The Impact of Physicians’ COVID-19 Pandemic Occupational Experiences on Mental Health

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Objective: To examine the association between a number of negative COVID-19 occupational stressors and probable anxiety, depression, and PTSD among physicians. Methods: Cross-sectional examination of longitudinal registry data consisting of physician personal and occupational well-being. Multivariable logistic regressions were performed to determine the association between negative COVID-19 experiences and outcomes. Results: Of the 620 eligible physicians, approximately half were female (49%), and 71% white with a mean age of 46.51 (SD = 13.28). A one-point increase in negative experience score was associated with a 23% increase in probable anxiety (OR = 1.23, 95% CI: 1.14–1.34), a 23% increase in probable depression (OR = 1.23, 95% CI: 1.13–1.33), and a 41% increase in probable PTSD (OR = 1.41, 95% CI: 1.30–1.52). Conclusions: Negative pandemic experiences were strongly associated with adverse mental health outcomes while greater resilience was protective.

Keywords: anxiety, COVID-19, depression, physicians, posttraumatic stress disorder

It has been over 1 year since the beginning of the COVID-19 pandemic during which healthcare workers (HCW) have faced prolonged alarming demands in patient care. As of June 2021, the United States alone has surpassed 33 million confirmed cases and over 600,000 deaths. New York (NY), the epicenter of the first wave, has accumulated nearly 100,000 cases, with New York City alone being responsible for over 44% of said cases. Recent literature has indicated that COVID-19 related exposures (ie, negative occupational COVID-19-related experiences), specifically experienced among frontline HCWs, have negative psychological implications, including increases in stress, anxiety, depression, and burnout. This is concerning, particularly among physicians, who are already at heightened risk for adverse psychological outcomes due to the nature of their occupation, irrespective of COVID-19. In COVID-19 studies among U.S. physicians, the prevalence of anxiety and depression were as high as 30% and 38%, respectively. Further, in the one study assessing symptoms of posttraumatic stress disorder (PTSD), 40% of physician respondents demonstrated elevated symptoms. These mental health outcomes have also been reported to be higher among those who work in high exposure risk settings, such as in those with direct contact with COVID-19 positive patients. Female physicians and those earlier in their careers (ie, residents and fellows) have also been reported to be disproportionately impacted by COVID-19 related experiences.

The studies examining COVID-19 exposure and mental health outcomes are limited in their assessment of healthcare worker-specific occupational exposures during the pandemic. To date, occupational exposures to COVID-19 have predominantly been measured as a binary assessment, primarily focusing on whether HCWs have treated patients with COVID-19. The best of our knowledge, no studies have investigated COVID-19 occupational exposures represented as an impact score and then evaluated how these cumulative exposures or impacts relate to measures of providing mental health. One study did collect other COVID-19 exposure variables, including high versus low-risk clinical working environments and personal and familial stressors, but did not assess specific occupational stressors and experiences, such as adequate/inadequate personal protective equipment, negative interactions with colleagues and staff, and witnessing patient deaths, which have all been identified as significant occupational stressors currently faced by HCWs. There is a need to assess COVID-19 occupational exposures in a more systematic and consistent manner to effectively understand their impact on physician mental health.

In addition to understanding the impact of COVID-19 occupational stressors and experiences on physician mental health...
outcomes, it is also important to consider what may reduce, or moderate these impacts. It has been widely reported that resilience and social support are protective against adverse mental health outcomes in the presence of stress.\textsuperscript{19–21} Among physicians specifically, resilience has been associated with reduced stress and higher professional quality of life.\textsuperscript{22–24} Organizational social support has been also known to be effective in reducing stress and burnout.\textsuperscript{25–28} COVID-19 impact studies have yet to incorporate provider resilience and organizational support as potential moderators of mental health outcomes.\textsuperscript{29–31} A better understanding of factors that protect against the negative impacts of a pandemic can help inform the development of future strategies to support healthcare workers during a pandemic.

