients							
	Quality of Working Life	Physical health	Mental health	Job and career satisfaction	Work passion and initiative	Professional pride	Professional competence	Balance between work and family
<b>Urban or Rural</b>								
Urban(ref.)								
Rural	0.471(-0.702, 1.644)	-0.123(-0.426, 0.180)	0.120(-0.165, 0.405)	0.070(-0.356, 0.496)	0.462*** (0.260, 0.665)	-0.014(-0.185, 0.157)	-0.043(-0.151, 0.064)	0.001(-0.112, 0.112)
<b>Gender</b>								
Male (ref.)								
Female	0.126(-0.994, 1.246)	-0.294*(-0.582, -0.005)	0.024(-0.248, 0.296)	0.291(-0.116, 0.697)	0.296** (0.103, 0.489)	0.014(-0.149, 0.178)	-0.174** (-0.276, -0.072)	-0.032(-0.139, 0.075)
<b>Age (Years)</b>								
<30 (ref.)								
30-45	-1.012(-2.809, 0.785)	-0.220(-0.684, 0.244)	-0.366(-0.803, 0.070)	-0.080(-0.732, 0.573)	-0.071(-0.381, 0.239)	-0.286* (-0.548, -0.024)	-0.028(-0.192, 0.136)	0.039(-0.133, 0.210)
>45	-0.404(-3.118, 2.311)	-0.757*(-1.457, -0.056)	-0.671*(-1.331, -0.012)	0.191(-0.795, 1.176)	0.326(-0.143, 0.794)	0.095(-0.301, 0.491)	0.329** (0.081, 0.577)	0.084(-0.175, 0.343)
<b>Marital status</b>								
Married (ref.)								
Not married	1.040(-0.664, 2.745)	0.578* (0.138, 1.018)	0.282(-0.132, 0.696)	0.381(-0.238, 0.999)	-0.064(-0.359, 0.230)	-0.088(-0.333, 0.160)	-0.206** (-0.361, -0.050)	0.158(-0.005, 0.321)
<b>Professional title</b>								
Junior or below(ref.)								
Middle	-1.240(-2.758, 0.278)	-0.362(-0.753, 0.030)	-0.391*(-0.760, -0.022)	-0.534(-1.085, 0.017)	-0.028(-0.290, 0.234)	-0.053(-0.274, 0.169)	0.269*** (0.131, 0.408)	-0.142(-0.287, 0.003)
Senior	-1.288(-3.403, 0.828)	-0.333(-0.879, 0.213)	-0.402(-0.916, 0.113)	-0.961*(-1.729, -0.193)	0.006(-0.359, 0.371)	-0.001(-0.309, 0.308)	0.366*** (0.173, 0.559)	0.037(-0.165, 0.239)
<b>Monthly basic salary (Yuan)</b>								
<5000 (ref.)								
8000-12000	2.795*** (1.482, 4.107)	0.736*** (0.397, 1.075)	0.459** (0.139, 0.778)	0.989*** (0.512, 1.465)	0.108(-0.118, 0.335)	0.333** (0.143, 0.524)	0.081(-0.038, 0.201)	0.089(-0.037, 0.214)
>8000	4.372*** (2.283, 6.461)	1.361*** (0.822, 1.900)	0.842** (0.334, 1.350)	1.715*** (0.957, 2.473)	-0.163(-0.523, 0.198)	0.462** (0.153, 0.766)	-0.094(-0.284, 0.097)	0.248* (0.049, 0.448)
<b>Region</b>								
Eastern(ref.)								
Central	-2.887*** (-4.270, -1.503)	-0.149(-0.506, 0.208)	-0.249(-0.585, 0.088)	-1.285*** (-1.788, -0.783)	-0.222(-0.460, 0.017)	-0.702*** (-0.998, -0.500)	-0.142* (-0.269, -0.016)	-0.137* (-0.269, -0.005)
Western	-4.710*** (-6.110, -3.309)	-1.007*** (-1.369, -0.646)	-0.730*** (-1.070, -0.389)	-1.350*** (-1.859, -0.842)	-0.426** (-0.667, -0.184)	-0.743*** (-0.998, -0.539)	-0.245*** (-0.372, -0.117)	-0.209*** (-0.342, -0.075)
<b>Weekly working hour</b>								
≤40 (ref.)								
41-60	-2.638** (-4.507, -0.770)	-0.748** (-1.230, -0.266)	-0.516* (-0.971, -0.062)	-0.841* (-1.519, -0.162)	0.028(-0.294, 0.351)	-0.046(-0.318, 0.226)	-0.006(-0.176, 0.165)	-0.510*** (-0.688, -0.332)
>60	-6.478*** (-8.551, -4.406)	-1.893*** (-2.428, -1.358)	-1.332*** (-1.836, -0.828)	-1.849*** (-2.602, -1.097)	-0.241(-0.598, 0.117)	-0.147(-0.448, 0.155)	-0.006(-0.195, 0.183)	-1.011*** (-1.209, -0.813)
<b>Night sleep deprivation</b>								
Never (ref.)								
Sometimes	-5.366*** (-7.678, -3.053)	-1.246*** (-1.842, -0.649)	-0.713* (-1.275, -0.151)	-1.425*** (-2.265, -0.586)	-0.763*** (-1.162, -0.364)	-0.570*** (-0.998, -0.233)	-0.343*** (-0.554, -0.132)	-0.306*** (-0.527, -0.085)
Frequent	-12.616*** (-14.956, -10.276)	-3.319*** (-3.923, -2.716)	-2.281*** (-2.850, -1.712)	-3.579*** (-4.429, -2.730)	-1.130*** (-1.534, -0.727)	-0.873*** (-1.258, -0.532)	-0.382*** (-0.596, -0.169)	-1.050*** (-1.273, -0.827)
<b>Workplace violence</b>								
Never (ref.)								
Sometimes	-9.267*** (-10.907, -7.627)	-1.908*** (-2.332, -1.485)	-1.720*** (-2.119, -1.321)	-3.063*** (-3.659, -2.468)	-0.880*** (-1.163, -0.597)	-0.705*** (-0.998, -0.465)	-0.275*** (-0.425, -0.125)	-0.716*** (-0.873, -0.560)
Frequent	-18.975*** (-21.075, -16.874)	-4.180*** (-4.722, -3.638)	-3.582*** (-4.092, -3.071)	-5.828*** (-6.591, -5.066)	-2.070*** (-2.433, -1.708)	-1.544*** (-1.898, -1.238)	-0.535*** (-0.727, -0.344)	-1.235*** (-1.436, -1.034)

Note: \*p&lt;0.05; \*\*p&lt;0.01; \*\*\*p&lt;0.001

Discussion

The study participants reported an overall QWL score of 92.51 (SD=17.74) out of a highest possible of 160. This level of QWL is low in comparison with the findings of studies conducted in some non-health industries such as primary and secondary school teachers [38] and oil-drilling workers [39-40]. Although medical practice requires high levels of work commitment, it is usually considered as a respectful and highly rewarded job[41]. However, medical practice also involves high levels of patient safety risk, especially in under-resourced facilities[42]. Patients often hold a very high expectation on the expensive medical services. The respectful doctor-patient relationship can be jeopardised when things do not go as well as anticipated[43].

We found that long working hours, frequent night sleep deprivation, frequent encounters of medical violence, and low salary are major predictors of low QWL. The respondents from the eastern region also reported higher QWL than their central and western counterparts. These results are consistent with the findings of previous studies [44-52]. Our study showed that exceedingly long working hours are particularly detrimental to physical health, mental health, job satisfaction, and work-life balance of the study participants. Indeed, long working hours are not uncommon in medical services given the global shortage of medical workforce, which have been proved to impair health of medical workers [44-46], leading to depressive symptoms [47], low job satisfaction [48], and increased risks of job stress [49]. In addition to long working hours, empirical evidence also shows that night sleep deprivation can cause sleep disturbances and fatigue, and increase the risk of serious illness [50] including depression [51]. Frequent night sleep deprivation can even negatively influence the performance of medical doctors as indicated in this study and others [52]. Unfortunately, insufficient sleep has been one of the most frequently reported concerns of medical doctors in China[53]. Those problems resulting from high workloads and disruptions of daily routine can be further exacerbated by low financial rewards. Compared with medical practitioners in many other countries, doctors in China earned a much lower level of income.

Unsurprisingly, frequent encounters of workplace violence emerged as a significant predictor of low QWL of medical doctors across all of the seven domains in this study. Over the past few years, China has witnessed increasing reports of incidence of violence against health workers, raising serious questions about the patient-provider relationship [54-57]. The deteriorating practice environment has led



to increased intention of health workers to leave the industry<sup>[58]</sup>. In this study, 16.6% of respondents reported frequent encounters with medical violence, compared with 68.7% reporting sometimes and 14.6% never. In China, most county hospitals are classified as secondary hospitals. They have suffered the most in patient-provider conflicts compared with their tertiary and primary care counterparts<sup>[59-60]</sup>. However, rural medical workers seem to have maintained a relatively higher work passion and initiative than their urban counterparts according to the findings of our study. It is likely that both health workers and patients may hold a relatively lower expectation on the medical services delivered in rural settings than those delivered in urban settings<sup>[61]</sup>. In recent years, the urban-rural disparities in medical resources<sup>[62]</sup> and healthcare services<sup>[63]</sup> in China have started to narrow down.

The regional differences of QWL revealed in this study are perhaps a reflection of the widespread issue of regional disparity in China. The relatively more developed eastern region has more financial resources and invest more in health than the less developed central and western regions<sup>[64-66]</sup>. As a result, medical doctors in the eastern region are exposed to a better working environment, thus reporting higher QWL.

China is facing serious challenges in maintaining a healthy and sustainable health workforce. Healthcare demands have been increasing dramatically with the rapid economic growth and population ageing over the past few decades<sup>[67-69]</sup>. This has imposed a great burden on the health care delivery system, further exacerbating the challenge of health workforce shortage. The long working hours (35.3% reporting >60 hours per week), coupled with frequent night sleep deprivation (60%) and low salary (less than 12% earning >US \$1255 per month) present a significant risk for occupational health and safety as indicated by the findings of this study. Low QWL not only affects the health and wellbeing of medical workers<sup>[70]</sup>, but can also affect their competency and work performance<sup>[5]</sup>. This can become a serious risk of patient safety and quality of care<sup>[71]</sup>.

