

# Preliminary Report: US Physician Stress During the Early Days of the COVID-19 Pandemic

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## Abstract

**Objective:** To assess the impact of the COVID-19 crisis on physician stress and mental health.

**Methods:** The 10-item Coping With COVID survey assessed stress among 2373 physicians from April 4 to May 27, 2020. A stress summary score with 4 items (a single-item [overall] stress measure, fear of exposure, perceived anxiety/depression due to COVID, and work overload, each scored 1-4) ranged from 4 to 16. Hypothesized stress mitigators included enhanced purpose and feeling valued by one's organization. Multilevel linear regression tested associations of variables with overall stress and stress summary scores.

**Results:** In 2373 physicians in 17 organizations (median response rate of 32%), mean stress summary score was 9.1 (SD 2.6). Stress was highest among women (stress summary score, 9.4 [SD 2.5] vs 8.7 [SD 2.6] in men;  $P < .001$ ), inpatient physicians (stress summary score, 9.4 [SD 2.8] vs 8.9 [SD 2.5] in outpatient physicians;  $P < .001$ ), early- and mid-career physicians (stress summary score, 9.5 [SD 2.6] vs 8.6 [SD 2.5] in late-career physicians;  $P < .001$ ), and physicians in critical care (stress summary score, 10.8), emergency departments (10.2), and hospital medicine (10.1). Increases in perceived anxiety/depression (regression coefficient, 0.30), workload (0.28), and fear (0.14) were associated with higher overall stress ( $P$  values  $< .001$ ). Increases in feeling valued were associated with lower stress summary scores (regression coefficient,  $-0.67$ ;  $P < .001$ ) and explained 11% of stress summary score variance at the physician level and 31% of variance at the organizational level.

**Conclusion:** Mental health support, modulation of workload, and noting physicians' organizational value should be explored as means to reduce COVID-related stress.

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COVID-19 has introduced unique stresses to the health care system and in particular to health care workers.<sup>1</sup> Rarely have we seen an epidemic with such risk to health care workers; Ebola carried this risk, but it was seen only in localized outbreaks.<sup>2</sup> COVID-19 has spanned the globe and led to unparalleled stress among large numbers of physicians and other health care team members.<sup>3-5</sup> It is as yet unknown how to measure and to mitigate that stress.

Stress among physicians during the time of COVID-19 has been reported.<sup>3-7</sup> A study of Chinese physicians and nurses early in the

pandemic<sup>3</sup> found that nurses, women, and mid-career and frontline health care workers were at the highest risk of depression, anxiety, and insomnia. The authors concluded that mental health support programs for health care workers exposed to COVID-related stress should “immediately be instituted” to prevent adverse mental health outcomes. Numerous US organizations have established stress management programs for basic need support (eg, healthy snacks and water,<sup>8</sup> wellness consultations,<sup>9</sup> emotional support lines,<sup>10</sup> and other means of mental health support<sup>11,12</sup>). However, a systematic approach based on measured



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stress and stress predictors, to our knowledge, has yet to be instituted.

We adapted a previously validated measure, the Mini-Z worklife measure,<sup>13,14</sup> and other worklife metrics to create the Coping With COVID instrument suitable for rapid dissemination and access by text or email for quick turnaround and frequent monitoring. The hypothesis was that knowledge of current stress levels and contributors and mitigators could allow targeted help to be brought to health care workers and clinical departments in need and that pulse surveys could determine the impact and effect of interventions. We now report the responses of 2373 physicians to the Coping With COVID measure and use this convenience sample to preliminarily identify high-risk groups and potentially remediable risk factors.

## METHODS

### Study Sample

A public website was created where organizations could register to deploy this no-cost survey. Invitations were sent to approximately 100 health care organizations, some of which had previously worked with the American Medical Association (AMA) on issues of practice transformation and professional well-being. Other organizations learned of the survey through AMA news stories. At the individual institutions' discretion, other health care team members were also surveyed, including nurses, advanced practice clinicians, housekeeping, respiratory therapists, and many others; these are the focus of a separate report.

