Health Care Workers' Mental Health During the First Weeks of the SARS-CoV-2 Pandemic in Switzerland – A Cross-Sectional Study

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Abstract

Background: The current SARS-CoV-2 pandemic poses various challenges for health care workers (HCWs), which may impair their mental health. First evidence from China suggests that HCWs are at risk for anxiety and depression. However, generalizability to western countries is limited. The current study aimed at exploring HCWs’ mental health during the SARS-CoV-2 pandemic in Switzerland. In addition, we conducted a network analysis to investigate the independent effect of risk and protective factors on HCWs’ mental health and their interplay.

Methods: In an exploratory, cross-sectional, nation-wide online survey, we assessed demographics, work characteristics, COVID-19 exposure, and anxiety, depression, and burnout in 857 physicians and 553 nurses during the pandemic in Switzerland. At the time of data collection, Switzerland had among the highest per capita rate of COVID-19 cases in the world.

Results: Overall symptom levels of anxiety, depression, and burnout were elevated. Women, nurses, frontline staff and HCWs exposed to COVID-19 patients reported more symptoms than their peers. However, these effects were all small and, in the network analysis, most of them did not remain significant after controlling for the other factors. Whereas COVID-19 exposure was only partially associated with mental health, perceived support by the employer independently predicted anxiety and burnout.

Conclusions: Our finding that HCWs had elevated levels of anxiety, depression, and burnout underscores the importance to systematically monitor HCWs’ mental health during this ongoing pandemic. Because perceived support and mental health impairments were negatively related, we encourage the implementation of supportive measures for HCWs’ well-being during this crisis.
Introduction

Since December 2019, the world has witnessed a pandemic spread of SARS-CoV-2 with daily increasing numbers of patients suffering from COVID-19.\(^1,2\) This global public health crisis poses various challenges for health care workers (HCW) all around the world. Over the last weeks, some HCWs worked additional hours to care for the high number of COVID-19 patients and put themselves at risk for infection, while others have seen their workload diminish due to public health-related measures enforced by authorities.\(^3\) Although many countries have managed to control the initial spread of SARS-CoV-2 at the time of writing (beginning of May 2020), it is currently unclear how the pandemic will further develop and whether some countries will be affected by a second wave of sharply increasing COVID-19 case numbers in the foreseeable future.\(^4\) Hence, the current pandemic has been and may continue to be a challenge for health care systems and the medical workforce all around the world.

From research in physicians and nurses, it is well-known that work-related stressors such as working overtime are associated with impaired mental health, for example in the form of burnout, anxiety, and depression.\(^5–8\) Importantly, the consequences of reduced mental health not only affect HCWs themselves, but also the quality of care they provide and their professional functioning.\(^6,9–12\) This is highly problematic, because medical performance is essential to manage the consequences of public health crises. Therefore, monitoring and maintaining the mental health of HCWs is crucial during a pandemic. Moreover, a solid understanding of factors that influence HCWs’ mental health is needed to develop and optimize protective measures.\(^13\)

Existing research on mental health of HCWs during a pandemic largely stems from the SARS outbreak at the beginning of this century.\(^14\) Several studies conducted in Canada have demonstrated the risk of pandemic-related stressors to HCWs’
mental health. For example, HCWs working in a clinical unit dedicated to the treatment of SARS patients experienced higher levels of stress than their peers.\textsuperscript{15} Another study found low organizational support as well as distrust in equipment to be associated with emotional exhaustion and anger.\textsuperscript{16} Moreover, a higher workload, assignment to unfamiliar tasks, health fears, and social isolation mediated the relationship between treating SARS patients and acute traumatic stress.\textsuperscript{17}

Although these studies can provide preliminary evidence, their generalizability to the current SARS-CoV-2 pandemic is limited due to the peculiarities of each pandemic. Thus, timely research on mental health of HCWs during the current pandemic is needed. A first study was conducted in China by Lai et al. at the beginning of February 2020 among 1257 Chinese HCWs. These authors demonstrated that women, nurses, frontline workers, and those working in Wuhan, the epicenter of the pandemic, had elevated symptom levels of anxiety, depression, insomnia, and traumatic stress compared to men, physicians, second-line workers and those not working in Wuhan.\textsuperscript{18} In contrast, a second Chinese study conducted by Li et al. at the end of February 2020 found that 214 individuals from the general public and 292 non-frontline nurses reported higher levels of vicarious traumatization than 234 nurses working at the frontline.\textsuperscript{19} In a third Chinese study conducted between the end of February and the beginning of March, Zhang et al. reported that 927 medical HCWs had a higher prevalence of insomnia, anxiety, depression, somatization, and obsessive-compulsives symptoms than 1255 non-medical HCWs.\textsuperscript{20} Furthermore, being a woman was a significant predictor of insomnia, anxiety, and depression, and exposure to COVID-19 patients was a predictor of anxiety and insomnia.\textsuperscript{20} However, a study among 470 HCWs in Singapore undertaken during the same period of time found the opposite, namely lower levels of stress-related symptoms in medical compared to non-medical HCWs.\textsuperscript{21} Lastly, in a
qualitative study among 69 HCWs in the Unites States, Shanafelt et al. identified key concerns causing anxiety among HCWs including lack of access to appropriate personal protective equipment, support, and up-to-date information.13

Although these studies provide preliminary evidence for the mental health of HCWs during the current pandemic, their generalizability is limited in several ways. First, most studies were undertaken at the beginning of the pandemic, when the spread of the virus was mostly limited to a single province (in China) or to a few cases (in Singapore). Hence, sufficient equipment and manpower was still at hand or could be dispatched. Second, quantitative evidence was collected only in two countries, both located in Asia. Thus, differences in the experience with a pandemic outbreak of a respiratory virus (this experience is higher in Singapore and China compared to many other countries), differences in health care systems, and differences in cultural norms limit the generalization of the existing result to European or American countries. Third, although previous research explored a multiplicity of outcomes and associations, a comprehensive overview over these complex associations is lacking.

In a cross-sectional, nation-wide study, we assessed the mental health of physicians and nurses during the SARS-CoV-2 pandemic in Switzerland. The data was collected between March 28 and April 4, 2020, when the SARS-CoV-2 outbreak had reached the stage of a pandemic1. At that time, Switzerland had among the highest per capita rate of COVID-19 cases in the world. In addition to mental health data, based on the above-mentioned studies, we collected demographics (e.g., gender, profession, professional experience), work characteristics (e.g., availability of support, work hours), and data on COVID-19 exposure at work (e.g., exposure to COVID-19 patients, working as frontline staff) to investigate the influence of these variables on mental health.
The aims of our study were exploratory. The first aim was to assess HCWs’ mental health by their symptom levels of anxiety, depression, and burnout. Second, following previous studies, we aimed to compare levels of symptoms between subgroups (e.g., frontline and non-frontline workers). Finally, we conducted a network analysis to investigate the independent effect of the various factors outlined above on HCWs’ mental health. By this network analysis, we aimed to provide the first comprehensive overview of these factors and to visualize the interplay between them.