It is unlikely that the above-mentioned occupational health and safety risks can be addressed without taking a systems approach. China has recently launched a series of health system reforms, aiming at improving health care accessibility and affordability through containing hospital costs and encouraging patients to seek medical care in primary care<sup>[16][72]</sup>. The central government has increased its investment in rural health development, in particular in the least developed western region. Strengthening law enforcement was also proposed to deal with workplace violence. These measures,

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

though necessary, may not be enough to address the low QWL issue in medical doctors. Although the cost containment measures may be welcomed by patients, they may hinder potential salary growth of health workers. Increasing policy attentions need to be paid to sustainable workload, proper financial and professional rewards, and work-life balance of medical workers. While growing health workforce is fundamental for a long-term solution, urgent efforts should be made to foster a safe working environment where health workers and patients can work in partnerships.

*Strength and limitations*

The sample size of this study is large. Data were collected through field visits, which ensured a high response rate. However, such an approach could not catch those who were not working at the time of the survey. The data were also subject to recall and self-reporting bias. The study adopted a cross-sectional design and no casual relationships should be assumed.

**Conclusion**

Low QWL of medical doctors working in public hospitals in China is evident, which is associated with long working hours, frequent night sleep deprivations, frequent encounters of workplace violence, and low salary. There are also significant regional differences in the QWL of medical doctors, with the eastern developed region featuring better QWL. Adequate resource support and safe working environment are critical for ensuring a sustainable healthy medical workforce, which requires a systems approach.

**Conflict of interests:** The authors declare no conflicts of interest.

**Authors' contributions:** CT, CG and CL performed literature review, designed the project, and drafted the article. CT and CG participated in data collection and data analyses. All authors have read and approved the final article.

**Acknowledgements:** We would like to thank our colleagues who facilitated the field visits and data collection and all of the participating hospitals and study participants.

**Funding:** This study was funded by the National Natural Science Foundation of China (No. 71603077).

**Patient consent:** No required.

**Ethics approval:** Ethics approval was granted by the Research Ethics Committee of Tongji Medical

College, Huazhong University of Science and Technology (No: IORG0003571).

**Data sharing statement:** The data relevant to this manuscript are available from the corresponding authors on reasonable request.

## References

- 1 T Moradi, F Maghaminejad, I Azizi-Fini. Quality of working life of nurses and its related factors. *Nurs Midwifery Stud* 2014;3(2):e19450.
- 2 AM Mosadeghrad, E Ferlie, D Rosenberg. A study of relationship between job stress, quality of working life and turnover intention among hospital employees. *Health Serv Manage Res* 2011;24(4):170-81.
- 3 H Li, Z Liu, R Liu, L Li, A Lin. The relationship between work stress and work ability among power supply workers in Guangdong, China: a cross-sectional study. *Bmc Public Health* 2016;16:123.
- 4 M Abbasi, A Zakerian, A Akbarzade, et al. Investigation of the Relationship between Work Ability and Work-related Quality of Life in Nurses. *Iran J Public Health* 2017;46(10):1404-12.
- 5 M Rastegari, A Khani, P Ghalriz, J Eslamian. Evaluation of quality of working life and its association with job performance of the nurses. *Iran J Nurs Midwifery Res* 2010;15(4):224-28.
- 6 M de Jong, AG de Boer, SJ Tamminga, MH Frings-Dresen. Quality of working life issues of employees with a chronic physical disease: a systematic review. *J Occup Rehabil* 2015;25(1):182-96.
- 7 AM Mosadeghrad. Quality of working life: an antecedent to employee turnover intention. *Int J Health Policy Manag* 2013;1(1):43-50.
- 8 GI Skoufi, GA Lialios, S Papakosta, et al. Shift Work and Quality of Personal, Professional, and Family Life among Health Care Workers in a Rehabilitation Center in Greece. *Indian J Occup Environ Med* 2017;21(3):115-20.
- 9 P Raeissi, MR Rajabi, E Ahmadizadeh, K Rajabkhah, E Kakemam. Quality of work life and factors associated with it among nurses in public hospitals, Iran. *J Egypt Public Health Assoc* 2019;94(1):25.
- 10 Z Chegini, JM Asghari, E Kakemam. Occupational stress, quality of working life and turnover intention amongst nurses. *Nurs Crit Care* 2019;24(5):283-89.
- 11 C Liu, T Bartram, SG Leggat. Link of Patient Care Outcome to Occupational Differences in Response to Human Resource Management: A Cross-Sectional Comparative Study on Hospital Doctors and Nurses in China. *Int J Environ Res Public Health* 2020;17(12).
- 12 Y Qiu, Q Wu, R Chen, C Guan. Research on psychological stress and mental health of medical staff in COVID-19 prevention and control. *Int J Disaster Risk Reduct* 2021;65:102524.
- 13 M Zhang, M Zhou, F Tang, et al. Knowledge, attitude, and practice regarding COVID-19 among healthcare workers in Henan, China. *J Hosp Infect* 2020;105(2):183-87.
- 14 NH Commission. China Health Statistics Yearbook 2019: Peking Union Medical College 2019.
- 15 Y Hu, Z Zhang. Skilled doctors in tertiary hospitals are already overworked in China. *Lancet Glob Health* 2015;3(12):e737.
- 16 C Tang, Z Luo, P Fang, F Zhang. Do patients choose community health services (CHS) for first treatment in China? Results from a community health survey in urban areas. *J Community Health* 2013;38(5):864-72.

- 17 M Storman, D Storman, J Maciag. Quality of work-life among young medical doctors in Poland. *Int J Occup Saf Ergon* 2021;1:1-07.
- 18 J Ding, Y Jia, J Zhao, et al. Optimizing quality of life among Chinese physicians: the positive effects of resilience and recovery experience. *Qual Life Res* 2020;29(6):1655-63.
- 19 HP Shan, XH Yang, XL Zhan, et al. Overwork is a silent killer of Chinese doctors: a review of Karoshi in China 2013-2015. *Public Health* 2017;147:98-100.
- 20 AJ He, J Qian. Explaining medical disputes in Chinese public hospitals: the doctor-patient relationship and its implications for health policy reforms. *Health Econ Policy Law* 2016;11(4):359-78.
- 21 SZ Yang, D Wu, N Wang, et al. Workplace violence and its aftermath in China's health sector: implications from a cross-sectional survey across three tiers of the health system. *Bmj Open* 2019;9(9):e31513.
- 22 A Kumari, T Kaur, P Ranjan, et al. Workplace violence against doctors: Characteristics, risk factors, and mitigation strategies. *J Postgrad Med* 2020;66(3):149-54.
- 23 T Cheung, PH Lee, P Yip. The association between workplace violence and physicians' and nurses' job satisfaction in Macau. *Plos One* 2018;13(12):e207577.
- 24 EC Tan, DR Chen. Second victim: Malpractice disputes and quality of life among primary care physicians. *J Formos Med Assoc* 2019;118(2):619-27.
- 25 MH Zubair, LR Hussain, KN Williams, KJ Grannan. Work-Related Quality of Life of US General Surgery Residents: Is It Really so Bad? *J Surg Educ* 2017;74(6):e138-46.
- 26 P Sirisawasd, N Chaiear, NP Johns, J Khiewyoo. Validation of the Thai Version of a Work-related Quality of Life Scale in the Nursing Profession. *Saf Health Work* 2014;5(2):80-85.
- 27 X Zeng, N Chaiear, P Klainin, et al. Work-related quality of life scale among Singaporean nurses. *Asian Biomed* 2011;5(4):467-74.
- 28 S Lin, N Chaiear, J Khiewyoo, B Wu, NP Johns. Preliminary psychometric properties of the chinese version of the work-related quality of life scale-2 in the nursing profession. *Saf Health Work* 2013;4(1):37-45.
- 29 B Nowrouzi, E Giddens, B Gohar, et al. The quality of work life of registered nurses in Canada and the United States: a comprehensive literature review. *Int J Occup Environ Health* 2016;22(4):341-58.
- 30 Q Zhang, YQ Xie, YJ Lan. [Development of a quality of working life scale (QWL7-32)]. *Sichuan Da Xue Xue Bao Yi Xue Ban* 2013;44(6):957-61.
- 31 Y Zhang, XL Liu, TD Wei, YJ Lan. [Relationship of job stress with job burnout and quality of work life in workers for offshore oil platforms]. *Zhonghua Lao Dong Wei Sheng Zhi Ye Bing Za Zhi* 2017;35(3):198-202.
- 32 JA Parise, ZA Soler. Quality of working life of call-center workers. *Rev Bras Enferm* 2016;69(4):751-56.
- 33 B Nowrouzi, N Lightfoot, M Lariviere, et al. Occupational Stress Management and Burnout Interventions in Nursing and Their Implications for Healthy Work Environments: A Literature Review. *Workplace Health Saf* 2015;63(7):308-15.
- 34 B Nowrouzi, E Giddens, B Gohar, et al. The quality of work life of registered nurses in Canada and the United States: a comprehensive literature review. *Int J Occup Environ Health* 2016;22(4):341-58.
- 35 X Chen, M Liu, C Liu, et al. Job Satisfaction and Hospital Performance Rated by Physicians in China: A Moderated Mediation Analysis on the Role of Income and Person-Organization Fit. *Int J Environ*