### Study Design

Surveys were distributed by individual institutions by email with an introduction by site leaders and the AMA. Each organization determined how many times to issue reminder emails. Responses were returned to a databank at Forward Health Group in Madison, Wisconsin, and then were subject to analysis at the AMA and Institute of Professional Worklife at Hennepin Healthcare. The physician responses included in our data analyses were collected from April 4 to May 27, 2020. The Hennepin Healthcare Institutional Review Board deemed this study a quality improvement/program evaluation project that was exempt from research requirements.

The Coping With COVID survey included demographic items (sex, years in practice, outpatient vs inpatient physician, role [physician vs other], and specialty) and contained 10 core questions about overall stress, fear of infection and transmission of the virus, perceived anxiety or depression due to COVID, work overload, child care issues,<sup>15</sup> sense of meaning and purpose, feeling valued by one's organization, and how much benefit would be obtained from healthy snacks with mental health support and inbox management support (Supplementary Figure 1A, available online at <http://mcpiqojournal.org>). The items typically ran from a choice of 1 (not at all/minimal) to 4 (very high/to a great extent); 3 and 4 were considered high (eg, high stress). Whereas there were numerous other aspects of COVID-related stress we wished to know about, because of the urgency created by the crisis, the instrument developers were encouraged to build this "for speed" for rapid turnaround and eventually for pulse monitoring. Pulse monitoring was used by very few organizations, and those data are not part of this report.

We then created a stress summary score that used 4 stress-related items (overall stress, fear of exposure/transmission, perceived anxiety/depression due to COVID, and work overload), each scored 1 to 4. Questions were aligned such that higher scores meant more stress and then summed. Thus, the stress summary score could vary from 4 to 16.

### Statistical Analyses

Basic descriptive statistics were used to portray stress levels and predictors for COVID-related stress in the first 2373 physicians from organizations with more than 20 physicians responding. (These are the first physician responders to the survey, which is still ongoing.) Stress summary scores were portrayed for the entire sample and then broken down by sex, inpatient vs outpatient role, years in practice, and specialty. Psychometric properties for the stress score were assessed, including Cronbach  $\alpha$ , McDonald  $\omega$ , and an intercorrelation matrix. Different iterations of items to be included in the stress score were tested to improve the psychometrics, eventually including the single-item stress score and all 3 stress predictors (fear, anxiety/depression, and workload). The final values (in the sample of 2373 physicians) showed that 4 items directly related to stress

had a Cronbach  $\alpha$  of 0.72, a McDonald  $\omega$  of 0.74 (both acceptable to good), and a correlation matrix with high correlations between items (most correlations  $>0.3$ , all  $P<.001$ ; [Supplementary Table 1A](#), available online at <http://mcpiqojournal.org>). The stress summary score had a reasonably symmetrical bell-shaped curve of distribution. Further validation of the stress summary score (K. Prasad, unpublished data, 2021) has shown continued good performance of the measure, with good internal consistency, a highly correlated set of 4 items in the intercorrelation matrix, and evidence for construct validity with strong relationships between stress measures and the validated single-item burnout measure used in the Mini-Z. Thus, using the 5 categories of construct validity,<sup>16</sup> the Coping With Covid survey meets, in part, most or all of the 5 criteria (content, response process, internal structure, relations to other variables, and consequences [[Supplementary Table 2A](#), available online at <http://mcpiqojournal.org>]).

Differences between results by sex, specialty, years since training, and location (outpatient vs inpatient) were tested for significance by the  $\chi^2$  test and, when appropriate, nonparametric testing. We then performed multilevel linear regressions, controlling for typical covariates (sex and years in practice), to assess key correlates (potential predictors and mitigators) of COVID-related stress, using both the single-item stress score and the stress summary score as outcomes. For comparisons and regressions,  $P<.05$  was considered statistically significant.