**Materials and Methods**

This study had an explorative, cross-sectional design with a single period of data collection, and was carried out as a fully anonymous online survey. Inclusion criteria were defined as actively working as a nurse or physician in Switzerland. Given the explorative nature of the study design, no primary hypothesis was tested and thus no sample size calculation was conducted. Recruitment of participants was not aimed to be representative in a specific sense, but to ensure nation-wide participation. Thus, participants were recruited non-targeted through mailing lists of hospitals and professional societies, social media, and personal contacts of the study team members, with a focus of reaching health care workers in all parts of Switzerland. To reduce potential selection bias, the study was conducted in German, French and Italian.

The survey included questions regarding demographics, work characteristics, COVID-19 exposure, and mental health. To account for the highly dynamic situation during the pandemic, the time period of reference for all questions of the survey was restricted to the past seven days. The survey was accessible through a link and could be filled out using a computer, tablet or smartphone. Data from participants
was saved and thus accessible for analysis only after full completion of the survey. However, some items (e.g., years of professional experience) were assessed using a text-field, which lead to minor data loss due to wrong input by participants. The ethics committee of the canton Zurich assessed the study and officially declared that the study did not fall within the scope of the Human Research Act (BASEC-Nr. Req-2020-00471). Therefore, no authorization from the ethics committee was required.

Data was collected between March 28 and April 4, 2020, starting 2 weeks after the federal council (constituting the collective head of state) categorised the situation as “extraordinary” (March 16, 2020). With the declaration of this state of emergency, the federal council signed an executive order resulting in a partial “lock-down” (although this did not include a curfew).

Sample

We received a total of 1533 completed questionnaires. Of these, 120 (7.7%) participants did not meet the inclusion criteria of being a nurse or a physician. Of the remaining 1413 participants, 3 (0.2%) indicated their gender as “other” and were excluded from further analysis to ensure comparability of groups. This resulted in a final sample size of 1410, of which 857 (60.8%) were physicians and 553 (39.2%) were nurses.

Measurements

Demographics. Demographics included age (in years), gender (woman, man, and other), profession (physician, nurse, and other), professional experience (in years), and canton (corresponding to a federal state) in which participants worked.

Work characteristics. Participants reported their average weekly work hours prior to the pandemic, their total work hours during the past seven days, and their
average hours of sleep per night during the past seven days. Furthermore, using a Likert scale from 1 = “not at all” to 7 = “absolutely”, participants rated the extent to which they generally felt well equipped (e.g., with protective masks), well supported by the authorities and employers, and well informed (e.g., about the development of the pandemic) by the authorities and employers.

**COVID-19 exposure.** Exposure to COVID-19 was assessed by several nominal questions (yes/no). First, participants indicated if they had experienced COVID-19 symptoms (e.g., fever, cough) since the beginning of the pandemic or if they had been tested positively for SARS-CoV-2. Second, they reported whether they had been exposed to suspected or confirmed COVID-19 patients during work, and third, whether they had been working in a clinical unit designated to diagnosis and treatment of COVID-19 patients. Participants answering to the latter question affirmatively were considered as frontline workers, the others as non-frontline workers.

**Mental health.** The *General Anxiety Disorder-7* (GAD-7)\(^\text{23}\), a 7-item questionnaire, was used to measure symptoms of anxiety. Symptoms of depression were measured with the 9-item *Patient Health Questionnaire-9* (PHQ-9)\(^\text{24}\). Both questionnaires are validated and frequently used instruments to assess the self-reported symptom severity of generalized anxiety and depression.\(^\text{25,26}\) In both questionnaires, individual symptoms are assessed by ratings on a 4-point Likert scale ranging from 0 = “not at all” to 3 = “nearly every day”. An overall score can be calculated by summing individual items. Consequently, the sum scores of the GAD-7 and PHQ-9 range from 0 to 21 and 0 to 27, respectively. Sum scores of 10 points or higher indicate clinically relevant symptoms, corresponding to a diagnosis of generalized anxiety disorder or a depressive episode.\(^\text{23–25}\) Burnout was assessed using a brief measurement tool for physician burnout developed and validated by
West et al. This tool consists of two single items derived from the *Maslach Burnout Inventory* (MBI) measuring emotional exhaustion and depersonalisation, two cardinal dimensions of burnout. These items were rated on a 7-point Likert scale ranging from 0 = “never” to 6 = “daily” and summed to form a total score. The answer format of all questionnaires was adapted to measure symptoms within the past seven days. The German, French, and Italian translations of the questionnaires provided by the corresponding manuals were used.

**Statistical analyses.** Due to abnormally distributed data, continuous and ordinal items were described using the median and interquartile range [IRQ; 25%-75%] Categorical data was described with frequencies (%). Accordingly, we used two-tailed Mann-Whitney *U* tests and chi-square tests to assess differences between independent groups. Effect size of group differences of ordinal and continuous variables was assessed as rank biserial correlation. The significance level for all tests was set to alpha = .05. Given the explorative study design, *p* values were not adjusted for multiple comparisons. Descriptive statistics and comparison of independent groups were conducted using JASP version 0.11.30

To explore the complex relationships among demographic data, work characteristics, COVID-19 exposure, and symptoms of anxiety, depression, and burnout, we conducted a network analysis. To maximize power of the network analysis and due to intercorrelation among some of the assessed variables, we had to select items for the network analysis. Based on the previous studies on the current pandemic, we included gender, profession, exposure to COVID-19 patients, working as frontline staff, and perceived support by the employer. The latter factor was chosen from the variables assessing several aspects of support (i.e., feeling well equipped, well supported and well informed). Perceived support can be considered an umbrella term that, following traditional classifications of social support types.
subsumes instrumental support (i.e., feeling well equipped) and informational support (i.e., feeling well informed). Furthermore, we included professional experience and work hours, since they are well-known risk factors for stress-related conditions such as burnout.6,32

Formally, the resulting network is a Gaussian Graphical Model, in which variables are represented by nodes, and edges between these variables represent partial correlations.1 Prior to network estimation, symptom overlap was tested using the default settings of the goldbricker function of the networktools package33. No exclusion of symptoms was suggested. The network was estimated using a regularization technique often used in psychopathology (e.g., Tibshirani34). The technique is based on the least absolute shrinkage and selection operator (LASSO35,36), which sets very small edges to zero and thus reduces the false positive rate. In other words, the technique is designed to have high specificity, while sensitivity might be limited (for more details see Epskamp et al.37). Stability and reliability analyses were conducted as recommended using the bootnet package.37 Network analysis was performed in the R statistical environment. Given that the network consisted of categorical, ordinal and continuous variables, the mgm package38 was used to estimate the network, and visualization was performed with the qpgrah package39.