- Res Public Health* 2020;17(16).
- 36 J Hou, Y Ke. Addressing the shortage of health professionals in rural China: issues and progress  
Comment on "Have health human resources become more equal between rural and urban areas after  
the new reform?". *Int J Health Policy Manag* 2015;4(5):327-28.
  - 37 F Faul, E Erdfelder, A Buchner, AG Lang. Statistical power analyses using G\*Power 3.1: tests for  
correlation and regression analyses. *Behav Res Methods* 2009;41(4):1149-60.
  - 38 Z Jian, Z Shu-shan, L Ya-jia, L Jian. Analysis on quality of working life and its influencing factors  
among medi-cal workers in 3 A grade hospital. *JOURNAL OF NORTH SICHUAN MEDICAL  
COLLEGE* 2016;31(1):112-15.
  - 39 M Jing-feng, L Ya-jia, C Xi-ning, et al. Analysis on the Influencing Factors of Quality of Working  
Life among oil-drilling workers. *Modern Preventive Medicine* 2011;38(2):211-14.
  - 40 Y Zhang, XL Liu, TD Wei, YJ Lan. [Relationship of job stress with job burnout and quality of work  
life in workers for offshore oil platforms]. *Zhonghua Lao Dong Wei Sheng Zhi Ye Bing Za Zhi*  
2017;35(3):198-202.
  - 41 C Liu, T Bartram, SG Leggat. Link of Patient Care Outcome to Occupational Differences in Response  
to Human Resource Management: A Cross-Sectional Comparative Study on Hospital Doctors and  
Nurses in China. *Int J Environ Res Public Health* 2020;17(12).
  - 42 C Liu, W Liu, Y Wang, Z Zhang, P Wang. Patient safety culture in China: a case study in an outpatient  
setting in Beijing. *Bmj Qual Saf* 2014;23(7):556-64.
  - 43 S Tao, C Liu, Q Wu, et al. Developing a scale measuring the doctor-patient relationship in China from  
the perspective of doctors. *Fam Pract* 2022;39(3):527-36.
  - 44 VH Bernstrom. Long working hours and sickness absence-a fixed effects design. *Bmc Public Health*  
2018;18(1):578.
  - 45 M Kivimaki, ST Nyberg, GD Batty, I Madsen, AG Tabak. Long Working Hours and Risk of Venous  
Thromboembolism. *Epidemiology* 2018;29(5):e42-44.
  - 46 KS Shin, YK Chung, YJ Kwon, JS Son, SH Lee. The effect of long working hours on cerebrovascular  
and cardiovascular disease; A case-crossover study. *Am J Ind Med* 2017;60(9):753-61.
  - 47 R Ogawa, E Seo, T Maeno, et al. The relationship between long working hours and depression among  
first-year residents in Japan. *Bmc Med Educ* 2018;18(1):50.
  - 48 A Nakata. Long working hours, job satisfaction, and depressive symptoms: a community-based  
cross-sectional study among Japanese employees in small- and medium-scale businesses. *Oncotarget*  
2017;8(32):53041-52.
  - 49 Z Li, JM Dai, D Zhang, et al. [Association between Long Working Hours and Job Stress and  
Depression among Employees from a State Grid Company]. *Zhonghua Lao Dong Wei Sheng Zhi Ye  
Bing Za Zhi* 2018;36(4):271-74.
  - 50 PJ Stryjewski, A Kuczaj, D Domal-Kwiatkowska, U Mazurek, E Nowalany-Kozielska. [Night work  
and shift work - effects on the health of workers]. *Przegl Lek* 2016;73(7):513-15.
  - 51 P Angerer, R Schmook, I Elfantel, J Li. Night Work and the Risk of Depression. *Dtsch Arztebl Int*  
2017;114(24):404-11.
  - 52 OA Meretoja. We should work less at night. *Acta Anaesthesiol Scand* 2009;53(3):277-79.
  - 53 Y Wu, F Jiang, S Wu, Y Liu, YL Tang. Sleep duration and satisfaction among physicians in tertiary  
public hospitals in China: a large sample national survey. *J Occup Med Toxicol* 2021;16(1):8.
  - 54 Y Gan, L Li, H Jiang, et al. Prevalence and Risk Factors Associated With Workplace Violence Against  
General Practitioners in Hubei, China. *Am J Public Health* 2018;108(9):1223-26.

55 P Li, K Xing, H Qiao, et al. Psychological violence against general practitioners and nurses in Chinese township hospitals: incidence and implications. *Health Qual Life Outcomes* 2018;16(1):117.

56 Y Tian, Y Yue, J Wang, et al. Workplace violence against hospital healthcare workers in China: a national WeChat-based survey. *Bmc Public Health* 2020;20(1):582.

57 G Sui, G Liu, L Jia, L Wang, G Yang. Associations of workplace violence and psychological capital with depressive symptoms and burn-out among doctors in Liaoning, China: a cross-sectional study. *Bmj Open* 2019;9(5):e24186.

58 T Heponiemi, A Kouvonen, M Virtanen, J Vanska, M Elovainio. The prospective effects of workplace violence on physicians' job satisfaction and turnover intentions: the buffering effect of job control. *Bmc Health Serv Res* 2014;14:19.

59 SZ Yang, D Wu, N Wang, et al. Workplace violence and its aftermath in China's health sector: implications from a cross-sectional survey across three tiers of the health system. *Bmj Open* 2019;9(9).

60 Y Tian, Y Yue, J Wang, et al. Workplace violence against hospital healthcare workers in China: a national WeChat-based survey. *Bmc Public Health* 2020;20(1):582.

61 L Shan, Y Li, D Ding, et al. Patient Satisfaction with Hospital Inpatient Care: Effects of Trust, Medical Insurance and Perceived Quality of Care. *Plos One* 2016;11(10):e164366.

62 Y Wang, Y Li, S Qin, et al. The disequilibrium in the distribution of the primary health workforce among eight economic regions and between rural and urban areas in China. *Int J Equity Health* 2020;19(1):28.

63 M Ying, S Wang, C Bai, Y Li. Rural-urban differences in health outcomes, healthcare use, and expenditures among older adults under universal health insurance in China. *Plos One* 2020;15(10):e240194.

64 J Ding, X Hu, X Zhang, et al. Equity and efficiency of medical service systems at the provincial level of China's mainland: a comparative study from 2009 to 2014. *Bmc Public Health* 2018;18(1):214.

65 XF Zhang, XY Tian, YL Cheng, et al. Health disparities among the western, central and eastern rural regions of China after a decade of health promotion and disease prevention programming. *J Huazhong Univ Sci Technolog Med Sci* 2015;35(4):606-14.

66 B Zha. The gap of economic development expanding between eastern China and middle, western China. *China Popul Res Newsl* 1996(1):2-03.

67 GG Liu, SA Vortherms, X Hong. China's Health Reform Update. *Annu Rev Public Health* 2017;38:431-48.

68 EF Fang, M Scheibye-Knudsen, HJ Jahn, et al. A research agenda for aging in China in the 21st century. *Ageing Res Rev* 2015;24(Pt B):197-205.

69 M Paiano, AE Jaques, P Nacamura, et al. Mental health of healthcare professionals in China during the new coronavirus pandemic: an integrative review. *Rev Bras Enferm* 2020;73(suppl 2):e20200338.

70 D Woo, Y Lee, S Park. Associations among working hours, sleep duration, self-rated health, and health-related quality of life in Korean men. *Health Qual Life Outcomes* 2020;18(1):287.

71 B Misiak, R Sierzantowicz, E Krajewska-Kulak, et al. Psychosocial Work-Related Hazards and Their Relationship to the Quality of Life of Nurses-a Cross-Sectional Study. *Int J Environ Res Public Health* 2020;17(3).

72 Y Zhang, Q Wang, T Jiang, J Wang. Equity and efficiency of primary health care resource allocation in mainland China. *Int J Equity Health* 2018;17(1):140.



STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation	Page No
Title and abstract	1	(a) Indicate the study’s design with a commonly used term in the title or the abstract	1-2
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3-4
Objectives	3	State specific objectives, including any prespecified hypotheses	4
Methods			
Study design	4	Present key elements of study design early in the paper	4
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	4-5
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	5
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5-6
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	7
Bias	9	Describe any efforts to address potential sources of bias	5-6
Study size	10	Explain how the study size was arrived at	5-6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	5-7
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	7
		(b) Describe any methods used to examine subgroups and interactions	7
		(c) Explain how missing data were addressed	6
		(d) If applicable, describe analytical methods taking account of sampling strategy	6-7
		(e) Describe any sensitivity analyses	6-7
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg	7-8

		numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	
		(b) Give reasons for non-participation at each stage	
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	7-8
		(b) Indicate number of participants with missing data for each variable of interest	
Outcome data	15*	Report numbers of outcome events or summary measures	7-8
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	9-13
		(b) Report category boundaries when continuous variables were categorized	9-13
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	9-13
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	9-13
<b>Discussion</b>			
Key results	18	Summarise key results with reference to study objectives	14-16
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	16
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	14-16
Generalisability	21	Discuss the generalisability (external validity) of the study results	16
<b>Other information</b>			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	16



# BMJ Open

## Quality of working life of medical doctors and associated risk factors: a cross-sectional survey in public hospitals in China

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2022-063320.R2
Article Type:	Original research
Date Submitted by the Author:	28-Oct-2022
Complete List of Authors:	Tang, Changmin; Hubei University of Chinese Medicine, School of Management; Hubei Provincial Key Research Base of Humanities and Social Sciences Guan, Cuiling; Hubei University of Chinese Medicine; Hubei Provincial Key Research Base of Humanities and Social Sciences Liu, Chaojie; La Trobe University, Public Health
<b>Primary Subject Heading</b>:	Occupational and environmental medicine
Secondary Subject Heading:	Health services research
Keywords:	Human resource management < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Health & safety < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, OCCUPATIONAL & INDUSTRIAL MEDICINE

SCHOLARONE™  
Manuscripts



I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our [licence](#).

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which [Creative Commons](#) licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

# Quality of working life of medical doctors and associated risk factors: a cross-sectional survey in public hospitals in China

Changmin Tang<sup>12\*</sup>, Cuiling Guan<sup>12\*</sup>, Chaojie Liu<sup>3\*</sup>

1. School of Management, Hubei University of Chinese Medicine, Wuhan, Hubei, China

2. Hubei Provincial Key Research Base of Humanities and Social Sciences, Wuhan, Hubei, China

3. School of Psychology and Public Health, La Trobe University, Melbourne, VIC 3086, Australia

\* Correspondence author:

Changmin Tang: tangcm@hbtcn.edu.cn, school of Management, Hubei University of Chinese Medicine;

Cuiling Guan: guancl@hbtcn.edu.cn, school of Management, Hubei University of Chinese Medicine;

Chaojie Liu: c.liu@latrobe.edu.au +613 94791715, school of Psychology and Public Health, La Trobe University.

**Quality of working life of medical doctors and associated risk factors: a cross-sectional survey in public hospitals in China**

**Abstract**

**Objectives:** To assess the quality of working life (QWL) of medical doctors and associated risk factors.

**Setting and participants:** A cross-sectional questionnaire survey of 2915 medical doctors from 48 hospitals was conducted in China.

**Methods:** The QWL-7-32 scale was adopted to assess seven domains of QWL: physical health, mental health, job and career satisfaction, work passion and initiative, professional pride, professional competence, and balance between work and family.

**Primary and secondary outcome measures:** Data were analysed using SPSS 19.0. ANOVA tests and multivariate linear regression analyses were performed to identify the sociodemographic characteristics and job factors associated with overall QWL and its seven subdomain scores.

**Results:** On average, the respondents reported an overall QWL score of 92.51 (SD=17.74) of a possible 160. Over 35% of respondents reported more than 60 hours of weekly working time; 59.9% experienced night sleep deprivation frequently; 16.6% encountered workplace violence frequently. The multivariate regression models revealed that the eastern region ( $\beta \leq -2.887$  for non-eastern regions,  $p < 0.001$ ), shorter working hours ( $\beta \leq -2.638$  for over 40 hours a week,  $p < 0.01$ ), less frequent night sleep deprivation ( $\beta \leq -5.366$  for sometimes or frequent,  $p < 0.001$ ), higher income ( $\beta \geq 2.795$  for lower income,  $p < 0.001$ ), and less frequent encounters of workplace violence ( $\beta \leq -9.267$  for sometimes or frequent,  $p < 0.001$ ) were significant predictors of higher QWL. Night sleep deprivation and workplace violence were common predictors ( $p < 0.05$ ) for all seven domains of QWL.