The objective of this study is to examine the association between the number of COVID-19 reported occupational experiences and anxiety, depression, and PTSD symptoms among physicians across a large, diverse health system disproportionately impacted during the first peak of the pandemic in the spring of 2020. It is hypothesized that physicians with more reported pandemic-related negative occupational experiences will have higher levels of mental health symptoms. We aim to address previous limitations by utilizing a cumulative exposure measure specifically designed to capture the many elements of COVID-19 occupational stressors and experiences. This is also the first study to investigate if associations between COVID-19 occupational experiences and mental health outcomes are modified by resilience, occupational support, and utilization of organizational well-being resources. Understanding the impact of negative occupational experiences during the pandemic on physicians’ mental health is critical to address ongoing provider well-being concerns and information gained can help inform interventions aimed at mitigating stress and attenuating adverse mental health outcomes.

METHODS

Study Design and Participants

We conducted a cross-sectional examination of pre-existing, longitudinal registry data of physicians across a diverse NY health system. The purpose of the registry was to assess healthcare providers personal and occupational well-being as it relates to the COVID-19 pandemic. Physicians were one of the various cohorts of healthcare providers included, and participation was voluntary. The registry consists of a baseline assessment, in addition to prospective data collections to evaluate changes over time. However, for the purpose of this study, we only analyzed data from the baseline assessments among physicians. Baseline assessments were conducted specifically among physicians between June 21 and August 21, 2020, and evaluated COVID-19 exposures from the three preceding months (March–May 2020) via an electronic questionnaire. Participants eligible for study measurements, including COVID-19-related exposures, potential modifiers, and mental health outcomes were contained within the baseline questionnaire. Participants eligible for study inclusion included physicians (attending, resident, or fellow) who were employed by or were affiliated with the health system during March and August of 2020 and were able to electronically consent for participation. Individuals who were either unable to electronically consent or not employed or affiliated during the aforementioned time frame were excluded. Of the 12,542 eligible physicians who were sent the baseline questionnaire, 620 completed it, resulting in a 4.9% participation rate. All registry data are stored and maintained by an institutional department. The current study was reviewed by an Institutional Review Board and was determined to be of exempt status.

Primary Predictor

To measure the extent of COVID-related negative impacts and experiences among our sample, we utilized the Supplemental Healthcare Module of the Epidemic-Pandemic Impact Inventory (EPII-SHMb). The larger 92-item version of the EPII was recently developed by Grasso et al in response to the COVID-19 pandemic to understand both the positive and negative impacts of the pandemic on various areas of personal and family life among non-healthcare workers.\textsuperscript{32} Although it is not currently validated, it is the most comprehensive tool to date that has been widely used since the beginning of the pandemic with initial psychometric properties reported on the larger inventory.\textsuperscript{33–35} For the purposes of the registry, we used the brief version of the Healthcare Module that was developed for use among healthcare worker populations.\textsuperscript{36} This adaptation contains 25-items that examine the many ways in which frontline healthcare workers may have been impacted by the pandemic due to their occupational setting. For the purposes of the current study, we used the first sixteen items which query potential negative occupational impacts that healthcare workers may have experienced since the start of the COVID-19 pandemic. An example item is: “Deaths of patients despite heroic efforts by the treatment team.” Each item is measured dichotomously, with a positive endorsement resulting in one point, and a negative or non-applicable resulting in zero points for a potential score (EPII score) ranging from 0 to 16 (Cronbach alpha = 0.77).

Outcomes

Our outcomes included validated measures assessing anxiety, depression, and PTSD symptoms. Anxiety and depression symptoms were measured using the Patient Health Questionnaire-4 (PHQ-4), which has been widely validated.\textsuperscript{42} Of the four total questions, two items correspond to an anxiety subscale, and two to a depression subscale. Survey items assess symptoms experienced over the last 2 weeks on a 4-point Likert scale, responses ranging from “0-Not at all” to “3-Nearly every day.” PHQ-4 anxiety and depression subscales have separate ranges of 0 to 6 with a score of 3 or greater defined as probable anxiety or depression.\textsuperscript{43} PTSD was measured utilizing the 5-item Primary Care PTSD Screen for the DSM-5 (PC-PTSD-5) which assesses recent exposure to traumatic events.\textsuperscript{44} The PC-PTSD-5 contains five yes/no questions, with any positive endorsement resulting in 1-point, and any negative endorsement resulting in 0 points for each question. All positive responses are summed to a total score, with a range of 1 to 5. Scores of 3 or higher were indicative of probable PTSD.\textsuperscript{45}