Results

Overall Sample. Table 1 summarizes demographics, work characteristics, and COVID-19 exposure of the whole sample. Symptom severity scores of the whole sample are presented in Table 2. Of the finally included 1410 participants, the

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1 Conceptually, the partial correlations can be understood as regression coefficients resulting from repeated regression analyses. In each individual regression analysis, a given node is the outcome (dependent variable) and all remaining nodes are the predictors (independent variables). This is repeated for all nodes. However, this is not the way the analysis is conducted (see above).
majority were German-speaking (n = 1124, 79.7%), women (n = 934, 66.2%), had a median age of 34 years [29-46] and median professional experience of 10 years [4-20]. Median working hours in the sample was 45 [36-54], with 572 (40.6%) participants working more hours than before the pandemic. Overall, experienced availability of medical equipment, support, and information by the employer and the authorities was high (all median scores ranging between 5 and 6, with 7 indicating the upper bound of the scale). One hundred ninety-seven (14%) of the participants had suspected COVID-19 symptoms or were tested positive for SARS-CoV-2, 1103 (78%) had contact with COVID-19 patients at work and 655 (46.5%) worked in designated COVID-19 units. Median anxiety and depressive symptom scores were 6 [3-10] and 5 [2-9]. Hence, these median scores were in the mild range (5 to 9 points\textsuperscript{23,24}). Based on the suggested cut-offs (a total score of $\geq 10$), 365 participants (25.9%) had clinically relevant symptoms of anxiety and 292 (20.7%) had clinically relevant symptoms of depression (see Table S2). On the 2-item burnout scale, scores ranged from 0 to 12, and the sample median was 4 [2-6].

**Group differences.** Results from group comparisons of symptom severity are presented in Table 2. In summary, women had higher symptom levels of anxiety and depression than men, yet similar burnout symptoms as men. Nurses, frontline staff and HCWs exposed to COVID-19 patients showed more symptoms of anxiety, depression, and burnout than physicians, non-frontline staff and non-exposed HCWs. However, all effects of the group comparisons were small (ranging from -.076 to -.251). Similar to these results, a significantly higher share of women, nurses, frontline staff and HCWs exposed to COVID-19 patients had clinically relevant symptoms of anxiety and depression compared to their male, physician, non-frontline and non-exposed colleagues (see Table S2). Differences between groups with regard to demographics and additional variables are presented in Table S1.
Relationships among the investigated variables (network analysis). The results of the network analysis are visualized in Figure 1. The edges in the network represent partial correlations between the variables, with the thickness of the edge representing the magnitude of the correlation and the colour indicating the direction (red = negative, blue = positive). Expectedly, being a woman was associated with working as a nurse, and working in a designated COVID-19 unit was associated with exposure to COVID-19 patients at work. The total symptom scores of anxiety, depression, and burnout were associated with one another. Symptoms of depression were not associated with any factor other than burnout and anxiety. Regarding anxiety, associations with gender, professional experience and perceived support by the employer emerged. Burnout was associated with professional experience, work hours, exposure to COVID-19 patients, and perceived support by the employer.

Discussion

This study represents the first nation-wide survey on mental health and work-related strain in health care workers during the SARS-CoV-2 pandemic in a Western country. Overall, approximately 40% of our sample worked more during the pandemic than before. Almost half of the sample was assigned to a designated COVID-19 unit and close to 80% were exposed to suspected or confirmed COVID-19 patients at work. Importantly, health care workers felt mostly well equipped, supported and informed by the employers and the authorities.

In general, participants reported mild levels of anxiety and depression, and elevated burnout scores. Still, overall anxiety and depression were significantly higher in our sample than the study by Lai et al. who investigated a sample of Chinese HCWs with the same questionnaires and also higher than a in Singaporean HCWs. Compared to the Chinese nurses assessed by Zhang et al., nurses in our
sample had similar levels of anxiety and depression. The higher prevalence of anxiety and depression among Swiss HCWs could have several reasons. First, at the time of data collection, Switzerland had very high per capita rate of COVID-19 cases, higher than during the study period of the other two studies. Second, in non-pandemic times, several studies have consistently documented higher levels of anxiety and depression in European countries compared to Asian nations. Thus, the higher prevalence in our sample might be due to higher general levels of anxiety and depression or to culture-dependent, social desirability effects. Third, in contrast to Singapore and China, Switzerland was not affected by the SARS pandemic at the beginning of the century. Thus, Chinese and Singaporean HCWs probably had more experience dealing with a pandemic than Swiss HCWs, which could have reduced their symptom burden.

Women, nurses, frontline staff, and health care workers exposed to COVID-19 patients exhibited higher levels of symptoms and a higher prevalence of clinically relevant symptoms of anxiety and depression when compared to their male, physician, non-frontline and non-exposed peers. However, all effects were small. The found differences between women and men, nurses and physicians, and frontline and non-frontline HCWs are in accordance with the study of Lai et al., thus replicating their results. In contrast, Li et al. reported that vicarious, i.e. indirect forms of traumatization was lower among HCWs working at the frontline compared to other HCWs and the general public. Still, the comparability of their results is limited, as they investigated a different aspect of psychopathology, namely vicarious traumatization, than Lai et al. and we did. However, unadjusted comparisons across several groups must be interpreted with caution, because some variables (e.g., women and nurse or frontline workers and exposure to COVID-19 patients) are highly intercorrelated and thus confound results.
By conducting the first network analysis on mental health and associated factors during the pandemic, we were able to map relationships between several variables while controlling for their mutual influence. Here, we highlight some specific associations. While support by the employer was associated with anxiety and burnout, working in a COVID-19 ward was not. Exposure to COVID-19 patients was only associated with burnout. Hence, although we found group differences in mental health between frontline and non-frontline staff and between HCWs who have and have not been exposed to COVID-19 patients, these associations did not remain significant after adjusting for all factors within the network. Taken together, COVID-19 exposure only partially predicted burnout, while support by the employer was a significant predictor of both burnout and anxiety. The role of perceived support has been studied extensively in occupational and health psychology, and its direct relationship with mental health of HCWs is well documented. For example, as postulated by the job-demand-control-support model, which has a broad empirical foundation, support is not only important to well-being but reduces the mental strain caused by job demands such as, in this case, COVID-19 exposure. Moreover, the importance of support was also recently emphasized in a qualitative study on HCWs’ concerns with regard to the SARS-CoV-2 pandemic. Another possible interpretation for the absence of individual effects of COVID-19 variables is that these effects were very small and thus did not survive regularization. In this case, even if the effects exist, they would not be of a clinically relevant magnitude.