**Conclusion:** The low QWL of medical doctors working in public hospitals in China is evident, which is associated with high workloads, low rewards, and workplace violence. There are also significant regional differences in the QWL of medical doctors, with the eastern developed region featuring better QWL. Public hospitals in China are facing serious challenges in occupational health and safety, which needs be addressed through a systems approach.

**Strengths and Limitations of this study**

- A large number (n=2915) of medical doctors from 48 public hospitals in China participated in the survey.
- The overall QWL and its seven domains (physical health, mental health, job and career satisfaction, work passion and initiative, professional pride, professional competence, and balance between work and family) were measured using the validated tool QWL-7-32.
- Data were collected through field visits and face-to-face interviews, with a high response rate.
- The study adopted a cross-sectional design and no causal relationships should be assumed.
- Data were subject to recall and self-reporting bias.

## Introduction

Over the past few decades, quality of working life (QWL) has attracted increasing attention in the healthcare industry<sup>[1-2]</sup>. QWL is a term that has been used to describe the broad job-related experience of an individual. High levels of QWL are important for health care organisations to attract and motivate employees that lead to good work performance<sup>[3-5]</sup>. Low QWL is not only detrimental to the physical and mental health of employees<sup>[6]</sup>, it may also be linked to poor work performance<sup>[2][7]</sup>. In the health industry, there have been increasing concerns about the link between low QWL and the poor quality of patient care<sup>[8]</sup>.

However, our understanding about the QWL of medical doctors is quite limited. Most existing QWL studies in the health industry have been conducted in western countries and seem to have a focus on nurses<sup>[5][9-10]</sup>. This is likely to be associated with the high prevalence of private practice of medical doctors in the study countries and their over-emphasis on professional autonomy in medicine<sup>[11]</sup>. In a publicly dominated system where medical doctors are hired as employees of hospitals, however, medical doctors are usually working under great pressure due to high compliance requirements from the professional body, the government, the organisation, and the public. Unlike their private counterparts, medical doctors employed by public hospitals have limited entitlement to flexible working time. They are also required to work on the frontline in response to public health emergencies such as the COVID-19 pandemic<sup>[12-13]</sup>. This study addresses the gap in the literature by assessing the QWL of medical doctors working in the public hospital system in China. Few QWL studies, if any, have been conducted on medical doctors in developing countries.

The Chinese health system is hospital-dominant, with most hospital beds being owned by public hospitals. The rapid economic development in China over the past few decades has been accompanied with a rapid expansion and modernisation of hospitals, employing 56.93% of medical doctors and delivering about 78.64% of inpatient care and 43.81% of outpatient and emergency visits in 2018 <sup>[14]</sup>. Unfortunately, due to the relatively weak primary care system, the workloads of medical doctors in public hospitals have remained high <sup>[15]</sup>. In China, patients enjoy the freedom to bypass primary care in seeking hospital services <sup>[16]</sup>. The daily average outpatient visits to a public hospital physician reached 7.5 in 2018 <sup>[14]</sup>. There is evidence that the high stress level has started to result in serious damages to the health and wellbeing of medical doctors in public hospitals <sup>[17-18]</sup>. In recent years, “Karoshi” (overwork death) of young hospital doctors has attracted extensive reporting in China <sup>[17][19]</sup>. Even more concerning is the deteriorating patient-doctor relationship. Workplace violence against medical doctors has been widely reported <sup>[20-21]</sup>, jeopardising the professional pride and job satisfaction of health workers <sup>[22-23]</sup>, as well as the QWL of medical doctors <sup>[24]</sup>. This study aimed to assess the QWL of medical doctors in public hospitals in China and to identify the sociodemographic characteristics and job factors associated with QWL.

**Methods**

A cross-sectional survey of medical doctors in public hospitals was conducted. Ethics approval was granted by the Research Ethics Committee of Tongji Medical College, Huazhong University of Science and Technology (No: IORG0003571).

**Participants and sampling**

A multi-stage stratified sampling strategy was adopted to select study participants. Six provinces were purposely identified considering a balance of geographic location and economic development: Shandong and Hebei from the east (most developed), Hubei and Hunan from the central (less developed), Guizhou and Qinghai from the west (least developed). In each selected province, four tertiary hospitals in metropolitan areas and four county hospitals in rural areas were conveniently selected. In total, 48 hospitals participated in this study: 24 urban tertiary and 24 rural county hospitals. All of these were government-owned public hospitals. All medical doctors employed by the participating hospitals were eligible for this study.

**Patient involvement**

Data were collected from medical doctors in public hospitals in China. There was no direct patient

involvement.

## Measurements

The questionnaire, which contains two sections, was designed by the research team in the Chinese language. The first section collected the socio-demographic characteristics and work experience data of the study participants. The second section measured QWL.

### *Quality of working life (QWL)*

Complex interactions exist between working and personal lives <sup>[25]</sup>. Several scales have been developed to disentangle working life from personal life <sup>[25][26-28]</sup>. They tend to measure working life from the perspectives of employee engagement, control at work, home-work interface, general well-being, job and career satisfaction, working conditions, and stress at work. Arguably, QWL is a highly contextualised concept <sup>[29]</sup>. This study adopted the QWL-7-32 scale, a scale that was developed in reference to the existing scales but was adapted to the specific context of China <sup>[30-31]</sup>. It defines quality of working life as “*the physical and mental effects of occupation on workers and their feelings on occupation*”. The QWL-7-32 contains 32 items measuring seven domains of QWL, namely physical health (8 items), mental health (5 items), job and career satisfaction (8 items), work passion and initiative (4 items), professional pride (3 items), professional competence (2 items), and balance between work and family (2 items). Each item was rated on a five-point Likert scale, with a higher score indicating higher QWL. A summed score was calculated for the entire QWL scale and its seven domains, respectively. The reliability of the scale was tested in 248 medical doctors conveniently selected from two urban tertiary hospitals and two county hospitals. The Cronbach’s alpha coefficients indicate acceptable internal consistency for the scale and its seven domains (Table 1).

**Table 1. Cronbach’s alpha coefficients of the QWL-7-32 scale (n=248)**

Domain	Number of items	Score range	Cronbach’s alpha
Physical health	8	8-40	0.869
Mental health	5	5-25	0.876
Job and career satisfaction	8	8-40	0.922
Work passion and initiative	4	4-20	0.670
Professional pride	3	3-15	0.780
Professional competence	2	2-10	0.800
Balance between work and family	2	2-10	0.746

Overall QWL	32	32-160	0.950
-------------	----	--------	-------

*Sociodemographic characteristics and work experience*

The selection of the variables measuring sociodemographic characteristics and work experience was guided by the existing literature. QWL is associated with both intrinsic and extrinsic factors [32-34]. In this study, the sociodemographic characteristics of the study participants (including gender, age and marital status) reflected the intrinsic factors associated with QWL. Work-related extrinsic factors measured in this study included salary, professional title, workload, night sleep deprivation, and experience of violence against health workers. Empirical evidence shows that low income is associated with low employee satisfaction [35]. A high workload is usually blamed for driving the deterioration of QWL [2][31]. Professional title is deemed as a proxy indicator of career success. Workplace violence against health workers has become a serious issue of concern in the hospital sector over the past few years in China [20-21], which has a profound impact on the QWL of health workers. We also considered regional variations and urban-rural differences in QWL, a common theme studied in health services research [36].

**Data collection**

Data were collected from January to November 2018. Trained investigators visited each participating hospital, inviting the medical doctors who were working at the time to self-complete a paper questionnaire. Participation in the survey was anonymous and voluntary. Respondents provided their implied informed consent prior to commencement of the survey. They were allowed to skip questions with which they felt uncomfortable.

A sample size of 2500 would enable us to detect an effect size of less than 0.01 for a multivariate linear regression analysis containing 20 predictors, with an  $\alpha$  error being set at 0.05 and a statistical power being set at 0.80 [37]. Considering that missing data commonly occur in questionnaire surveys, we collected at least 80 questionnaires in each urban tertiary hospital and 60 in each county hospital. A total of 3360 questionnaires were dispatched and 3170 (94.35%) were returned. This resulted in a final sample of 2915 (86.76%) containing no missing data for data analyses. The pilot sample was not included in the final data analysis.

**Data analysis**

Data were entered into EpiData 3.0 and analysed using SPSS 19.0. In all of the analyses, a two-sided



*p* value of less than 0.05 was deemed statistically significant.

Frequency distributions in different categories of the sociodemographic characteristics and work experience of the study participants were described and compared between urban and rural and across regions using Chi-square tests.

Means and standard deviations of the QWL (including its seven domains) scores were calculated. Differences in the QWL scores among the study participants with different characteristics were tested through ANOVA tests. Multivariate linear regression models were established with an Enter approach involving all of the independent variables with a statistical significance in the univariate analyses to identify the sociodemographic and work-related predictors of QWL after adjustment for variations in other variables.

## Results

### Sociodemographic characteristics and work experience

The majority of respondents were male (53.2%) and aged between 30 and 45 years (61.0%). Most (76.7%) were married at the time of the survey. Only 17.9% had been awarded a senior professional title, while 46.9% had a junior title. About 48% of respondents had a monthly basic salary of less than 5,000 Yuan (US\$ 785), compared with 40.9% earning 5,000-8,000 Yuan (US\$ 785-1255) and 11.2% earning more than 8,000 Yuan (US\$ 1255).

The vast majority (88.9%) of respondents reported working more than 40 hours a week. The weekly workload of 35.3% of respondents exceeded 60 hours. Night sleep deprivation was frequent in 59.9% of respondents. Over 68% of respondents reported sometimes while 16.6% reported frequent experience of workplace violence from patients and/or their family members (Table 2).

There were significant regional and urban-rural differences in the sociodemographic characteristics and work experience of the study participants. The eastern participants were more likely to be female and married, while the central participants were more likely to report higher than 60-hour weekly workload and more frequent night sleep deprivation, and the western participants were more likely to be younger, had a junior professional title, earned a basic salary in the middle range (5000-8000 Yuan), and reported experience of workplace violence more frequently. Compared with their urban counterparts, the rural participants were more likely to be married, held a lower professional title,

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

reported workplace violence more frequently, and earned lower salary despite reporting a higher workload and more frequent night sleep deprivation (Table 2).