Moderators

Potential moderators of the association between COVID HCW negative impacts and the three mental health outcomes were resilience, perceived occupational support, and utilization of workplace well-being resources. Resilience was assessed by the Brief Resilience Scale (BRS).\textsuperscript{46} The BRS is a 6-item scale that assess one’s perceived ability to “bounce back” after stressful or difficult experiences. Each item on the BRS has responses between 1 and 5 (1 = Strongly Disagree to 5 = Strongly agree). Items were averaged to create the resilience score (range: 1–5), with higher scores indicating higher levels of resilience. We assessed organizational support via two separate questions, one inquiring about perceived workplace support and the other the assessed the number of organizational provided well-being resources utilized by participants. Perceived occupational support was measured using the question, “On a scale of 1–5, how often did you feel supported at work?” with 5 choices ranging from 1: Not Supported to 5: Completely Supported. This measure was further dichotomized into the binary variable indicating 1: Somewhat/Completely Supported and 0: Neutral To Not Supported. Use of organizational well-being resources was defined...
as whether a participant reported that they utilized any workplace-sponsored well-being program (yes/no). See Supplemental Material, http://links.lww.com/JOM/A987 for distributions of use.

Other Measures

Demographic variables were collected and included age, gender, race, Hispanic ethnicity (yes/no), and partner status. We also collected physician occupational descriptors including the level of training, provision of direct COVID-19 care, redeployment status—defined as deployment to a COVID-19 clinical area that is not typically where they see patients and in-patient familiarity which was based on medical specialty. Physicians were considered to be familiar with adult inpatient medicine if they reported a specialty in medicine (ie, critical care, cardiology, gastroenterology, geriatric medicine, hematology/oncology, infectious disease, and pulmonary medicine), family medicine, or emergency medicine.

Statistical Analysis

Proportions of probable anxiety, probable depression, and probable PTSD were compared by study variables. Two sample t-tests were used to compare mean age and mean EPII score among those with and without probable anxiety, depression, and PTSD. Chi-square test was used to assess associations between outcomes and categorical study variables.

Separate multivariable logistic regressions were performed to determine the association between EPII score and mental health outcomes. Candidate variables to include in the model were EPII score, BRS score, use of organizational well-being resources, occupational support, redeployment status, level of training, gender, race, Hispanic ethnicity, partner status, inpatient medicine familiarity based on specialty, and provision of direct COVID patient care. Variables were chosen by the study team based on known previous risk factors of mental health outcomes. Observations with responses for gender = “prefer not to answer” (n = 2) and partner status = “other” (n = 7) were excluded from modeling analyses due to low frequencies. VIF was calculated and indicated no collinearity (all VIF < 5). To create a model which does not overfit the data, the variable selection was first performed using LASSO regression. For each outcome, variables selected in the LASSO regression which yielded the lowest mean squared error were retained for the final model. Then final logistic regression models including only the selected variables were performed to obtain effect estimates. Interactions between EPII score and each potential moderator (BRS score, occupational support, and use of organizational well-being resources) were also tested to determine whether there were differential effects of EPII score on outcomes due to these subgroups and if significant, they were also included in the final models. Adjusted odds ratios (OR) and 95% confidence intervals (CI) were presented. Analyses were conducted utilizing SAS version 9.4 (SAS Institute).