Regarding anxiety, associations with being a woman and higher professional experience in addition to perceived support by the employer emerged. While higher levels of anxiety among women in general and in female HCWs during a pandemic in particular are well documented, the positive association with professional experience is counterintuitive. Given that HCWs with a higher professional
experience tended to be older, we can only speculate that these HCWs more likely belonged to a risk group for COVID-19 related complications (e.g., cardiac diseases). This might have led to more anxiety. Burnout was negatively associated with professional experience and positively related to work hours, which is well-documented in literature on HCW burnout.²⁶,³²

This study is limited in several ways. First, the cross-sectional nature of the study with a single period of data collection and no control group does not allow to draw conclusions about changes in symptoms. In other words, we do not know whether symptoms changed compared to before the pandemic, whether changes are a consequence of the pandemic, or whether HCWs reacted in a specific way different from the general population. These important questions need to be addressed by future studies with an appropriate design (e.g., within the frame of ongoing cohort studies). Second, given the non-targeted recruitment, our sample was likely not representative of HCWs in Switzerland. Moreover, the non-targeted recruitment might have introduced several kinds of selection bias (e.g., very busy HCWs might not have been willing to participate). In addition, due to the non-targeted recruitment, we are unable to calculate a response rate. Still, the 857 physicians participating in this study represent approximately 2.3% of all 37'882 licenced Swiss physicians in 2019.⁴⁶ This exceeds the per capita rate of participating HCWs of previous studies by far. Third, mental health of participants was measured using self-report questionnaires. This might lead to an overestimation of symptoms.²⁴ Fourth, the adaptation of all questionnaires to cover symptom experience over the last seven days has not been validated and limits comparability to studies undertaken with the original validated versions of the questionnaires (covering two weeks in case of the GAD-7²³ and PHQ-9²⁴) and a full year in case of the brief measurement tool for physician burnout developed and validated by West et al.²⁷). However, the strength
of the restriction to the past seven days lies in the capacity to measure symptoms
during a highly dynamic time of crisis. Finally, questions regarding COVID-exposure
or perceived support were developed for this specific study and were therefore not
validated.

Notwithstanding these limitations, our study has clinical and scientific
implications. Our finding that 25.9% of the investigated HCWs had clinically relevant
symptoms of anxiety and 20.7% clinically relevant symptoms of depression
underscores the importance to systematically monitor HCWs’ mental health during
this ongoing pandemic. Furthermore, given that perceived support and higher levels
of anxiety and burnout were negatively related, we encourage the implementation of
supportive measures for HCWs’ well-being during this crisis. Such measures should
address key concerns of HCWs identified in previous research (e.g., sufficient access
to personal protective equipment and access to child-care during increased work
hours\textsuperscript{13}). Most importantly, however, HCWs themselves can best express their
individual needs. Hence, besides a systematic monitoring of HCWs’ mental health,
we encourage managers and regulators to actively engage with the health care force
and hear them and their concerns. Due to the well-documented negative effect of
impaired mental health of HCWs on their provided care,\textsuperscript{6,9–12} these measures not
only support HCWs themselves but also serve patients by ensuring continuation of
high-quality care, especially during a public health crisis.

Regarding future research, our study implies the need to address remaining
questions with adequately designed studies. For example, changes in symptoms
during different stages of the pandemic should be addressed by longitudinal studies.
In addition, existing cohort studies should answer the question whether HCWs
developed more symptoms during the pandemic compared to before.
In conclusion, in our sample, of which 40% worked more hours than prior to the pandemic, overall symptom levels of anxiety and depression were mild, and burnout was elevated. Still, symptoms of anxiety and depression were significantly higher than in a similar study conducted in China during the beginning of the SARS-CoV-2 pandemic.\textsuperscript{18} In general, participants felt well-equipped and well-supported by their employer and the authorities. Women reported more symptoms than men, nurses more than physicians, frontline staff more than those not working at the frontline, and HCWs exposed to COVID-19 more than non-exposed peers. However, these effects were all small and most of them did not remain significant after controlling for the other factors within the network analysis. Importantly, whereas COVID-19 exposure was only partially associated with burnout, perceived support by the employer independently predicted anxiety and burnout. Given that the pandemic is ongoing and its future progress unpredictable, we encourage the implementation of monitoring systems for HCWs’ mental health and measures to maintain their well-being during this crisis.
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References

1. World Health Organization. Rolling updates on coronavirus disease (COVID-19). https://www.who.int/emergencies/diseases/novel-coronavirus-2019/events-as-they-happen.
2. World Health Organization. Coronavirus disease (COVID-2019) situation reports. https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports/.
3. von Matt R. Paradoxe Situation. Kurzarbeit in Spitälern in der Corona-Krise. April 2020. https://www.srf.ch/news/schweiz/paradoxe-situation-kurzarbeit-in-spitaeichern-inder-corona-krise.
4. Reuters. CDC Chief Warns Second COVID-19 Wave May Be Worse, Arriving With Flu Season. New York Times. https://www.nytimes.com/reuters/2020/04/21/us/21reuters-health-coronavirus-usa-winter.html. Published April 21, 2020.
5. Shanafelt TD, Sloan JA, Habermann TM. The well-being of physicians. Am J Med. 2003;114(6):513-519. doi:10.1016/S0002-9343(03)00117-7
6. Shanafelt TD, Noseworthy JH. Executive Leadership and Physician Well-being. Mayo Clin Proc. 2017;92(1):129-146. doi:10.1016/j.mayocp.2016.10.004
7. Wallace JE, Lemaire JB, Ghali WA. Physician wellness: a missing quality indicator. The Lancet. 2009;374(9702):1714-1721. doi:10.1016/S0140-6736(09)61424-0
8. Jennings BM. Work Stress and Burnout Among Nurses: Role of the Work Environment and Working Conditions. In: Hughes RG, ed. Patient Safety and Quality: An Evidence-Based Handbook for Nurses. Advances in Patient Safety. Rockville (MD): Agency for Healthcare Research and Quality (US); 2008. http://www.ncbi.nlm.nih.gov/books/NBK2668/. Accessed April 26, 2020.
9. Poghosyan L, Clarke SP, Finlayson M, Aiken LH. Nurse burnout and quality of care: Cross-national investigation in six countries. Res Nurs Health. 2010;33(4):288-298. doi:10.1002/nur.20383
10. Panagioti M, Geraghty K, Johnson J, et al. Association Between Physician Burnout and Patient Safety, Professionalism, and Patient Satisfaction: A Systematic Review and Meta-analysis. JAMA Intern Med. 2018;178(10):1317. doi:10.1001/jamainternmed.2018.3713
11. Scheepers RA, Boerebach BCM, Arah OA, Heineman MJ, Lombarts KM. A Systematic Review of the Impact of Physicians’ Occupational Well-Being on the Quality of Patient Care. Int J Behav Med. 2015;22(6):683-698. doi:10.1007/s12529-015-9473-3
12. Firth-Cozens J. Interventions to improve physicians’ well-being and patient care. Soc Sci Med. 2001;52(2):215-222. doi:10.1016/S0277-9536(00)00221-5
13. Shanafelt T, Ripp J, Trockel M. Understanding and Addressing Sources of Anxiety Among Health Care Professionals During the COVID-19 Pandemic. JAMA. April 2020. doi:10.1001/jama.2020.5893
14. Maunder R. The experience of the 2003 SARS outbreak as a traumatic stress among frontline healthcare workers in Toronto: lessons learned. May RM, McLean AR, Pattison J, Weiss RA, eds. Philos Trans R Soc Lond B Biol Sci. 2004;359(1447):1117-1125. doi:10.1098/rstb.2004.1483
15. Styra R, Hawryluck L, Robinson S, Kasapinovic S, Fones C, Gold WL. Impact on health care workers employed in high-risk areas during the Toronto SARS outbreak. J Psychosom Res. 2008;64(2):177-183. doi:10.1016/j.jpsychores.2007.07.015
16. Marjanovic Z, Greenglass ER, Coffey S. The relevance of psychosocial variables and working conditions in predicting nurses’ coping strategies during the SARS crisis: An online questionnaire survey. Int J Nurs Stud. 2007;44(6):991-998.
doi:10.1016/j.ijnurstu.2006.02.012