For peer review only

Table 2. Socio-demographic and job-related characteristics of study participants

Characteristics	n (%)	Eastern (n=976)				Central (n=964)				Western (n=975)			
		Urban	Rural	Total	p	Urban	Rural	Total	p	Urban	Rural	Total	p
<b>Gender**</b>													
Male	1550(53.2)	260(48.8)	215(48.5)	475(48.7)	0.939	359(57.6)	219(64.2)	578(60.0)	0.046	314(52.0)	183(49.3)	497(51.0)	0.420
Female	1365(46.8)	273(51.2)	228(51.5)	501(51.3)		264(42.4)	122(35.8)	386(40.0)		290(48.0)	188(50.7)	478(49.0)	
<b>Age (Years)**</b>													
<30	796(27.3)	121(22.7)	81(18.3)	202(20.7)	0.015	162(26.0)	97(28.4)	259(26.9)	0.579	212(35.1)	123(33.2)	335(34.4)	0.181
30-45	1778(61.0)	357(67.0)	291(65.7)	648(66.4)		385(61.8)	199(58.4)	584(60.6)		342(56.6)	204(55.0)	546(56.0)	
>45	341(11.7)	55(10.3)	71(16.0)	126(12.9)		76(12.2)	45(13.2)	121(12.6)		50(8.3)	44(11.9)	94(9.6)	
<b>Marital status*</b>													
Married	2237(76.7)	410(76.9)	368(83.1)	778(79.7)	0.017	462(74.2)	271(79.5)	733(76.0)	0.065	431(71.4)	295(79.5)	726(74.5)	0.005
Not married	678(23.3)	123(23.1)	75(16.9)	198(20.3)		161(25.8)	70(20.5)	231(24.0)		173(28.6)	76(20.5)	249(25.5)	
<b>Professional title**</b>													
Junior or below	1368(46.9)	212(39.8)	171(38.6)	383(39.2)	<0.001	285(45.7)	167(49.0)	452(46.9)	0.310	315(52.2)	218(58.8)	533(54.7)	<0.001
Middle	1024(35.1)	202(37.9)	212(47.9)	414(42.4)		205(32.9)	115(33.7)	320(33.2)		173(28.6)	117(31.5)	290(29.7)	
Senior	523(17.9)	119(22.3)	60(13.5)	179(18.3)		133(21.3)	59(17.3)	192(19.9)		116(19.2)	36(9.7)	152(15.6)	
<b>Monthly basic salary** (Yuan)</b>													
<5000	1395(47.9)	214(40.2)	293(66.1)	507(51.9)	<0.001	306(49.1)	177(51.9)	483(50.1)	<0.001	247(40.9)	158(42.6)	405(41.5)	0.261
5000-8000	1193(40.9)	213(40.0)	141(31.8)	354(36.3)		209(33.5)	144(42.2)	353(36.6)		298(49.3)	188(50.7)	486(49.8)	
>8000	327(11.2)	106(19.9)	9(2.0)	115(11.8)		108(17.3)	20(5.9)	128(13.3)		59(9.8)	25(6.7)	84(8.6)	
<b>Weekly working hours**</b>													
≤40	324(11.1)	87(16.3)	36(8.1)	123(12.6)	<0.001	68(10.9)	10(2.9)	78(8.1)	<0.001	68(11.3)	55(14.8)	123(12.6)	<0.001
41-60	1562(53.6)	295(55.3)	309(69.8)	604(61.9)		324(52.0)	132(38.7)	456(47.3)		345(57.1)	157(42.3)	502(51.5)	
>60	1029(35.3)	151(28.3)	98(22.1)	249(25.5)		231(37.1)	199(58.4)	430(44.6)		191(31.6)	159(42.9)	350(35.9)	
<b>Night sleep deprivation*</b>													
Never	212(7.3)	46(8.6)	32(7.2)	78(8.0)	0.008	55(8.8)	18(5.3)	73(7.6)	<0.001	41(6.8)	20(5.4)	61(6.3)	0.603
Sometimes	957(32.8)	206(38.6)	134(30.2)	340(34.8)		223(35.8)	62(18.2)	285(29.6)		208(34.4)	124(33.4)	332(34.1)	
Frequent	1746(59.9)	281(52.7)	277(62.5)	558(57.2)		345(55.4)	261(76.5)	606(62.9)		355(58.8)	227(61.2)	582(59.7)	
<b>Workplace violence**</b>													
Never	427(14.6)	108(20.3)	72(16.3)	180(18.4)	0.117	119(19.1)	25(7.3)	144(14.9)	<0.001	70(11.6)	33(8.9)	103(10.6)	<0.001
Sometimes	2003(68.7)	368(69.0)	309(69.8)	677(69.4)		421(67.6)	237(69.5)	658(68.3)		432(71.5)	236(63.6)	668(68.5)	
Frequent	485(16.6)	57(10.7)	62(14.0)	119(12.2)		83(13.3)	79(23.2)	162(16.8)		102(16.9)	102(27.5)	204(20.9)	

Note: \*  $p < 0.05$  and \*\*  $p < 0.001$  for regional differences.

**Quality of working life**

On average, the respondents reported a QWL score of 92.51 (SD=17.74) of a highest possible 160: 22.68±4.56 for physical health; 13.71±4.09 for mental health; 22.30±6.16 for job and career satisfaction; 13.10±2.74 for work passion and initiative; 9.24±2.32 for professional pride; 6.66±1.42 for professional competence; and 4.82±1.65 for balance between work and family, respectively (Table 3).

Overall, the respondents from rural hospitals in the central region and those who were aged between 30 and 45 years and married, held a middle professional title, earned a lower income, worked longer hours, experienced more frequent night sleep deprivation, and encountered more frequent workplace violence reported lower QWL than others ( $p<0.05$ ): although urban-rural location was not associated with professional pride ( $p=0.090$ ) and professional competence ( $p=0.345$ ); marital status was not associated with work passion and initiative ( $p=0.388$ ) and professional pride ( $p=0.473$ ); professional title was not associated with job and career satisfaction ( $p=0.139$ ) and work passion and initiative ( $p=0.661$ ); and salary was not associated with work passion and initiative ( $p=0.878$ ). The male respondents had lower job and career satisfaction ( $p=0.005$ ) and work passion and initiative ( $p<0.001$ ), despite reporting higher professional competence ( $p<0.001$ ) than their female counterparts (Table 3).

Table 3. Sociodemographic and job-related characteristics associated with quality of working life

Characteristics	n (%)	Quality of Working Life		Physical health		Mental health		Job and career satisfaction		Work passion and initiative		Professional pride		Professional competence		Balance between work and family	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
<b>Urban or Rural</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.003</b>		<b>P&lt;0.002</b>		<b>P&lt;0.003</b>		P=0.090		P=0.345		<b>P&lt;0.001</b>	
Urban	1760(60.4)	93.39	17.40	23.05	4.51	13.89	4.03	22.58	6.08	12.97	2.68	9.30	2.25	6.68	1.41	4.92	1.64
Rural	1155(39.6)	91.16	18.16	22.13	4.58	13.43	4.17	21.86	6.26	13.28	2.81	9.15	2.41	6.63	1.45	4.67	1.67
<b>Gender</b>		P=0.058		P=0.998		P=0.073		<b>P&lt;0.005</b>		<b>P&lt;0.001</b>		P=0.339		<b>P&lt;0.001</b>		P=0.251	
Male	1550(53.2)	91.92	18.47	22.68	4.72	13.58	4.10	21.99	6.35	12.92	2.82	9.20	2.50	6.76	1.49	4.79	1.69
Female	1365(46.8)	93.17	16.85	22.68	4.37	13.85	4.08	22.64	5.92	13.30	2.62	9.28	2.10	6.56	1.34	4.86	1.60
<b>Age (Years)</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>	
<30	796(27.3)	94.55	17.54	23.36	4.66	14.41	4.04	22.87	5.97	13.21	2.61	9.33	2.20	6.41	1.35	4.97	1.63
30-45	1778(61.0)	91.16	17.59	22.37	4.42	13.40	4.03	21.94	6.16	12.97	2.76	9.11	2.31	6.67	1.40	4.70	1.65
>45	341(11.7)	94.76	18.31	22.75	4.87	13.65	4.33	22.79	6.47	13.51	2.85	9.71	2.56	7.21	1.56	5.14	1.67
<b>Marital status</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		P=0.388		P=0.473		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>	
Married	2237(76.7)	91.74	17.69	22.41	4.49	13.48	4.06	22.06	6.19	13.07	2.78	9.22	2.37	6.75	1.44	4.76	1.65
Not married	678(23.3)	95.03	17.68	23.59	4.67	14.46	4.10	23.08	5.99	13.18	2.58	9.30	2.13	6.38	1.34	5.04	1.64
<b>Professional title</b>		<b>P&lt;0.027</b>		<b>P&lt;0.006</b>		<b>P&lt;0.001</b>		P=0.139		P=0.661		<b>P&lt;0.016</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>	
Junior or below	1368(46.9)	92.96	17.42	22.90	4.61	14.00	4.08	22.50	6.00	13.09	2.59	9.19	2.22	6.42	1.34	4.86	1.64
Middle	1024(35.1)	91.35	17.77	22.32	4.38	13.35	4.05	22.00	6.18	13.05	2.82	9.17	2.33	6.79	1.41	4.66	1.64
Senior	523(17.9)	93.60	18.41	22.82	4.74	13.63	4.16	22.35	6.52	13.19	2.93	9.50	2.53	7.05	1.52	5.06	1.67
<b>Monthly basic salary (Yuan)</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		P=0.878		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>	
<5000	1395(47.9)	91.22	18.32	22.37	4.77	13.59	4.25	21.86	6.23	13.07	2.76	9.07	2.34	6.52	1.44	4.74	1.68
5000-8000	1193(40.9)	92.56	17.19	22.63	4.35	13.60	3.94	22.34	6.15	13.12	2.75	9.30	2.30	6.78	1.39	4.78	1.61
>8000	327(11.2)	97.82	16.14	24.20	4.06	14.61	3.84	23.99	5.57	13.11	2.58	9.73	2.21	6.84	1.41	5.33	1.61
<b>Region</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>	
Eastern	976(33.5)	96.21	17.43	23.32	4.40	14.24	4.04	23.52	6.05	13.47	2.82	9.78	2.20	6.83	1.43	5.05	1.60
Central	964(33.1)	91.47	17.76	22.76	4.57	13.64	4.09	21.68	6.31	13.01	2.65	9.00	2.32	6.66	1.41	4.72	1.64
Western	975(33.4)	89.82	17.42	21.98	4.60	13.24	4.09	21.68	5.94	12.80	2.69	8.94	2.34	6.50	1.40	4.69	1.69
<b>Weekly working hours</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.010</b>		<b>P&lt;0.001</b>	
≤40	324(11.1)	101.65	16.88	25.06	4.36	15.44	3.90	25.08	5.56	13.60	2.55	9.75	2.34	6.82	1.39	5.90	1.36
41-60	1562(53.6)	94.81	16.73	23.28	4.21	14.16	3.91	22.95	6.03	13.30	2.68	9.39	2.24	6.70	1.37	5.04	1.56
>60	1029(35.3)	86.13	17.39	21.03	4.58	12.47	4.09	20.42	6.01	12.63	2.82	8.86	2.38	6.57	1.50	4.16	1.61
<b>Night sleep deprivation</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>	
Never	212(7.3)	107.63	18.27	26.49	4.80	16.45	4.32	26.67	6.20	14.49	2.79	10.35	2.42	7.07	1.53	6.11	1.62
Sometimes	957(32.8)	98.65	15.34	24.38	3.77	15.00	3.68	24.14	5.57	13.42	2.54	9.55	2.14	6.71	1.34	5.45	1.45
Frequent	1746(59.9)	87.30	16.75	21.29	4.34	12.66	3.92	20.75	5.93	12.75	2.76	8.94	2.34	6.59	1.44	4.32	1.55
<b>Workplace violence</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>		<b>P&lt;0.001</b>	
Never	427(14.6)	105.76	17.46	25.79	4.39	16.27	4.11	26.45	5.97	14.22	2.73	10.21	2.30	6.94	1.50	5.88	1.56
Sometimes	2003(68.7)	92.74	15.55	22.77	4.06	13.75	3.73	22.31	5.67	13.16	2.57	9.28	2.17	6.67	1.34	4.80	1.53
Frequent	485(16.6)	79.88	17.64	19.60	4.66	11.26	4.08	18.59	5.91	11.83	2.92	8.23	2.53	6.39	1.61	3.98	1.70
<b>Total</b>	2915 (100)	92.51	17.74	22.68	4.56	13.71	4.09	22.30	6.16	13.10	2.74	9.24	2.32	6.66	1.42	4.82	1.65