## RESULTS

Of the 2373 respondents in 17 organizations (the median organizational response rate of all health care workers responding by May 27 divided by all health care workers surveyed per site was 32% [range, 0.4%-100%]; that of 2 larger organizations completing surveys was 47% and 60%), 1140 (48%) were female, 839 (35%) were outpatient physicians, and 725 (31%) were in practice more than 20 years ([Table 1](#)). The 17 organizations represented in this paper were characterized as follows: 8 (47%) large ( $>100,000$  patients served) and 6 (36%) academic/teaching, with 6 (35%) located in the Midwest, 4 (24%) in the South, 4 (24%) in the West, and 3 (18%) in the Northeast. Compared with 104 organizations

that were invited but had not opted in, the included group was somewhat more likely to be a large organization, more likely to be an integrated health system (private, nonprofit) rather than an academic hospital, and geographically similar to the invited but not-participating group. We found “high stress” on the single-item stress question, defined as high or very high on the 4-point scale, in 701 (30%) of physicians (range, 15%-43% in different organizations). There were 1462 physicians (62%) who were afraid (moderately or to a great extent) of exposure or transmission, 723 (30%) who described high levels of anxiety or depression, and 700 (29%) who noted work overload. Meaning and purpose were increased (moderately or to a great extent) in 1096 (46%), and 1343 (57%) felt valued by their organization (moderately or to a great extent).

[Table 2](#) notes bivariate comparisons. A greater proportion of inpatient than outpatient physicians noted work overload (183 [32%] vs 193 [23%];  $P<.001$ ). More women than men noted high anxiety and depression (388 [34%] vs 276 [25%];  $P<.001$ ), and more early- and mid-career physicians had high stress vs late-career physicians (503 [33%] vs 163 [22%];  $P<.001$ ). Stress summary scores were higher in women (9.4 [SD 2.5] vs 8.7 [SD 2.6] in men), in inpatient physicians (9.4 [SD 2.8] vs 8.9 [SD 2.5] in outpatient physicians), and in early- and mid-career physicians (9.5 [SD] 2.6 vs 8.6 [SD 2.5] in late-career physicians; all  $P<.001$ ). Higher stress summary scores were also seen in frontline specialties ([Figure 1](#)), including critical care (10.8), emergency medicine (10.2), and hospital medicine (10.1).

Stress summary scores nationally showed a reasonably normal distribution with meaningful variability between organizations and specialties ([Figure 1](#)). Regression analyses ([Tables 3 and 4](#)) showed that stress on the single-item measure was most strongly associated with perceived anxiety/depression (regression coefficient, 0.30), work overload (0.28), and fear of exposure (0.14; all  $P<.001$ ). Regressions explained 56% of overall (single-item) stress at the organizational level. Likewise, in the regressions, lower stress summary scores were associated with feeling valued by one’s organization (coefficient,  $-0.67$ ;  $P<.001$ ); this is the amount

TABLE 1. Demographics and Responses of 2373 Physicians on Coping With COVID Survey

Demographics	Response, No. (%)
Men	1086 (46)
Women	1140 (48)
Inpatient	576 (24)
Outpatient	839 (35)
Years in practice	
1-5	579 (24)
6-10	406 (17)
11-15	289 (12)
16-20	265 (11)
>20	725 (31)
Responses to specific questions	
High stress (high and very high)	701 (30)
High fear of exposure/transmission (moderately and to a great extent)	1462 (62)
Anxiety/depression (moderately and to a great extent)	723 (30)
Work overload (moderately and to a great extent)	700 (29)
Enhanced meaning and purpose (moderately and to a great extent)	1096 (46)
Feeling valued by organization (moderately and to a great extent)	1343 (57)
Factors that would help mitigate stress	
Inbox support (moderately and to a great extent)	615 (26)
Access to mental health support (moderately and to a great extent)	589 (25)
Healthy food available (moderately and to a great extent)	1164 (49)
Average stress summary score	9.1 (SD 2.6); minimum-maximum, 4-16; 25th percentile, 7; 75th percentile, 11
Stress score by specialty (highest scores for specialties with >20 physicians)	
Palliative care (n = 23)	10.9
Critical care medicine (n = 46)	10.8
Emergency medicine (n = 154)	10.2
Hospital medicine (n = 138)	10.1
Infectious disease (n = 38)	10.0

Numbers may not add to 2373 or 100% in certain categories due to missing data or physicians with responses other than those listed.

of change in the outcome scale (in this case, a stress summary score improvement of 0.67) associated with a 1-point increase in the associated variable (feeling valued by the organization). Figure 2 shows a linear relation between greater perception of value and lower stress summary scores ( $R^2=31\%$  of stress summary scores explained by feeling valued at the organizational level).