17. Maunder RG, Lancee WJ, Rourke S, et al. Factors Associated With the Psychological Impact of Severe Acute Respiratory Syndrome on Nurses and Other Hospital Workers in Toronto: Psychosom Med. 2004;66(6):938-942. doi:10.1097/01.psy.0000145673.84698.18

18. Lai J, Ma S, Wang Y, et al. Factors Associated With Mental Health Outcomes Among Health Care Workers Exposed to Coronavirus Disease 2019. JAMA Netw Open. 2020;3(3):e203976. doi:10.1001/jamanetworkopen.2020.3976

19. Li Z, Ge J, Yang M, et al. Vicarious traumatization in the general public, members, and non-members of medical teams aiding in COVID-19 control. Brain Behav Immun. March 2020:S0889159120303093. doi:10.1016/j.bbi.2020.03.007

20. Zhang W, Wang K, Yin L, et al. Mental Health and Psychosocial Problems of Medical Health Workers during the COVID-19 Epidemic in China. Psychother Psychosom. April 2020:1-9. doi:10.1159/000507639

21. Tan BYQ, Chew NWS, Lee GKH, et al. Psychological Impact of the COVID-19 Pandemic on Health Care Workers in Singapore. Ann Intern Med. April 2020. doi:10.7326/M20-1083

22. Bundesamt für Gesundheit. Coronavirus: Bundesrat erklärt die «ausserordentliche Lage» und verschärft die Massnahmen. March 2020. https://www.bag.admin.ch/bag/de/home/das-bag/aktuell/medienmitteilungen.msg-id-78454.html.

23. Spitzer RL, Kroenke K, Williams JBW, Löwe B. A Brief Measure for Assessing Generalized Anxiety Disorder: The GAD-7. Arch Intern Med. 2006;166(10):1092. doi:10.1001/archinte.166.10.1092

24. Kroenke K, Spitzer RL, Williams JBW. The PHQ-9: Validity of a brief depression severity measure. J Gen Intern Med. 2001;16(9):606-613. doi:10.1046/j.1525-1497.2001.016009606.x

25. Manea L, Gilbody S, McMillan D. Optimal cut-off score for diagnosing depression with the Patient Health Questionnaire (PHQ-9): a meta-analysis. Can Med Assoc J. 2012;184(3):E191-E196. doi:10.1503/cmaj.110829

26. Arroll B, Goodyear-Smith F, Crengle S, et al. Validation of PHQ-2 and PHQ-9 to Screen for Major Depression in the Primary Care Population. Ann Fam Med. 2010;8(4):348-353. doi:10.1370/afm.1139

27. West CP, Dyrbye LN, Sloan JA, Shanafelt TD. Single Item Measures of Emotional Exhaustion and Depersonalization Are Useful for Assessing Burnout in Medical Professionals. J Gen Intern Med. 2009;24(12):1318-1321. doi:10.1007/s11606-009-1129-z

28. Maslach C, Jackson SE. The measurement of experienced burnout. J Organ Behav. 1981;2(2):99-113. doi:10.1002/job.4030020205

29. Maslach C, Jackson SE, Leiter MP. Maslach Burnout Inventory Manual. Menlo Park, CA: Mind Garden; 2010.

30. JASP Team. JASP [Computer Software]; 2020. https://jasp-stats.org/.

31. Taylor SE. Social Support: A Review. In: Friedman H S, ed. The Oxford Handbook of Health Psychology. Oxford University Press; 2011. doi:10.1093/oxfordhb/9780195342819.013.0009

32. Stimpfel AW, Sloane DM, Aiken LH. The Longer The Shifts For Hospital Nurses, The Higher The Levels Of Burnout And Patient Dissatisfaction. Health Aff (Millwood). 2012;31(11):2501-2509. doi:10.1377/hlthaff.2011.1377

33. Jones P. Networktools: Tools for Identifying Important Nodes in Networks.; 2019. https://CRAN.R-project.org/package=networktools. Accessed January 30, 2020.

34. Tibshirani R. Regression Shrinkage and Selection Via the Lasso. J R Stat Soc Ser B
Methodol. 1996;58(1):267-288. doi:10.1111/j.2517-6161.1996.tb02080.x

35. Epskamp S, Waldorp LJ, Mõttus R, Borsboom D. The Gaussian Graphical Model in Cross-Sectional and Time-Series Data. *Multivar Behav Res*. 2018;53(4):453-480. doi:10.1080/00273171.2018.1454823

36. Epskamp S, Fried EI. A tutorial on regularized partial correlation networks. *Psychol Methods*. 2018;23(4):617-634. doi:10.1037/met0000167

37. Epskamp S, Borsboom D, Fried EI. Estimating psychological networks and their accuracy: A tutorial paper. *Behav Res Methods*. 2018;50(1):195-212. doi:10.3758/s13428-017-0862-1

38. Haslbeck JMB, Waldorp LJ. mgm: Estimating Time-Varying Mixed Graphical Models in High-Dimensional Data. *ArXiv151006871 Stat*. February 2020. http://arxiv.org/abs/1510.06871. Accessed April 26, 2020.