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

The multivariate regression models confirmed that eastern region, less frequent night sleep deprivation, and less frequent encounters of workplace violence were significant predictors of higher QWL across all of the seven domains after adjustment for variations of other variables. Urban location remained a significant predictor of lower work passion and initiative. Male gender was a significant predictor of higher physical health and professional competence, but lower work passion and initiative. A younger age was associated with higher physical health and mental health, and higher professional pride, but lower professional competence. Those who were married had lower physical health but higher professional competency than those who were unmarried. A junior professional title was associated with higher job and career satisfaction, but lower professional competency. Lower income was associated with lower QWL, but the effects were not statistically significant for work passion and initiative, and professional competency. Less working hours was associated with higher QWL, but the effects were not statistically significant for work passion and initiative, professional pride, and professional competence (Table 4).

Table 4. Results (Beta coefficients) of multivariate linear regression models on quality of working life

Predictor	Standardised Beta Coefficients							
	Quality of Working Life	Physical health	Mental health	Job and career satisfaction	Work passion and initiative	Professional pride	Professional competence	Balance between work and family
<b>Urban or Rural</b>								
Urban(ref.)								
Rural	0.471(-0.702, 1.644)	-0.123(-0.426, 0.180)	0.120(-0.165, 0.405)	0.070(-0.356, 0.496)	0.462*** (0.260, 0.665)	-0.014(-0.185, 0.157)	-0.043(-0.151, 0.064)	0.001(-0.112, 0.112)
<b>Gender</b>								
Male (ref.)								
Female	0.126(-0.994, 1.246)	-0.294*(-0.582, -0.005)	0.024(-0.248, 0.296)	0.291(-0.116, 0.697)	0.296** (0.103, 0.489)	0.014(-0.149, 0.178)	-0.174**(-0.276, -0.072)	-0.032(-0.139, 0.075)
<b>Age (Years)</b>								
<30 (ref.)								
30-45	-1.012(-2.809, 0.785)	-0.220(-0.684, 0.244)	-0.366(-0.803, 0.070)	-0.080(-0.732, 0.573)	-0.071(-0.381, 0.239)	-0.286*(-0.548, -0.024)	-0.028(-0.192, 0.136)	0.039(-0.133, 0.210)
>45	-0.404(-3.118, 2.311)	-0.757*(-1.457, -0.056)	-0.671*(-1.331, -0.012)	0.191(-0.795, 1.176)	0.326(-0.143, 0.794)	0.095(-0.301, 0.491)	0.329** (0.081, 0.577)	0.084(-0.175, 0.343)
<b>Marital status</b>								
Married (ref.)								
Not married	1.040(-0.664, 2.745)	0.578* (0.138, 1.018)	0.282(-0.132, 0.696)	0.381(-0.238, 0.999)	-0.064(-0.359, 0.230)	-0.088(-0.333, 0.160)	-0.206**(-0.361, -0.050)	0.158(-0.005, 0.321)
<b>Professional title</b>								
Junior or below(ref.)								
Middle	-1.240(-2.758, 0.278)	-0.362(-0.753, 0.030)	-0.391*(-0.760, -0.022)	-0.534(-1.085, 0.017)	-0.028(-0.290, 0.234)	-0.053(-0.274, 0.169)	0.269*** (0.131, 0.408)	-0.142(-0.287, 0.003)
Senior	-1.288(-3.403, 0.828)	-0.333(-0.879, 0.213)	-0.402(-0.916, 0.113)	-0.961*(-1.729, -0.193)	0.006(-0.359, 0.371)	-0.001(-0.309, 0.308)	0.366*** (0.173, 0.559)	0.037(-0.165, 0.239)
<b>Monthly basic salary (Yuan)</b>								
<5000 (ref.)								
8000-12000	2.795*** (1.482, 4.107)	0.736*** (0.397, 1.075)	0.459** (0.139, 0.778)	0.989*** (0.512, 1.465)	0.108(-0.118, 0.335)	0.333** (0.143, 0.524)	0.081(-0.038, 0.201)	0.089(-0.037, 0.214)
>8000	4.372*** (2.283, 6.461)	1.361*** (0.822, 1.900)	0.842** (0.334, 1.350)	1.715*** (0.957, 2.473)	-0.163(-0.523, 0.198)	0.462** (0.153, 0.766)	-0.094(-0.284, 0.097)	0.248* (0.049, 0.448)
<b>Region</b>								
Eastern(ref.)								
Central	-2.887*** (-4.270, -1.503)	-0.149(-0.506, 0.208)	-0.249(-0.585, 0.088)	-1.285*** (-1.788, -0.783)	-0.222(-0.460, 0.017)	-0.702*** (-0.998, -0.500)	-0.142*(-0.269, -0.016)	-0.137*(-0.269, -0.005)
Western	-4.710*** (-6.110, -3.309)	-1.007*** (-1.369, -0.646)	-0.730*** (-1.070, -0.389)	-1.350*** (-1.859, -0.842)	-0.426** (-0.667, -0.184)	-0.743*** (-0.998, -0.539)	-0.245*** (-0.372, -0.117)	-0.209** (-0.342, -0.075)
<b>Weekly working hours</b>								
≤40 (ref.)								
41-60	-2.638** (-4.507, -0.770)	-0.748** (-1.230, -0.266)	-0.516* (-0.971, -0.062)	-0.841* (-1.519, -0.162)	0.028(-0.294, 0.351)	-0.046(-0.318, 0.226)	-0.006(-0.176, 0.165)	-0.510*** (-0.688, -0.332)
>60	-6.478*** (-8.551, -4.406)	-1.893*** (-2.428, -1.358)	-1.332*** (-1.836, -0.828)	-1.849*** (-2.602, -1.097)	-0.241(-0.598, 0.117)	-0.147(-0.448, 0.155)	-0.006(-0.195, 0.183)	-1.011*** (-1.209, -0.813)
<b>Night sleep deprivation</b>								
Never (ref.)								
Sometimes	-5.366*** (-7.678, -3.053)	-1.246*** (-1.842, -0.649)	-0.713* (-1.275, -0.151)	-1.425** (-2.265, -0.586)	-0.763*** (-1.162, -0.364)	-0.570** (-0.998, -0.233)	-0.343** (-0.554, -0.132)	-0.306** (-0.527, -0.085)
Frequent	-12.616*** (-14.956, -10.276)	-3.319*** (-3.923, -2.716)	-2.281*** (-2.850, -1.712)	-3.579*** (-4.429, -2.730)	-1.130*** (-1.534, -0.727)	-0.873*** (-1.278, -0.532)	-0.382*** (-0.596, -0.169)	-1.050*** (-1.273, -0.827)
<b>Workplace violence</b>								
Never (ref.)								
Sometimes	-9.267*** (-10.907, -7.627)	-1.908*** (-2.332, -1.485)	-1.720*** (-2.119, -1.321)	-3.063*** (-3.659, -2.468)	-0.880*** (-1.163, -0.597)	-0.705*** (-0.998, -0.465)	-0.275*** (-0.425, -0.125)	-0.716*** (-0.873, -0.560)
Frequent	-18.975*** (-21.075, -16.874)	-4.180*** (-4.722, -3.638)	-3.582*** (-4.092, -3.071)	-5.828*** (-6.591, -5.066)	-2.070*** (-2.433, -1.708)	-1.544*** (-1.898, -1.238)	-0.535*** (-0.727, -0.344)	-1.235*** (-1.436, -1.034)

Note: \*p&lt;0.05; \*\*p&lt;0.01; \*\*\*p&lt;0.001

Discussion

The study participants reported an overall QWL score of 92.51 (SD=17.74) of a highest possible 160. This level of QWL is low in comparison with the findings of studies conducted in some non-health industries such as primary and secondary school teachers [38] and oil-drilling workers [39-40]. Although medical practice requires high levels of work commitment, it is usually considered a respectful and highly rewarding job [41]. However, medical practice also involves high levels of patient safety risk, especially in under-resourced facilities [42]. Patients often hold very high expectations due to the high expense of medical services. The respectful doctor-patient relationship can be jeopardised when things do not go as well as anticipated [43].