RESULTS

Of the 620 physicians in the study, the mean age was 46.51 (SD = 13.28) (Table 1). The majority were White (71.0%) and non-Hispanic (89.3%). About half were female (48.8%). These demographics generally reflect those of physicians in the larger health system although we had slightly higher proportions of female and White participants. Overall utilization of organizational resources was 14.2%. We further examined utilization by volunteer status and frequencies of use were similar (10.4% vs 11.8%; data not in tabular format). Mean EPII score was 7.11 (SD = 3.53) and was higher among those who had probable anxiety, probable depression, and probable PTSD. Several individual EPII items were commonly associated with all three mental health outcomes; namely, risk of contracting COVID-19, contact with patients’ distressed family members, and family/friends not understanding exhaustion caused by work (Figure 1).

Unadjusted analyses indicated that participants with a higher EPII score, low to neutral occupational support (vs high support), and higher utilization of organizational well-being resources (vs no utilization) had higher proportions of all mental health outcomes. Resilience, as measured by the BRS score, was also lower among those who had probable anxiety, probable depression, and probable PTSD.

Multivariable logistic regression models were fitted using >90% of the sample.

An increase in the EPII score, meaning an increase in one of the listed COVID-19 negative impacts from the EPII instrument, was associated with a 23% increase (95% CI: 1.14–1.34) in probable anxiety, a 23% increase (95% CI: 1.13–1.33) in probable depression, and a 41% increase (95% CI: 1.30–1.52) in probable PTSD while controlling for other factors from their respective models (Table 2). The interactions between EPII score and potential moderators (resilience, occupational support, and use of organizational well-being resources) were not significant and therefore the interactions were not included in the final models. This suggests that resilience and support do not modify the relationship between EPII and outcomes. There were, however, strong individual associations between resilience and outcomes. A one-unit increase in BRS score was associated with 46% and 54% protection in mental health outcomes. In addition, perceived lack of occupational support was associated with a two-fold increased odds of probable anxiety.

DISCUSSION

This is the first study to date to assess the relationship between the degree of COVID-19-specific healthcare worker impacts, as measured by EPII score, on three key mental health outcomes typically associated with traumatic stress exposure—probable anxiety, probable depression, and probable PTSD. The EPII score can be considered a measure of the burden of COVID-19 exposure since items are summed to create the score. In our study, the EPII score was a strong predictor of each mental health outcome studied, even after controlling for other important variables.

Though some physicians in our sample have been in the position of returning to pre-pandemic routines, others have continued to serve on the frontlines and may have been impacted more severely by ongoing exposure (as measured by EPII). Our findings suggest a need to target those with the greatest exposure for more support, including exposure from the initial surge and from the potential stressors of ongoing care delivery. Furthermore, the association between exposure and mental health outcomes was strongest for probable PTSD. PTSD is often comorbid with depression and anxiety.46,47 and these results suggest strong consideration of targeting PTSD when considering interventions.

As measured by the EPII, factors such as fear of contagion, death of patients despite all efforts, circumstances involving contact with a distressed family member and the inability of friends and family to understand physician’s physical and emotional exhaustion ranked as top concerns for adverse mental health outcomes. This supports recent research findings which indicate that factors primarily relating to emotional trauma from treating COVID-19 patients are the prominent concern of HCW.48 Future research should focus efforts on understanding whether there are specific factor structures within the EPII that may be more strongly associated with mental health as compared to others.

We were surprised that measures of resilience did not moderate the impact of exposure on mental health outcomes. However, consistent with other studies29,49 we were able to demonstrate that resilience was protective against all of the negative mental health outcomes in that it was independently associated with symptoms of depression, anxiety, and PTSD. This would suggest that interventions that bolster the resilience of the workforce will be critical in protecting against the mental health sequelae of healthcare workers.
Variable Total, No. (%)