39. Epskamp S, Cramer AOJ, Waldorp LJ, Schmittmann VD, Borsboom D. qgraph: Network Visualizations of Relationships in Psychometric Data. *J Stat Softw*. 2012;48(4). doi:10.18637/jss.v048.i04

40. WHO World Mental Health Survey Consortium. Prevalence, Severity, and Unmet Need for Treatment of Mental Disorders in the World Health Organization World Mental Health Surveys. *JAMA*. 2004;291(21):2581. doi:10.1001/jama.291.21.2581

41. Tan C-C. SARS in Singapore--key lessons from an epidemic. *Ann Acad Med Singapore*. 2006;35(5):345-349.

42. Velando /i2/Soriano A, Ortega /i2/Campos E, Gómez /i2/Urquiza JL, Ramírez /i2/Baena L, De La Fuente EI, Cañadas /i2/De La Fuente GA. Impact of social support in preventing burnout syndrome in nurses: A systematic review. *Jpn J Nurs Sci*. 2020;17(1). doi:10.1111/jjns.12269

43. Johnson JV, Hall EM. Job strain, work place social support, and cardiovascular disease: a cross-sectional study of a random sample of the Swedish working population. *Am J Public Health*. 1988;78(10):1336-1342. doi:10.2105/AJPH.78.10.1336

44. Häusser JA, Mojzisch A, Niesel M, Schulz-Hardt S. Ten years on: A review of recent research on the Job Demand–Control (-Support) model and psychological well-being. *Work Stress*. 2010;24(1):1-35. doi:10.1080/02678371003683747

45. McLean CP, Asnaani A, Litz BT, Hofmann SG. Gender differences in anxiety disorders: Prevalence, course of illness, comorbidity and burden of illness. *J Psychiatr Res*. 2011;45(8):1027-1035. doi:10.1016/j.jpsychires.2011.03.006

46. Hostettler S, Kraft E. FMH-Ärztestatistik 2019 – hohe Abhängigkeit vom Ausland. *Schweiz Ärzteztg*. March 2020. doi:10.4414/saez.2020.18725
Table 1
Demographics, Work Characteristics, and COVID-19 Exposure of 1410 Health Care Workers.

| Variable                                | Overall (N = 1410) | Median | IQR  |
|-----------------------------------------|--------------------|--------|------|
| Demographics                            |                    |        |      |
| Age in years\(^a\)                      | 34                 | 29-46  |      |
| Women, n (%)                            | 934                | 66.2   |      |
| Professional experience in years\(^b\) | 10                 | 4-20   |      |
| Nurses, n (%)                           | 553                | 39.2   |      |
| Physicians, n (%)                       | 857                | 60.8   |      |
| German speaking, n (%)                  | 1124               | 79.7   |      |
| French speaking, n (%)                  | 143                | 10.1   |      |
| Italian speaking, n (%)                 | 143                | 10.1   |      |
| Work Characteristics                    |                    |        |      |
| Total working hours in the previous 7 days | 45                 | 36-54  |      |
| Total working hours per week prior to the pandemic\(^c\) | 45             | 40-50  |      |
| Working more during the pandemic than before, n (%)\(^d\) | 572           | 40.6   |      |
| Working less during the pandemic than before, n (%)\(^e\) | 416           | 29.5   |      |
| Average number of sleep hours in the previous 7 days\(^f\) | 7                | 6-7.5  |      |
| Having access to medical equipment      | 5                  | 3-6    |      |
| Perceived support by employer\(^g\)     | 6                  | 4-7    |      |
| Perceived support by authorities        | 5                  | 3-6    |      |
| Perceived passage of information by employer\(^h\) | 6              | 4-7    |      |
| Perceived passage of information by authorities | 5              | 4-6    |      |
| COVID-19 Exposure                       |                    |        |      |
| Had suspected COVID-19 symptoms or tested positive for SARS-CoV-2, n (%) | 197              | 14.0   |      |
| Was exposed to suspected or confirmed COVID-19 patients at work, n (%) | 1103            | 78.2   |      |
| Worked in at clinical unit designated to diagnosis and treatment of patients with suspected or confirmed COVID-19, n (%) | 655              | 46.5   |      |

Note.
\(^a\) N = 1408; \(^b\) N = 1384; \(^c\) N = 1353; \(^d\) N = 1334; \(^e\) N = 1282; \(^f\) N = 1290
Table 2
Mental Health of 1410 Health Care Workers and Comparison Across Different Subgroups.

|                         | Gender | Profession | Workplace | Exposure to COVID-19 Patients |
|-------------------------|--------|------------|-----------|-------------------------------|
|                         | Overall (N = 1410) | Women (n = 934) | Men (n = 476) | Effect size | Nurses (n = 553) | Physicians (n = 857) | Effect size | Frontline (n = 655) | Secondline (n = 755) | Effect size | Yes (n = 1103) | No (n = 307) | Effect size |
| Anxiety                 | 6 (3-10) | 6 (4-10.75) | 4 (3-8)*** | -.197 | 7 (4-10) | 5 (3-9)*** | -.144 | 6 (3-11) | 5 (3-9)** | -.095 | 6 (3-10) | 5 (3-8)*** | -.157 |
| Depression              | 5 (2-9) | 6 (3-9) | 4 (2-7)*** | -.167 | 6 (3-9) | 5 (2-8)*** | -.142 | 6 (3-10) | 4 (2-8)** | -.145 | 6 (3-9) | 4 (1-7)*** | -.218 |
| Burnout                 | 4 (2-6) | 4 (2-6) | 4 (2-6) | 4 (2-7) | 4 (2-6)* | -.076 | 5 (2-7) | 3 (2-6)** | -.200 | 4 (2-7) | 3 (1-5)*** | -.251 |

Note.
ES = Effect Size; Effect size is measured as a rank-biserial-correlation; Burnout = Overall burnout symptom score; Anxiety = Overall GAD-7 score; Depression = Overall PHQ-9 score.
* p < 0.05, ** p < 0.01, *** p < 0.001
Figure 1

Relationships between demographics, work characteristics, COVID-19 exposure, and symptoms of anxiety, depression, and burnout.