## DISCUSSION

In this study of 2373 physicians throughout the United States, almost two-thirds of physicians (1471 [62%]) were afraid of infection

or transmission of the virus to loved ones, 712 (30%) reported being anxious or depressed, and 688 (29%) were overloaded by work. As found in Chinese physicians during the early days of the COVID outbreak,<sup>3</sup> US physicians at risk for higher stress included women, those in early- and mid-career practice, inpatient physicians, and specialists in critical care, hospital medicine, and emergency medicine. A 4-item stress summary score incorporating overall stress, fear, mental health concerns, and work overload had reasonable internal consistency. Average stress summary scores varied between specialties and

TABLE 2. Bivariate Comparisons of Stress and Worklife Factors by Sex, Location, and Years in Practice<sup>a,b</sup>

	Stress, No. (%)	Fear, No. (%)	Anxiety, No. (%)	Workload, No. (%)	Meaning, No. (%)	Valued, No. (%)	Stress summary score, (SD [n])
Female	333 (29)	708 (62)	388 (34)	370 (32)	533 (47)	671 (59)	9.4 (2.5 [1140])
Male	294 (27)	640 (59)	276 (25)	271 (25)	509 (47)	635 (58)	8.7 (2.6 [1086])
Difference	0.02	0.03	0.08 <sup>c</sup>	0.07 <sup>c</sup>	0.001	0.004	0.675 <sup>c</sup>
Inpatient	191 (33)	369 (64)	201 (35)	183 (32)	278 (48)	294 (51)	9.4 (2.8 [576])
Outpatient	234 (28)	510 (61)	241 (29)	193 (23)	354 (42)	481 (57)	8.9 (2.5 [839])
Difference	0.05 <sup>c</sup>	0.03	0.06 <sup>d</sup>	0.09 <sup>c</sup>	0.06 <sup>d</sup>	-0.06 <sup>d</sup>	0.521 <sup>c</sup>
>20 years	163 (22)	406 (56)	167 (21)	154 (21)	326 (45)	455 (63)	8.6 (2.5 [725])
<20 years	503 (33)	988 (64)	523 (34)	513 (33)	724 (47)	845 (55)	9.5 (2.6 [1539])
Difference	-0.11 <sup>c</sup>	-0.07 <sup>c</sup>	-0.11 <sup>c</sup>	-0.10 <sup>c</sup>	0.03	0.09 <sup>c</sup>	-0.864 <sup>c</sup>

<sup>a</sup>High and very high categories on Likert scales from 1 to 4 combined. Stress summary score includes 4 items (overall stress, fear due to exposure/transmission, anxiety or depression, and work overload;  $\alpha = 0.72$ ;  $\omega = 0.74$ ). Respondents who selected "Prefer not to answer" (n = 143) or "Nonbinary/third gender" (n = 4) were removed from this bivariate analysis.

<sup>b</sup>Numbers may not add to 2373 or 100% in certain categories due to missing data or physicians with responses other than those listed.

<sup>c</sup>P<.001.

<sup>d</sup>P<.05.

organizations. Feeling valued by one's organization was strongly associated with lower stress summary scores, explaining 31% of the variance in stress summary scores at the organizational level.

Whereas there have been numerous blog posts, summaries of interventions, and supportive essays on helping physicians and other health care workers during these stressful times,<sup>12,17-20</sup> to our knowledge there have been few if any systematic studies of health care workers within the United States. A Chinese study<sup>3</sup> of 1500 physicians and nurses found high rates of depression, anxiety, insomnia, and distress. Mental health disorders were most common in women, nurses, intermediate-career clinicians, and frontline workers (odds ratios of greater distress, 1.5-3.0).