We found that long working hours, frequent night sleep deprivation, frequent encounters of medical violence, and low salary are major predictors of low QWL. The respondents from the eastern region also reported higher QWL than their central and western counterparts. These results are consistent with the findings of previous studies [44-52]. Our study showed that exceedingly long working hours were particularly detrimental to the physical health, mental health, job satisfaction, and work-life balance of the study participants. Indeed, long working hours are not uncommon in medical services given the global shortage of a medical workforce, which has been shown to impair the health of medical workers [44-46], leading to depressive symptoms [47], low job satisfaction [48], and the increased risk of job stress [49]. In addition to long working hours, empirical evidence also shows that night sleep deprivation can cause sleep disturbances and fatigue, and increase the risk of serious illness [50] including depression [51]. Frequent night sleep deprivation can even negatively influence the performance of medical doctors as indicated in this study and others [52]. Unfortunately, insufficient sleep is one of the most frequently reported concerns of medical doctors in China [53]. The problems resulting from high workloads and disruptions to daily routine can be further exacerbated by low financial rewards. Compared with medical practitioners in many other countries, doctors in China earn a much lower level of income.

Unsurprisingly, frequent encounters of workplace violence emerged as a significant predictor of low QWL of medical doctors across all of the seven domains in this study. Over the past few years, China has witnessed increasing reports of incidence of violence against health workers, raising serious questions about the patient-provider relationship [54-57]. The deteriorating practice environment has led to the increased intention of health workers to leave the industry [58]. In this study, 16.6% of



respondents reported frequent encounters with medical violence, compared with 68.7% reporting sometimes and 14.6% never. In China, most county hospitals are classified as secondary hospitals. They have suffered the most in patient-provider conflicts compared with their tertiary and primary care counterparts<sup>[59-60]</sup>. However, rural medical workers seem to have maintained a relatively higher work passion and initiative than their urban counterparts according to the findings of our study. It is likely that both health workers and patients may hold a relatively lower expectation of the medical services delivered in rural settings than those delivered in urban settings<sup>[61]</sup>. In recent years, the urban-rural disparities in medical resources<sup>[62]</sup> and healthcare services<sup>[63]</sup> in China have started to narrow.

The regional differences of QWL revealed in this study are perhaps a reflection of the widespread issue of regional disparity in China. The relatively more developed eastern region has more financial resources and invests more in health than the less developed central and western regions<sup>[64-66]</sup>. As a result, medical doctors in the eastern region experience a better working environment, thus reporting higher QWL.

China is facing serious challenges in maintaining a healthy and sustainable health workforce. Healthcare demands have increased dramatically with the rapid economic growth and ageing population over the past few decades<sup>[67-69]</sup>. This has imposed a great burden on the health care delivery system, further exacerbating the challenge of the health workforce shortage. The long working hours (35.3% reporting >60 hours per week), coupled with frequent night sleep deprivation (60%) and low salary (less than 12% earning >US \$1255 per month) present a significant risk for occupational health and safety as indicated by the findings of this study. Low QWL not only affects the health and wellbeing of medical workers<sup>[70]</sup>, it can also affect their competency and work performance<sup>[5]</sup>. This can become a serious risk of patient safety and quality of care<sup>[71]</sup>.

It is unlikely that the aforementioned occupational health and safety risks can be addressed without taking a systems approach. China has recently launched a series of health system reforms, aiming at improving health care accessibility and affordability by containing hospital costs and encouraging patients to seek medical care in primary care<sup>[16][72]</sup>. The central government has increased its investment in rural health development, in particular in the least developed western region. Strengthening law enforcement was also proposed to deal with workplace violence. These measures, though necessary, may not be enough to address the low QWL issue experienced by medical doctors.

Although the cost containment measures may be welcomed by patients, they may hinder the potential salary growth of health workers. Increasing policy attentions need to be paid to sustainable workload, proper financial and professional rewards, and the work-life balance of medical workers. While growing the health workforce is fundamental for a long-term solution, urgent efforts should be made to foster a safe working environment where health workers and patients can work in partnership.

*Strengths and limitations*

The sample size of this study is large. Data were collected through field visits, which ensured a high response rate. However, such an approach cannot catch those who were not working at the time of the survey. The data were also subject to recall and self-reporting bias. The study adopted a cross-sectional design and no causal relationships should be assumed.

**Conclusion**

The low QWL of medical doctors working in public hospitals in China is evident, which is associated with long working hours, frequent night sleep deprivations, frequent encounters of workplace violence, and low salary. There are also significant regional differences in the QWL of medical doctors, with the eastern developed region featuring better QWL. Adequate resource support and a safe working environment are critical for ensuring a sustainable healthy medical workforce, which requires a systems approach.

**Conflict of interests:** The authors declare no conflicts of interest.

**Authors' contributions:** CT, CG and CL performed the literature review, designed the project, and drafted the article. CT and CG participated in the data collection and data analyses. All authors have read and approved the final article.

**Acknowledgements:** We would like to thank our colleagues who facilitated the field visits and data collection and all of the participating hospitals and study participants.

**Funding:** This study was funded by the National Natural Science Foundation of China (No. 71603077).

**Patient consent:** None required.

**Ethics approval:** Ethics approval was granted by the Research Ethics Committee of Tongji Medical College, Huazhong University of Science and Technology (No: IORG0003571).

**Data sharing statement:** The data relevant to this manuscript are available from the corresponding authors on reasonable request.

## References

- 1 T Moradi, F Maghaminejad, I Azizi-Fini. Quality of working life of nurses and its related factors. *Nurs Midwifery Stud* 2014;3(2):e19450.
- 2 AM Mosadeghrad, E Ferlie, D Rosenberg. A study of relationship between job stress, quality of working life and turnover intention among hospital employees. *Health Serv Manage Res* 2011;24(4):170-81.
- 3 H Li, Z Liu, R Liu, L Li, A Lin. The relationship between work stress and work ability among power supply workers in Guangdong, China: a cross-sectional study. *Bmc Public Health* 2016;16:123.
- 4 M Abbasi, A Zakerian, A Akbarzade, et al. Investigation of the Relationship between Work Ability and Work-related Quality of Life in Nurses. *Iran J Public Health* 2017;46(10):1404-12.
- 5 M Rastegari, A Khani, P Ghalriz, J Eslamian. Evaluation of quality of working life and its association with job performance of the nurses. *Iran J Nurs Midwifery Res* 2010;15(4):224-28.
- 6 M de Jong, AG de Boer, SJ Tamminga, MH Frings-Dresen. Quality of working life issues of employees with a chronic physical disease: a systematic review. *J Occup Rehabil* 2015;25(1):182-96.
- 7 AM Mosadeghrad. Quality of working life: an antecedent to employee turnover intention. *Int J Health Policy Manag* 2013;1(1):43-50.
- 8 GI Skoufi, GA Lialios, S Papakosta, et al. Shift Work and Quality of Personal, Professional, and Family Life among Health Care Workers in a Rehabilitation Center in Greece. *Indian J Occup Environ Med* 2017;21(3):115-20.
- 9 P Raeissi, MR Rajabi, E Ahmadizadeh, K Rajabkhah, E Kakemam. Quality of work life and factors associated with it among nurses in public hospitals, Iran. *J Egypt Public Health Assoc* 2019;94(1):25.
- 10 Z Chegini, JM Asghari, E Kakemam. Occupational stress, quality of working life and turnover intention amongst nurses. *Nurs Crit Care* 2019;24(5):283-89.
- 11 C Liu, T Bartram, SG Leggat. Link of Patient Care Outcome to Occupational Differences in Response to Human Resource Management: A Cross-Sectional Comparative Study on Hospital Doctors and Nurses in China. *Int J Environ Res Public Health* 2020;17(12).
- 12 Y Qiu, Q Wu, R Chen, C Guan. Research on psychological stress and mental health of medical staff in COVID-19 prevention and control. *Int J Disaster Risk Reduct* 2021;65:102524.
- 13 M Zhang, M Zhou, F Tang, et al. Knowledge, attitude, and practice regarding COVID-19 among healthcare workers in Henan, China. *J Hosp Infect* 2020;105(2):183-87.
- 14 NH Commission. China Health Statistics Yearbook 2019: Peking Union Medical College 2019.
- 15 Y Hu, Z Zhang. Skilled doctors in tertiary hospitals are already overworked in China. *Lancet Glob Health* 2015;3(12):e737.
- 16 C Tang, Z Luo, P Fang, F Zhang. Do patients choose community health services (CHS) for first treatment in China? Results from a community health survey in urban areas. *J Community Health* 2013;38(5):864-72.
- 17 M Storman, D Storman, J Maciag. Quality of work-life among young medical doctors in Poland. *Int J Occup Saf Ergon* 2021:1-07.

18 J Ding, Y Jia, J Zhao, et al. Optimizing quality of life among Chinese physicians: the positive effects of resilience and recovery experience. *Qual Life Res* 2020;29(6):1655-63.

19 HP Shan, XH Yang, XL Zhan, et al. Overwork is a silent killer of Chinese doctors: a review of Karoshi in China 2013-2015. *Public Health* 2017;147:98-100.

20 AJ He, J Qian. Explaining medical disputes in Chinese public hospitals: the doctor-patient relationship and its implications for health policy reforms. *Health Econ Policy Law* 2016;11(4):359-78.

21 SZ Yang, D Wu, N Wang, et al. Workplace violence and its aftermath in China's health sector: implications from a cross-sectional survey across three tiers of the health system. *Bmj Open* 2019;9(9):e31513.

22 A Kumari, T Kaur, P Ranjan, et al. Workplace violence against doctors: Characteristics, risk factors, and mitigation strategies. *J Postgrad Med* 2020;66(3):149-54.

23 T Cheung, PH Lee, P Yip. The association between workplace violence and physicians' and nurses' job satisfaction in Macau. *Plos One* 2018;13(12):e207577.

24 EC Tan, DR Chen. Second victim: Malpractice disputes and quality of life among primary care physicians. *J Formos Med Assoc* 2019;118(2):619-27.

25 MH Zubair, LR Hussain, KN Williams, KJ Grannan. Work-Related Quality of Life of US General Surgery Residents: Is It Really so Bad? *J Surg Educ* 2017;74(6):e138-46.

26 P Sirisawasd, N Chaiear, NP Johns, J Khiewyoo. Validation of the Thai Version of a Work-related Quality of Life Scale in the Nursing Profession. *Saf Health Work* 2014;5(2):80-85.

27 X Zeng, N Chaiear, P Klainin, et al. Work-related quality of life scale among Singaporean nurses. *Asian Biomed* 2011;5(4):467-74.

28 S Lin, N Chaiear, J Khiewyoo, B Wu, NP Johns. Preliminary psychometric properties of the chinese version of the work-related quality of life scale-2 in the nursing profession. *Saf Health Work* 2013;4(1):37-45.