Note. Nodes represent variables; Edges represent partial correlations (blue = positive, red = negative, thickness = magnitude of the correlation); Women = Gender (Levels: Men = 1, Women = 2); Exp. = Professional experience in years; Nurse = Nursing Staff (Variable = Profession, Levels: Physician = 1, Nurse = 2); W.Hours = Total working hours in the previous 7 days; Support = Perceived support by employer; Patients = Exposure to suspected or confirmed COVID-19 patients at work (Levels: No=0, Yes= 1); Ward = Working in clinical unit designated to diagnosis and treatment of patients with suspected or confirmed COVID-19 (Levels: No=0, Yes= 1); Burnout = Overall burnout symptom score; Anxiety = Overall GAD-7 score; Depression = Overall PHQ-9 score.

Reading example. Years of working experience is partially correlated positive with being a nurse (instead of a physician) and with overall anxiety measured with the GAD-7, and partially correlated negative with overall burnout and with working on a designated COVID-19 ward.
Supplementary Materials for

Health Care Workers' Mental Health During the First Weeks of the SARS-CoV-2 Pandemic in Switzerland – A Cross-Sectional Study
Table S1
Demographics, Work Characteristics, and COVID-19 Exposure Across Different Subgroups

| Demographics                                                                 | Overall (N = 1410) | Gender                                                                 | Women (n = 934) | Men (n = 476) | Effect size |
|------------------------------------------------------------------------------|-------------------|----------------------------------------------------------------------|----------------|--------------|------------|
| Effect size                                                                  |                   |                                                                      |                |              |            |
| Demographics                                                                 |                   |                                                                      |                |              |            |
| Age in years median (IQR)                                                   | 34 (29-46)        | 34 (29-45)                                                           | 35 (30-47)**   | .085         |            |
| Women, n (%)                                                                | 476 (33.8)        | 10 (4-20)                                                            | 10 (4-20)      | 9 (3-20)     |            |
| Professional experience in years, median (IQR)                               | 10 (4-20)         |                                                                      | 10 (4-20)      | 9 (3-20)     |            |
| Work characteristics                                                         |                   |                                                                      |                |              |            |
| Total working hours in the previous 7 days, median (IQR)                     | 45 (36-54)        | 43 (34-50)                                                           | 50 (42-58.5)***| .256         |            |
| Total working hours per week prior to the pandemic, median (IQR)             | 45 (40-50)        | 42 (33.3-50)                                                         | 50 (43-55)***  | .418         |            |
| Working more during the pandemic than before, n (%)                         | 572 (40.6)        | 387 (41.3)                                                           | 185 (38.9)     |              |            |
| Working less during the pandemic than before, n (%)                         | 416 (29.5)        | 254 (27.2)                                                           | 162 (34.0)*    |              |            |
| Average number of sleep hours in the previous 7 days, median (IQR)           | 7 (6-7.5)         |                                                                      | 7 (6-7.5)      | 7 (6-7)      |            |
| Having access to medical equipment, median (IQR)                             | 5 (3-6)           |                                                                      | 5 (3-6)        | 5 (3-6)**    | .087       |
| Perceived support by employer, median (IQR)                                 | 6 (4-7)           |                                                                      | 6 (4-7)        | 6 (4-6)      |            |
| Perceived support by authorities, median (IQR)                               | 5 (3-6)           |                                                                      | 5 (3-6)        | 5 (3-6)      |            |
| Perceived passage of information by employer, median (IQR)                  | 6 (4-7)           |                                                                      | 6 (4-7)        | 6 (5-7)      |            |
| Perceived passage of information by authorities, median (IQR)               | 5 (4-6)           |                                                                      | 6 (4-6)        | 5 (4-6)      |            |
| COVID-19 Exposure                                                            |                   |                                                                      |                |              |            |
| Had suspected COVID-19 symptoms or tested positive for SARS-CoV-2, n (%)     | 197 (14.0)        | 125 (13.4)                                                           | 72 (15.1)      |              |            |
| Was exposed to suspected or confirmed COVID-19 patients at work, n (%)       | 1103 (78.2)       |                                                                      | 712 (76.2)     | 391 (82.1)** |            |
| Worked in at clinical unit designated to diagnosis and treatment of patients | 655 (46.5)        |                                                                      | 412 (45.1)     | 234 (49.2)   |            |

Note.
^N = 1408, Women = 932, Men = 476, Nurses = 551, Physicians = 857, Frontline = 654, Secondline = 754, COVID-19 Pat. exposure = 1101, No Exp. = 307;  
^N = 1384, Women = 915, Men = 469, Nurses = 536, Physicians = 848, Frontline = 643, Secondline = 741, COVID-19 Pat. exposure = 1083, No Exp. = 301;  
^N = 1410, Women = 934, Men = 476, Nurses = 553, Physicians = 857, Frontline = 655, Secondline = 755, COVID-19 Pat. exposure = 1103, No Exp. = 307;  
^N = 1353, Women = 887, Men = 466, Nurses = 528, Physicians = 825, Frontline = 622, Secondline = 731, COVID-19 Pat. exposure = 1057, No Exp. = 296;  
^N = 1334, Women = 873, Men = 461, Nurses = 501, Physicians = 833, Frontline = 613, Secondline = 721, COVID-19 Pat. exposure = 1044, No Exp. = 290;  
^N = 1282, Women = 865, Men = 417, Nurses = 536, Physicians = 746, Frontline = 631, Secondline = 651, COVID-19 Pat. exposure = 1027, No Exp. = 255;  
^N = 1290, Women = 866, Men = 424, Nurses = 534, Physicians = 756, Frontline = 640, Secondline = 620, COVID-19 Pat. exposure = 1037, No Exp. = 253;

Effect size is measured as a rank-biserial-correlation. *p < 0.05, **p < 0.01, ***p < 0.001
Table S1 (continued)

| Profession          | Workplace | Exposure to COVID-19 Patients |
|---------------------|-----------|-------------------------------|
| Nurses (n= 553)     | Frontline (n= 655) | Yes (n= 1103) |
| Physicians (n= 857) | Secondline (n= 755) | No (n= 307) |

**Demographics**

| Age in years, median (IQR) | Effect size | Nurses | Physicians | Frontline | Secondline | Yes | No |
|----------------------------|-------------|--------|------------|-----------|------------|-----|----|
| 37 (29-48)                 | .320        | 34 (29-45) | 32 (29-41) | 38 (30-50)*** | .260 | 33 (29-44) | 41 (31-52)*** |
| 477 (86)                   | .284        | 457 (53.3)*** | 421 (64.3) | 513 (67.9) | 712 (64.6) | 222 (72.3)* |
| Professional experience in years, median (IQR) | .265        | 14 (7-25) | 7 (3-15) | 14 (5-25)*** | 33 (29-44) | 16 (6-26)*** |