Previous work in the United States links work conditions to burnout.<sup>21-24</sup> In particular, lack of control of work and chaotic work conditions are well-known stressors associated with burnout, as is time pressure during work activities (worsened in COVID care because of protective equipment donning and doffing, absence of family visitors, and extreme anxiety by patients). Favorable organizational cultures, including values alignment, quality emphasis, and collegiality and communication,<sup>21,25</sup> are associated with less

stress and burnout and could be useful targets for change during the COVID crisis.

Table 2 shows groups at risk, in particular, female physicians, inpatient physicians, those in practice less than 20 years, and certain high-exposure specialties. Specialties such as emergency medicine, critical care, and hospital medicine may assume more frontline care and thus be at risk for high stress and adverse personal outcomes. Our data offer the potential to survey for stress and then to address the findings.

Regressions demonstrate that key correlates of stress include perceived mental health issues (anxiety and depression) as well as work overload and fear of exposure and transmission. Thus, strategies to be tested could focus on mental health support programs as well as monitoring and modulating of workload (eg, with rotating shifts, increased delegation of clerical work to support staff, and plenty of breaks with water and healthy food). One feature of organizations and individuals with lower stress was workers' feeling valued by their organizations. Another area for stress reduction could therefore be greater teamwork, including coverage for inbox management for those with increased assignments because of COVID-19 duties. In addition, institutions could consider committing to direct, individual communications of appreciation