| Age, mean (SD) | 46.51 (13.28) |
|---------------|---------------|
| Gender
| Female  | 300 (48.8) |
| Male | 313 (50.9) |
| Prefer not to answer | 2 (0.3) |
| Race
| White only | 434 (71.0) |
| Asian only | 116 (19.0) |
| Black/African American | 18 (2.9) |
| Other/multiple races | 43 (7.0) |
| Hispanic ethnicity
| Yes | 65 (10.7) |
| No | 542 (89.3) |
| Partner status
| Single/separated/divorced/widowed | 144 (23.4) |
| Other | 7 (1.1) |
| Married/engaged | 464 (75.4) |
| Redeployed
| No | 449 (72.4) |
| Yes | 171 (27.6) |
| Did you directly care for patients with COVID-19 or suspected of having COVID-19?
| No | 126 (20.3) |
| Yes | 494 (79.7) |
| Trainee status
| Attending | 491 (79.2) |
| Fellow | 33 (5.3) |
| Resident | 96 (15.5) |
| Inpatient medicine familiarity
| Yes | 204 (33.1) |
| No | 412 (66.9) |
| EPII Score, mean (SD) | 7.11 (3.53) |
| Brief Resilience Score, mean (SD) | 3.87 (0.77) |
| Occupational support
| Not supported/neutral | 135 (22.1) |
| Somewhat/complete supported | 477 (77.9) |
| Use of organizational well-being resources
| Yes | 88 (14.2) |
| No | 532 (85.8) |

SD, standard deviation; EPII, Epidemic-Pandemic Impacts Inventory; PTSD, posttraumatic stress disorder.

*Total and percents based on non-missing data.

During the pandemic, further, the finding that a perceived lack of organizational support was associated with a greater mental health burden, specifically with anxiety in the multivariable analysis, is important as perceived organizational support has been considered protective against burnout and poor mental health outcomes. Providing and communicating psychological supports in a manner that is well-received by physicians (and all HCWs) is an important area for intervention and maybe a key target for resilience-building. Peer supports, in particular, have been identified as an important mechanism to support HCW and may offer the dual benefit of increasing perceptions of support to enhance resilience while addressing distress as well.

The use of organizational well-being resources was not associated with mental health outcomes in the multivariable models. Only 14% of the sample used any service and the potential options ranged widely from daily wellness posts to the utilization of the Employee Assistance Program (EAP) for individual mental health-care with a professional. It is possible that there is a more nuanced impact of the use of services in which those who had greater mental health symptoms were more likely to use services such as EAP, but small sample sizes prevent us from examining those associations. As more well-being resources are being offered and made easily accessible to physicians, it will be important to continue to track utilization over time to determine whether the use of such resources impacts mental health symptoms longitudinally.

**Limitations**

Several limitations should be noted. This is a cross-sectional study and temporal relationships cannot be ascertained. Responses were also collected after the first surge of the COVID-19 pandemic for NY and responses should be interpreted with respect to this timeframe. Also, study results may not generalize to all physicians and our sample was only a fraction of the larger sampling frame. Our time frame. Also, study results may not generalize to all physicians and our sample was only a fraction of the larger sampling frame. Our lower than anticipated response rate may not accurately represent the underlying population of physicians, which may have led to over or underestimations of true estimates. Although age was distributed similarly in our sample compared to those within the greater health system, females and whites were more represented in our sample.

**TABLE 1.** Characteristics of Study Sample Compared by Mental Health Outcomes

| Variable | Probable Anxiety | Probable Depression | Probable PTSD |
|----------|------------------|---------------------|---------------|
| Total, No. (%) | 47.20 (13.34) | 47.18 (11.71) | 47.25 (15.33) |
| No, No. (%) | 43.02 (11.90) | 33.10 (10.7) | 33.10 (10.7) |
| Yes, No. (%) | 46.29 (13.3) | 33.10 (10.7) | 33.10 (10.7) |
| Total, No. (%) | 47.18 (11.71) | 47.18 (11.71) | 47.25 (15.33) |
| No, No. (%) | 43.02 (11.90) | 33.10 (10.7) | 33.10 (10.7) |
| Yes, No. (%) | 46.29 (13.3) | 33.10 (10.7) | 33.10 (10.7) |
| Total, No. (%) | 47.25 (15.33) | 47.25 (15.33) | 47.25 (15.33) |
| No, No. (%) | 43.02 (11.90) | 33.10 (10.7) | 33.10 (10.7) |
| Yes, No. (%) | 46.29 (13.3) | 33.10 (10.7) | 33.10 (10.7) |
| Total, No. (%) | 47.25 (15.33) | 47.25 (15.33) | 47.25 (15.33) |
| No, No. (%) | 43.02 (11.90) | 33.10 (10.7) | 33.10 (10.7) |
| Yes, No. (%) | 46.29 (13.3) | 33.10 (10.7) | 33.10 (10.7) |
FIGURE 1. Distribution of EPII item responses by mental health outcomes. EPII, Epidemic-Pandemic Impacts Inventory.

