



Mental Health of Young Physicians in China During the Novel Coronavirus Disease 2019 Outbreak

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Introduction

With more than 3 million cases worldwide, the novel coronavirus disease 2019 (COVID-19) poses a growing global public health challenge.¹ Medical personnel disproportionately bear the additional physical and psychological burdens associated with pandemics, yet the mental health implications of COVID-19 for physicians are unknown.^{2,3} In this cohort study, we assessed anxiety, depression, mood, and other established factors associated with mental health problems in a cohort of young physicians in China before and during the outbreak.

Author affiliations and article information are listed at the end of this article.

Methods

The ethics committees of Shanghai Jiao Tong University and the University of Michigan approved this study. All participants provided written informed consent and were compensated ¥25 (as of May 7, 2020, ¥1 = \$0.14 US). This study follows the American Association for Public Opinion Research (AAPOR) reporting guideline.

Training physicians from 12 Shanghai hospitals who enrolled in the prospective Intern Health Study in August 2019 completed surveys 2 weeks before beginning residency and again at 3 months (before the COVID-19 outbreak) and 6 months (during the COVID-19 outbreak) that assessed anxiety (Generalized Anxiety Disorder-7 scale), depression (Patient Health Questionnaire-9), and workplace violence.^{4,5} Mood valence (rated from 1 to 10, with higher scores indicating better mood) was measured daily via a mobile smartphone application. The same protocol was used to collect data in the prior 2018 to 2019 residency cohort.

A series of random effect mixed models were fitted to assess changes in Generalized Anxiety Disorder-7, Patient Health Questionnaire-9, and mood scores and experience, observation, and fear of workplace violence between quarter 1 and quarter 2 for both the 2018 to 2019 and 2019 to 2020 cohorts. Preresidency baseline (mood score, Generalized Anxiety Disorder-7 and Patient Health Questionnaire-9 total scores, and a personal history of depression) and within-residency (work hours, sleep duration, and experience, observation, and fear of violence before and after the outbreak) factors that have previously been associated with depression and anxiety in training physicians were included in the models.⁶ All analyses were performed using SAS statistical software version 9.4 (SAS Institute). Statistical significance was calculated with generalized linear mixed models. A 2-tailed $P < .05$ was considered statistically significant. Data analyses were performed in March and April 2020.

Results

Of the 1037 invited residents, 726 (70%) agreed to participate in the study. Of those 726 residents, 385 (53%) completed the quarter 1 or quarter 2 surveys and were included in the analysis (247 women [64%]; median age, 25 years [interquartile range, 23-28 years]). For the 2019 to 2020 cohort, daily mood scores decreased statistically significantly between quarter 1 and quarter 2 ($\beta = -0.50$; 95% CI, -0.80 to -0.20 ; $P = .002$). In parallel, scores for symptoms of depression ($\beta = 0.61$; 95% CI, 0.08 to 1.14 ; $P = .02$) and anxiety ($\beta = 0.64$; 95% CI, 0.17 to 1.12 ; $P = .008$)

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increased statistically significantly during this period (Table). Furthermore, fear of violence (odds ratio, 2.36; 95% CI, 1.56 to 3.57; $P < .001$) and observation of violence from patients or their families (odds ratio, 3.63; 95% CI, 2.50 to 5.27, $P < .001$) increased statistically significantly (Table). In contrast, there were no statistically significant changes in mood, anxiety, or depressive symptoms or workplace violence status between quarter 1 and quarter 2 for the 2018 to 2019 cohort (Figure).

Discussion

This study found that physicians in China experienced an increase in mental health symptoms and fear of violence and a decline in mood after the COVID-19 outbreak. These findings may reflect training physicians' added clinical workload with the emergence of COVID-19 and are consistent with past evidence that the additional stressors physicians face during infectious disease outbreaks place them at greater risk for both short-term and long-term mental health problems.^{2,3}

Table. Differences in Mood Score, Symptoms of Anxiety and Depression, and Workplace Violence Between Quarter 1 and Quarter 2 by Cohort

Cohort	Mood				GAD-7				PHQ-9			
	Q1	Q2	β or OR (95% CI) ^a	P value	Q1	Q2	β or OR (95% CI) ^a	P value	Q1	Q2	β or OR (95% CI) ^a	P value
2018-2019 ^b	6.70	7.25	0.24 (-0.43 to 0.91)	.43	5.30	5.43	0.01 (-0.57 to 0.58)	.98	6.25	6.19	-0.32 (-0.93 to 0.29)	.30
2019-2020 ^b	7.07	6.80	-0.50 (-0.80 to -0.20)	.002	4.33	5.43	0.64 (0.17 to 1.12)	.008	5.17	5.77	0.61 (0.08 to 1.14)	.02
	Fear of violence				Observed violence				Experienced violence			
2018-2019 ^c	21.27	14.68	0.63 (0.38-1.03)	.06	25.08	24.77	0.92 (0.60-1.40)	.68	6.35	8.72	1.46 (0.75-2.86)	.27
2019-2020 ^c	17.76	30.31	2.36 (1.56-3.57)	<.001	22.12	49.48	3.63 (2.50-5.27)	<.001	7.48	8.01	1.13 (0.60-2.15)	.70