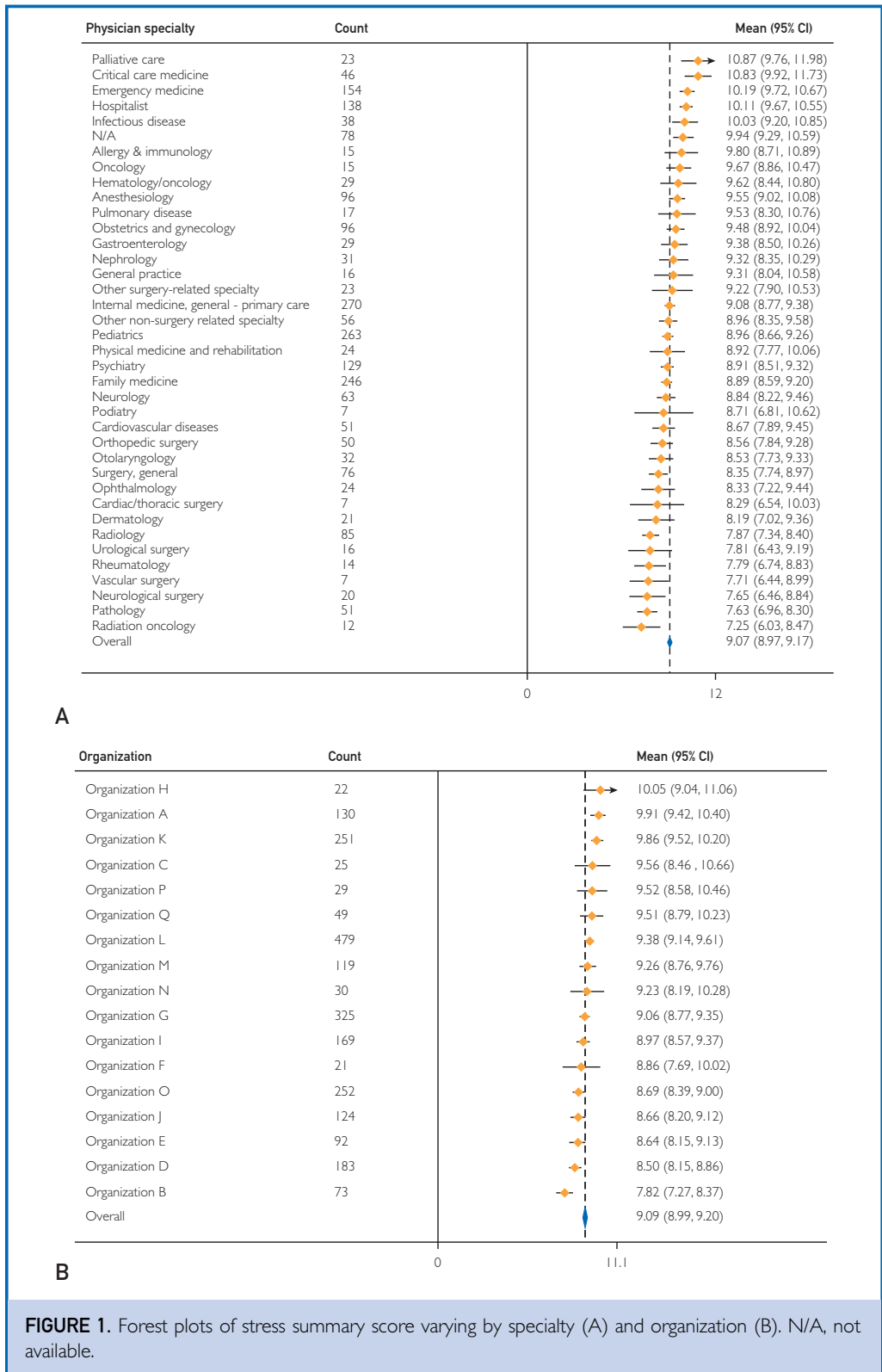


TABLE 3. Results of Multilevel Linear Regressions Predicting Single-Item Stress

Fixed effects						
Single-stress item	Coefficient	Standard error	Z	P> z	95% CI	
Fear	0.141	0.016	8.56	.000	0.109	0.173
Anxiety/depression	0.302	0.018	16.75	.000	0.267	0.337
Work overload	0.275	0.014	19.14	.000	0.247	0.304
Purpose	-0.001	0.015	-0.07	.944	-0.030	0.028
Feeling valued	-0.044	0.015	-2.85	.004	-0.074	-0.013
Female	-0.057	0.026	-2.15	.032	-0.110	-0.005
Years in practice	0.001	0.008	0.20	.840	-0.015	0.018
Intercept	0.683	0.079	8.63	.000	0.528	0.838
Random effects		Estimate	Standard error		95% CI	
Organizational-level variance (intercept)		0.006	0.003		0.002	0.020
Respondent-level variance (residual)		0.363	0.011		0.342	0.385
Snijders and Bosker R <sup>2</sup>						
Organizational level 0.5599						
Respondent level 0.4095						

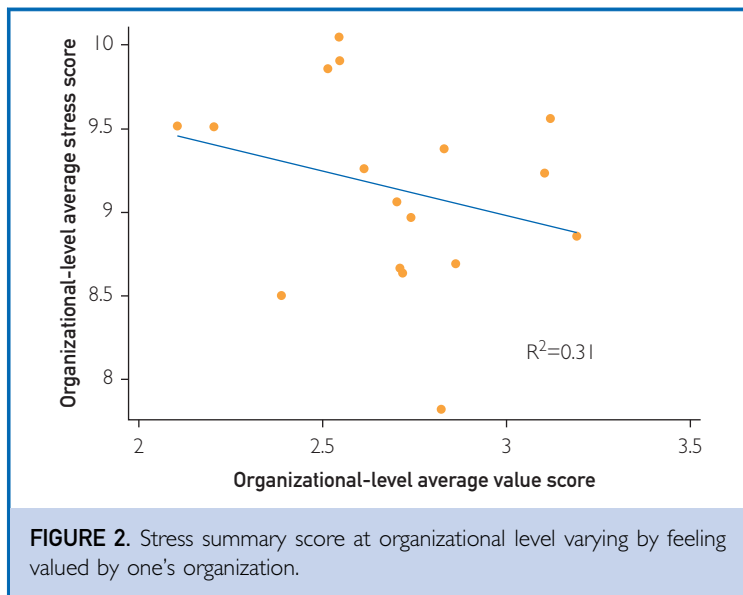
from executive leaders. The effectiveness of different strategies for support in feeling valued remains to be tested.