**Work characteristics**

| Total working hours in the previous 7 days, median (IQR) | Effect size | Nurses | Physicians | Frontline | Secondline | Yes | No |
|---------------------------------------------------------|-------------|--------|------------|-----------|------------|-----|----|
| 42 (34-50)                                              | .227        | 50 (40-55)*** | 50 (40-57) | 42.5 (30-50)*** | -.259 | 48 (40-55) | 40 (25-48)*** |
| 40 (30-42)                                              | .687        | 50 (45-55)*** | 48 (40-50) | 42 (34-50)*** | -.161 | 45 (40-50) | 42 (30-50)*** |
| Working more during the pandemic than before, n (%)    | .265        | 309 (58.5) | 263 (31.9)*** | 304 (46.4) | 268 (35.5)*** | 490 (46.4) | 82 (27.7)*** |
| Working less during the pandemic than before, n (%)    | .265        | 71 (13.4) | 345 (41.8)*** | 163 (24.9) | 253 (33.5)*** | 298 (28.2) | 118 (39.9)*** |
| Average number of sleep hours in the previous 7 days, median (IQR) | .143        | 6 (6-7) | 7 (6-7.5)*** | 7 (6-7.5) | 7 (6-7.5) | 7 (6-7) | 7 (6-8) |
| Having access to medical equipment, median (IQR)       | .128        | 4 (3-6) | 5 (3-6)*** | 5 (3-6) | 5 (3-6) | 5 (3-6) | 5 (3-6) |
| Perceived support by employer, median (IQR)            | .115        | 5 (4-6) | 6 (4-7)*** | 6 (4-6) | 6 (4-7) | 6 (4-6)* | .6 (5-7)* |
| Perceived support by authorities, median (IQR)         | .116        | 5 (3-6) | 5 (3-6)*** | 5 (3-6) | 5 (3-6) | 5 (3-6) | 5 (3-6) |
| Perceived passage of information by employer, median (IQR) | .079        | 6 (4-7) | 6 (5-7)* | 6 (4-7) | 6 (5-7) | 6 (4-7) | 6 (5-7)** |
| Perceived passage of information by authorities, median (IQR) | .079        | 5 (4-6) | 6 (4-6) | 5 (4-6) | 6 (4-6) | 5 (4-6) | 6 (5-6.5)* |

**COVID-19 Exposure**

| Had suspected COVID-19 symptoms or tested positive for SARS-CoV-2, n (%) | Effect size | Nurses | Physicians | Frontline | Secondline | Yes | No |
|------------------------------------------------------------------------|-------------|--------|------------|-----------|------------|-----|----|
| 76 (13.7)                                                              | .128        | 121 (14.1) | 89 (13.6) | 108 (14.3) | 162 (14.7) | 35 (11.4) |
| Was exposed to suspected or confirmed COVID-19 patients at work, n (%) | .116        | 416 (75.2) | 688 (80.2)* | 627 (95.7) | 476 (63.0)*** |
| Worked in at clinical unit designated to diagnosis and treatment of patients with suspected or confirmed COVID-19, n (%) | .128        | 240 (43.3) | 415 (48.4) | 627 (56.8) | 28 (9.1)*** |

Table S2

Clinically Relevant Symptoms of Anxiety and Depression of 1410 Health Care Workers Across Different Subgroups
| Gender | Profession | Workplace | Exposure to COVID-19 Patients |
|--------|------------|-----------|-----------------------------|
| Overall (N = 1410) | Women (n = 934) | Men (n = 476) | Effect size | Nurses (n = 553) | Physicians (n = 857) | Effect size | Frontline (n = 655) | Secondline (n = 755) | Effect size | Yes (n = 1103) | No (n = 307) | Effect size |
| Anxiety | 6 (3-10) | 6 (4-10.75) | 4 (3-8)*** | .197 | 7 (4-10) | 5 (3-9)*** | -.144 | 6 (3-11) | 5 (3-9)** | .095 | 6 (3-10) | 5 (3-8)*** | .157 |
| Depression | 5 (2-9) | 6 (3-9) | 4 (2-7)*** | -.167 | 6 (3-9) | 5 (2-8)*** | -.142 | 6 (3-10) | 4 (2-8)*** | -.145 | 6 (3-9) | 4 (1-7)*** | -.218 |
| Burnout | 4 (2-6) | 4 (2-6) | 4 (2-6) | 4 (2-7) | 4 (2-6)* | .076 | 5 (2-7) | 3 (2-6)*** | -.200 | 4 (2-7) | 3 (1-5)*** | -.251 |

* p < 0.05, ** p < 0.01, *** p < 0.001

Note. Effect size is measured as a rank-biserial-correlation; Clinically relevant anxiety = overall GAD-7 score ≥ 10; Clinically relevant depression = overall PHQ-9 score ≥ 10.
Figure S1

Bootstrap edge weights difference test between non-zero estimated edge-weights in the network shown in Figure 1.

Note. Bootstrapped difference tests ($\alpha = 0.05$) between edge-weights that were non-zero in the network; Black boxes indicate significant differences between two edges, non-significant differences are indicated by grey boxes; the colour of the boxes (ranging from white to blue) corresponds to the magnitude of the edge.

Gender (Levels: Men = 1, Women = 2); Exp. = Professional experience in years; Prof = Profession (Levels: Physician = 1, Nurse = 2); W.Hours = Total working hours in the previous 7 days; Support = Perceived support by employer; Exp.Pat. = Exposure to suspected or confirmed COVID-19 patients at work (Levels: No=0, Yes= 1); C.Sta = Working in clinical unit designated to diagnosis and treatment of patients with suspected or confirmed COVID-19 (Levels: No=0, Yes= 1); Burnout = Overall burnout symptom score, Anxiety = Overall GAD-7 score, Depression = Overall PHQ-9 score.
Figure S2

Bootstrap 95% confidence intervals for estimated edge weights of the network.

| Bootstrap mean | Sample |
|----------------|--------|
| edge           |        |

Each edge is represented by a horizontal line; Edge weights are represented by the red line; The grey area indicated the 95% confidence intervals.

Gender (Levels: Men = 1, Women = 2); Exp. = Professional experience in years; Prof = Profession (Levels: Physician = 1, Nurse = 2); W.Hours = Total working hours in the previous 7 days; Support = Perceived support by employer; Exp.Pat. = Exposure to suspected or confirmed COVID-19 patients at work (Levels: No=0, Yes= 1); C.Sta = Working in clinical unit designated to diagnosis and treatment of patients with suspected or confirmed COVID-19 (Levels: No=0, Yes= 1); Burnout = Overall burnout symptom score, Anxiety = Overall GAD-7 score, Depression = Overall PHQ-9 score.