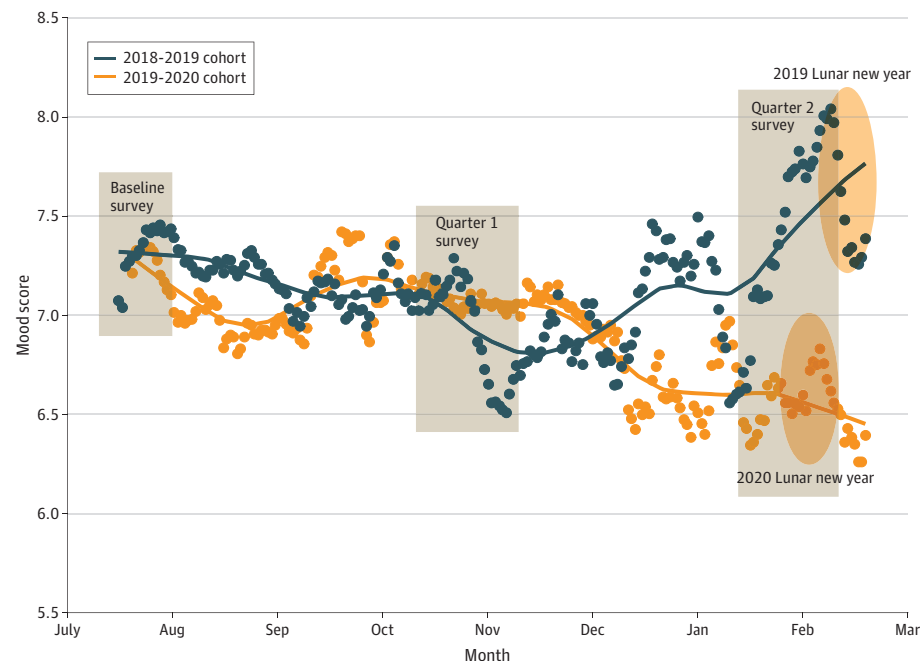
Abbreviations: GAD-7, Generalized Anxiety Disorder-7; OR, odds ratio; PHQ-9, Patient Health Questionnaire-9; Q1, quarter 1; Q2, quarter 2.

^b Data are mean scores.

^c Data are percentage of participants who answered yes on the survey.

^a β values refer to the change between quarters 1 and 2 for all variables.

Figure. Mood Before and After the Coronavirus Disease 2019 (COVID-19) Outbreak



Lines and dots depict daily mood score using a moving weekly mean. The mood score difference between quarter 1 (before the COVID-19 outbreak) and quarter 2 (after the COVID-19 outbreak) was statistically significant for the 2019 to 2020 cohort ($\beta = -0.50$; 95% CI, -0.80 to -0.20; $P = .002$). No statistically significant difference was observed for the 2018 to 2019 cohort. The rectangles indicate the time frame for each survey period for the 2019 to 2020 cohort. The ovals indicate the date range for the Lunar New Year holiday for the 2018 to 2019 cohort (February 4, 2019, to February 19, 2019) and 2019 to 2020 cohort (January 24, 2020, to February 8, 2020).

A limitation of this study is that our sample consisted of first-year training physicians in China; studies in other physician populations are needed to understand the mental health effects of the COVID-19 pandemic on physicians more broadly. With most new cases now outside China, ensuring that physicians receive appropriate support and access to mental health services is increasingly imperative, for their own well-being, as well as that of their patients and the global community.

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Author Contributions: Drs Li and Sen had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. Dr Li, Dr Frank, and Ms Zhao contributed equally and share first authorship.

Concept and design: Li, Frank, Zhao, Wang, Burmeister, Sen.

Acquisition, analysis, or interpretation of data: Li, Frank, Zhao, Chen, Burmeister, Sen.

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Study in Chinese doctors shows mental toll of caring in the time of COVID-19

Rigorous study shows depression and anxiety symptoms worsened among medical residents in Shanghai, and fear of workplace violence doubled, in early 2020

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They worked in hospitals hundreds of miles from the epicenter of COVID-19. Their city of 24 million people locked down hard enough, and did enough testing, that it only had a few hundred cases of the disease.

But hundreds of young Chinese doctors in a new study still experienced a sharp drop in mood, a rise in depression and anxiety symptoms, and a doubling of their fear of workplace violence, in just the first month of the coronavirus pandemic.

The new findings, published in *JAMA Network Open* by an American and Chinese team, show in stark terms the potential mental toll of being a frontline healthcare worker in the time of COVID-19.

The rise in symptoms among 385 first-year medical residents in Shanghai contrasts with data from members of the previous year's crop of residents, who took part in the same study from 2018 to 2019.