TABLE 2. Multivariable Logistic Regression Models of the Associations Between EPII Score with Mental Health Outcomes

| Probable Anxiety                                                                 | OR*        | 95% CI    | P value   |
|----------------------------------------------------------------------------------|------------|-----------|-----------|
| EPII score                                                                       | 1.23       | 1.14      | 1.34      | <0.001    |
| Brief Resilience Score                                                           | 0.46       | 0.34      | 0.62      | <0.001    |
| Use of workplace well-being resources, yes vs no                                 | 1.61       | 0.88      | 2.95      | 0.12      |
| Perceived occupational support, not supported/neutral vs somewhat/completely supported | 2.02       | 1.20      | 3.39      | 0.008     |
| Deployed, yes vs no                                                              | 1.57       | 0.92      | 2.68      | 0.10      |
| Female vs male                                                                   | 1.65       | 1.02      | 2.66      | 0.04      |
| Inpatient medicine familiarity, yes vs no                                         | 1.35       | 0.81      | 2.27      | 0.25      |
| Direct COVID patient care, yes vs no                                             | 0.53       | 0.26      | 1.07      | 0.08      |

| Probable Depression                                                               | OR*        | 95% CI    | P value   |
|----------------------------------------------------------------------------------|------------|-----------|-----------|
| EPII score                                                                       | 1.23       | 1.13      | 1.33      | <0.001    |
| Brief Resilience Score                                                           | 0.54       | 0.38      | 0.75      | <0.001    |

| Probable PTSD                                                                     | OR*        | 95% CI    | P value   |
|----------------------------------------------------------------------------------|------------|-----------|-----------|
| EPII score                                                                       | 1.41       | 1.30      | 1.52      | <0.001    |
| Brief Resilience Score                                                           | 0.50       | 0.36      | 0.68      | <0.001    |
| Female vs male                                                                   | 1.90       | 1.18      | 3.05      | 0.008     |
| Asian only vs White only                                                          | 0.43       | 0.23      | 0.80      | 0.008     |
| Other/multiple races vs White only                                               | 0.74       | 0.32      | 1.73      | 0.49      |
| Single vs partner                                                                | 0.77       | 0.45      | 1.32      | 0.34      |

OR, odds ratio; CI, confidence interval; EPII, Epidemic-Pandemic Impacts Inventory; LASSO, Least Absolute Shrinkage and Selection Operator; PTSD, posttraumatic stress disorder.
*Odds ratios were adjusted for all variables listed for each outcome. Variables chosen from LASSO regression.
Additionally, the EPII is a new instrument and has not been validated. The burden of EPII score was studied to examine the impact of exposure; however, it is important to separate which items or types of items are driving the associations found. For example, one could envision fear of contagion being more associated with anxiety, while witnessing significant deaths may be more associated with PTSD. Lastly, probable mental health outcomes were determined with the use of brief self-report instruments and not the clinical interview.

CONCLUSIONS
This is the first study, to the best of our knowledge, to demonstrate a strong association between the degree of COVID-19 negative impacts and poorer mental health outcomes in a large population of physicians. The protective role of resilience and organizational support underscores the importance of considering preventive interventions that strengthen resilience processes while also providing mental health interventions to address probable anxiety, depression, and PTSD. Future studies will be needed to establish the prevalence of these conditions with standardized clinical interviews and will need to explore the trajectory of these conditions over time.

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