29 B Nowrouzi, E Giddens, B Gohar, et al. The quality of work life of registered nurses in Canada and the United States: a comprehensive literature review. *Int J Occup Environ Health* 2016;22(4):341-58.

30 Q Zhang, YQ Xie, YJ Lan. [Development of a quality of working life scale (QWL7-32)]. *Sichuan Da Xue Xue Bao Yi Xue Ban* 2013;44(6):957-61.

31 Y Zhang, XL Liu, TD Wei, YJ Lan. [Relationship of job stress with job burnout and quality of work life in workers for offshore oil platforms]. *Zhonghua Lao Dong Wei Sheng Zhi Ye Bing Za Zhi* 2017;35(3):198-202.

32 JA Parise, ZA Soler. Quality of working life of call-center workers. *Rev Bras Enferm* 2016;69(4):751-56.

33 B Nowrouzi, N Lightfoot, M Lariviere, et al. Occupational Stress Management and Burnout Interventions in Nursing and Their Implications for Healthy Work Environments: A Literature Review. *Workplace Health Saf* 2015;63(7):308-15.

34 B Nowrouzi, E Giddens, B Gohar, et al. The quality of work life of registered nurses in Canada and the United States: a comprehensive literature review. *Int J Occup Environ Health* 2016;22(4):341-58.

35 X Chen, M Liu, C Liu, et al. Job Satisfaction and Hospital Performance Rated by Physicians in China: A Moderated Mediation Analysis on the Role of Income and Person-Organization Fit. *Int J Environ Res Public Health* 2020;17(16).

36 J Hou, Y Ke. Addressing the shortage of health professionals in rural China: issues and progress

- Comment on "Have health human resources become more equal between rural and urban areas after the new reform?". *Int J Health Policy Manag* 2015;4(5):327-28.
- 37 F Faul, E Erdfelder, A Buchner, AG Lang. Statistical power analyses using G\*Power 3.1: tests for correlation and regression analyses. *Behav Res Methods* 2009;41(4):1149-60.
  - 38 Z Jian, Z Shu-shan, L Ya-jia, L Jian. Analysis on quality of working life and its influencing factors among medi-cal workers in 3 A grade hospital. *JOURNAL OF NORTH SICHUAN MEDICAL COLLEGE* 2016;31(1):112-15.
  - 39 M Jing-feng, L Ya-jia, C Xi-ning, et al. Analysis on the Influencing Factors of Quality of Working Life among oil-drilling workers. *Modern Preventive Medicine* 2011;38(2):211-14.
  - 40 Y Zhang, XL Liu, TD Wei, YJ Lan. [Relationship of job stress with job burnout and quality of work life in workers for offshore oil platforms]. *Zhonghua Lao Dong Wei Sheng Zhi Ye Bing Za Zhi* 2017;35(3):198-202.
  - 41 C Liu, T Bartram, SG Leggat. Link of Patient Care Outcome to Occupational Differences in Response to Human Resource Management: A Cross-Sectional Comparative Study on Hospital Doctors and Nurses in China. *Int J Environ Res Public Health* 2020;17(12).
  - 42 C Liu, W Liu, Y Wang, Z Zhang, P Wang. Patient safety culture in China: a case study in an outpatient setting in Beijing. *Bmj Qual Saf* 2014;23(7):556-64.
  - 43 S Tao, C Liu, Q Wu, et al. Developing a scale measuring the doctor-patient relationship in China from the perspective of doctors. *Fam Pract* 2022;39(3):527-36.
  - 44 VH Bernstrom. Long working hours and sickness absence-a fixed effects design. *Bmc Public Health* 2018;18(1):578.
  - 45 M Kivimaki, ST Nyberg, GD Batty, I Madsen, AG Tabak. Long Working Hours and Risk of Venous Thromboembolism. *Epidemiology* 2018;29(5):e42-44.
  - 46 KS Shin, YK Chung, YJ Kwon, JS Son, SH Lee. The effect of long working hours on cerebrovascular and cardiovascular disease; A case-crossover study. *Am J Ind Med* 2017;60(9):753-61.
  - 47 R Ogawa, E Seo, T Maeno, et al. The relationship between long working hours and depression among first-year residents in Japan. *Bmc Med Educ* 2018;18(1):50.
  - 48 A Nakata. Long working hours, job satisfaction, and depressive symptoms: a community-based cross-sectional study among Japanese employees in small- and medium-scale businesses. *Oncotarget* 2017;8(32):53041-52.
  - 49 Z Li, JM Dai, D Zhang, et al. [Association between Long Working Hours and Job Stress and Depression among Employees from a State Grid Company]. *Zhonghua Lao Dong Wei Sheng Zhi Ye Bing Za Zhi* 2018;36(4):271-74.
  - 50 PJ Stryjewski, A Kuczaj, D Domal-Kwiatkowska, U Mazurek, E Nowalany-Kozielska. [Night work and shift work - effects on the health of workers]. *Przegl Lek* 2016;73(7):513-15.
  - 51 P Angerer, R Schmook, I Elfantel, J Li. Night Work and the Risk of Depression. *Dtsch Arztebl Int* 2017;114(24):404-11.
  - 52 OA Meretoja. We should work less at night. *Acta Anaesthesiol Scand* 2009;53(3):277-79.
  - 53 Y Wu, F Jiang, S Wu, Y Liu, YL Tang. Sleep duration and satisfaction among physicians in tertiary public hospitals in China: a large sample national survey. *J Occup Med Toxicol* 2021;16(1):8.
  - 54 Y Gan, L Li, H Jiang, et al. Prevalence and Risk Factors Associated With Workplace Violence Against General Practitioners in Hubei, China. *Am J Public Health* 2018;108(9):1223-26.
  - 55 P Li, K Xing, H Qiao, et al. Psychological violence against general practitioners and nurses in Chinese township hospitals: incidence and implications. *Health Qual Life Outcomes* 2018;16(1):117.

56 Y Tian, Y Yue, J Wang, et al. Workplace violence against hospital healthcare workers in China: a national WeChat-based survey. *Bmc Public Health* 2020;20(1):582.

57 G Sui, G Liu, L Jia, L Wang, G Yang. Associations of workplace violence and psychological capital with depressive symptoms and burn-out among doctors in Liaoning, China: a cross-sectional study. *Bmj Open* 2019;9(5):e24186.

58 T Heponiemi, A Kouvonen, M Virtanen, J Vanska, M Elovainio. The prospective effects of workplace violence on physicians' job satisfaction and turnover intentions: the buffering effect of job control. *Bmc Health Serv Res* 2014;14:19.

59 SZ Yang, D Wu, N Wang, et al. Workplace violence and its aftermath in China's health sector: implications from a cross-sectional survey across three tiers of the health system. *Bmj Open* 2019;9(9).

60 Y Tian, Y Yue, J Wang, et al. Workplace violence against hospital healthcare workers in China: a national WeChat-based survey. *Bmc Public Health* 2020;20(1):582.

61 L Shan, Y Li, D Ding, et al. Patient Satisfaction with Hospital Inpatient Care: Effects of Trust, Medical Insurance and Perceived Quality of Care. *Plos One* 2016;11(10):e164366.

62 Y Wang, Y Li, S Qin, et al. The disequilibrium in the distribution of the primary health workforce among eight economic regions and between rural and urban areas in China. *Int J Equity Health* 2020;19(1):28.

63 M Ying, S Wang, C Bai, Y Li. Rural-urban differences in health outcomes, healthcare use, and expenditures among older adults under universal health insurance in China. *Plos One* 2020;15(10):e240194.

64 J Ding, X Hu, X Zhang, et al. Equity and efficiency of medical service systems at the provincial level of China's mainland: a comparative study from 2009 to 2014. *Bmc Public Health* 2018;18(1):214.

65 XF Zhang, XY Tian, YL Cheng, et al. Health disparities among the western, central and eastern rural regions of China after a decade of health promotion and disease prevention programming. *J Huazhong Univ Sci Technolog Med Sci* 2015;35(4):606-14.

66 B Zha. The gap of economic development expanding between eastern China and middle, western China. *China Popul Res Newsl* 1996(1):2-03.

67 GG Liu, SA Vortherms, X Hong. China's Health Reform Update. *Annu Rev Public Health* 2017;38:431-48.

68 EF Fang, M Scheibye-Knudsen, HJ Jahn, et al. A research agenda for aging in China in the 21st century. *Ageing Res Rev* 2015;24(Pt B):197-205.

69 M Paiano, AE Jaques, P Nacamura, et al. Mental health of healthcare professionals in China during the new coronavirus pandemic: an integrative review. *Rev Bras Enferm* 2020;73(suppl 2):e20200338.

70 D Woo, Y Lee, S Park. Associations among working hours, sleep duration, self-rated health, and health-related quality of life in Korean men. *Health Qual Life Outcomes* 2020;18(1):287.

71 B Misiak, R Sierzantowicz, E Krajewska-Kulak, et al. Psychosocial Work-Related Hazards and Their Relationship to the Quality of Life of Nurses-a Cross-Sectional Study. *Int J Environ Res Public Health* 2020;17(3).

72 Y Zhang, Q Wang, T Jiang, J Wang. Equity and efficiency of primary health care resource allocation in mainland China. *Int J Equity Health* 2018;17(1):140.



STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation	Page No
Title and abstract	1	(a) Indicate the study’s design with a commonly used term in the title or the abstract	1-2
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3-4
Objectives	3	State specific objectives, including any prespecified hypotheses	4
Methods			
Study design	4	Present key elements of study design early in the paper	4
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	4-5
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	5
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5-6
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	7
Bias	9	Describe any efforts to address potential sources of bias	5-6
Study size	10	Explain how the study size was arrived at	5-6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	5-7
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	7
		(b) Describe any methods used to examine subgroups and interactions	7
		(c) Explain how missing data were addressed	6
		(d) If applicable, describe analytical methods taking account of sampling strategy	6-7
		(e) Describe any sensitivity analyses	6-7
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg	7-8

		numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	
		(b) Give reasons for non-participation at each stage	
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	7-8
		(b) Indicate number of participants with missing data for each variable of interest	
Outcome data	15*	Report numbers of outcome events or summary measures	7-8
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	9-13
		(b) Report category boundaries when continuous variables were categorized	9-13
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	9-13
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	9-13
<b>Discussion</b>			
Key results	18	Summarise key results with reference to study objectives	14-16
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	16
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	14-16
Generalisability	21	Discuss the generalisability (external validity) of the study results	16
<b>Other information</b>			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	16