Where this year's class saw sharp change across most measures of mental health and workplace violence during the first half of the training year, last year's class had stable scores at the same point in their training. Other research in Chinese and American residents has shown that the strain of first-year medical training is linked to a sharp rise in depressive symptoms over pre-residency scores.

"Even before this pandemic, the levels of depression and anxiety symptoms among our healthcare workers were high and our findings indicate that they are getting worse," says Srijan Sen, M.D., Ph.D., the University of Michigan psychiatrist and neuroscientist who leads the Intern Health Study that yielded the data. "As it is clear that this pandemic will be with us for the foreseeable future, we need to prioritize the well-being of our healthcare workers, not only for themselves, but also for the patients that will need them in the coming months and year."

Sen worked with colleagues from U-M's Michigan Neuroscience Institute, and Shanghai Jiao Tong University, to gather and analyze the data.

Weidong Li, M.D., Ph.D., co-first and co-corresponding author of the new paper and a professor at SJTU, notes that typically, late winter is a time of elevated moods in China, due to the Lunar New Year celebration.

"Our findings indicate that the negative mental health effects of COVID-19 are not limited to physicians working at the center of the initial outbreak in Wuhan, but extend to other places like Shanghai, which is 500 miles away," he says. "With the numerous new cases spread worldwide, this has important implications for the way communities around the globe respond to this growing public health crisis." Li is the deputy director of the Brain Science and Technology Research Center, and vice dean of the Bio-X Institutes, at SJTU.

Elena Frank, Ph.D., director of the Intern Health Study, notes that the data provide a strong reminder about the impacts of infectious disease outbreaks on both the physical and psychological health of healthcare workers. "It's easy to forget that they face many of the same additional stresses as the rest of us - concerns about elderly or at-risk family, loss of childcare - while simultaneously managing an increased clinical workload, and all while placing themselves and their families at greater risk of infection," she says. "The potential mental health consequences of confronting such enormous pressures cannot be overlooked."

Unwitting sentinels of a pandemic's effects

When the 385 doctors in the study volunteered for the research project last summer, they were about to begin the same intense, sometimes grueling training experience that marks the start of a medical career in many countries.

A few weeks ago, data from earlier cohorts of residents was published as a preprint - a report that has not undergone peer review - by Sen and Li's colleagues. It shows a similar rise in depression symptoms happened in 7,000 first-year residents (also called interns) at more than 100 U.S. hospitals, and 1,000 Chinese first-year residents at 16 Shanghai and Beijing hospitals across three years of the study.

Like study participants before them in the U.S. and China, members of the Shanghai intern class entering 12 hospitals in August 2019 agreed to track their mood daily on a smartphone app, and every few months answer standardized questionnaires about their mental health and whether they had experienced, observed or feared physical or verbal violence in their workplace.

Little did they know that their data would give some of the clearest indications yet of the mental toll of being on the front line of a pandemic.

The new study looks at changes in scores between the surveys that the residents took in October and November 2019, and the ones they took in January and February, as the pandemic reached its peak in China. It also measures changes in daily mood between those two quarters.

Sen, who is also the associate vice president for research at U-M, and the Frances and Kenneth Eisenberg Professor of Depression and Neurosciences, has been involved in mental health programs for residents at Michigan Medicine, U-M's academic medical center.

His decade-long study has focused on first-year residents because they all start and end their training year at the same time, and have similar experiences - making them an ideal study population for the question of how intense stress affects mental health.

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In addition to Sen, Li and Frank, the study's authors are co-first author Zhuo Zhao, M.S., of the Michigan Neuroscience Institute; Lihong Chen, Ph.D., and Zhen Wang, M.D., of SJTU, and Margit Burmeister, Ph.D., of U-M. Sen and Burmeister are faculty in the Departments of Psychiatry and Computational Medicine &


Bioinformatics at U-M, and members of MNI and the U-M Depression Center. Sen is also a member of the Institute for Healthcare Policy and Innovation.

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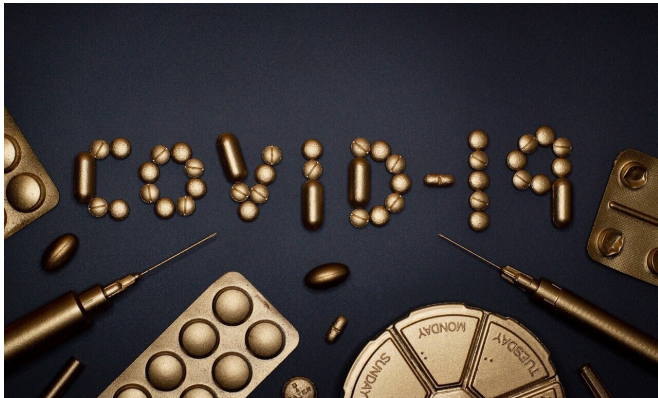
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Study in Chinese doctors shows mental toll of caring in the time of COVID-19

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