The stress summary score suggests that there are differing amounts of stress between organizations. Mapping the stress score to the surge of viral cases at each organization is a next step in better understanding the rise and fall of stress at each institution. Current surges in most states in the United States

suggest that wider availability of user-friendly measures of stress and stress predictors may be useful. Furthermore, there is a need to determine the most effective mental health support programs. Numerous strategies are in use, including “warmlines” for emotional support, buddy programs,<sup>11</sup> peer support programs,<sup>26</sup> wellness consultations,<sup>9</sup> and wellness teams making rounds; but which methods encourage the highest use and which are

TABLE 4. Results of Multilevel Linear Regressions Predicting Composite Stress Scale

Fixed effects						
Stress composite scale	Coefficient	Standard error	z	P> z	95% CI	
Sense of purpose	0.449	0.059	7.50	.000	0.331	0.566
Feeling valued	-0.673	0.060	-11.08	.000	-0.792	-0.554
Female	0.510	0.107	4.75	.000	0.299	0.720
Years in practice	-0.214	0.034	-6.24	.000	-0.281	-0.147
Intercept	10.11	0.240	42.14	.000	9.64	10.5
Random effects		Estimate	Standard error		95% CI	
Organizational-level variance (intercept)		0.169	0.080		0.066	0.428
Respondent-level variance (residual)		5.88	0.180		5.53	6.24
Snijders and Bosker R <sup>2</sup>						
Organizational level 0.3136						
Respondent level 0.1059						



**FIGURE 2.** Stress summary score at organizational level varying by feeling valued by one's organization.

most effective remain to be determined. Abbott et al<sup>11</sup> have elegantly summarized the literature on stress during disasters and what types of programs have been used to address it. The APD (Anticipate, Prepare, and Deter) strategy has several means of implementation, focusing on basic physical needs support, peer support (“leave no one behind”), and higher intensity support for at-risk groups or persons. Shanafelt et al<sup>1</sup> proposed a framework based on “hear me, protect me, prepare me, support me, care for me.” The peer support program of Shapiro and Galowitz<sup>26</sup> at Brigham and Women's Hospital in Boston is a long-standing example of the opportunity these programs may offer. Rigorous studies are required that test the efficacy of interventions, particularly preventive measures before or in between periods of high stress.

Knowing that 1462 physicians (62%) were afraid of infection or transmission of the virus to loved ones suggests that focusing on addressing this issue has merit. Whereas providing sufficient personal protective equipment is appropriately considered to be the crucial intervening step to address this fear, other considerations could be implemented. For example, institutions could provide clear instructional guidelines to health care workers about doffing procedures on returning home from work to decrease both the risk of

transmission and the anxiety that accompanies this risk.

Our study has several limitations. The sample is a convenience sample predominantly composed of organizations previously enrolled in programs to address stress and burnout; thus, our results may be biased toward groups more experienced at instituting coping mechanisms and wellness interventions. In addition, we were not able to measure exposure to COVID-19 by respondents or organizations at the time they were surveyed. Several organizations began their survey before reaching a peak in COVID in their area, whereas others were experiencing a major surge. Response rates are incomplete owing to a continued rollout of the survey, although they were reasonably high in those large organizations that had completed surveying, and the median rate of 32% is considerably higher than in recent national physician surveys. Likewise, because the study was conducted rapidly during an evolving pandemic, the Coping With COVID measure was adapted from other measures and kept brief, with a conscious decision to trade off brevity of the measure with less use of longer instruments and scales to improve respondent burden. Because of this need for rapid deployment, the Coping With COVID measure has not been fully validated. Internal consistency is reasonable for the 4-item stress scale ( $\alpha$ , 0.72;  $\omega$ , 0.74), and the correlation matrix (Supplemental Table 1A, available online at <http://mcpiqjournal.org>) shows good correlations between items and overall stress (all  $P < .001$ ). Further validation of the scale against validated metrics of satisfaction, stress, and burnout in subsequent cohorts of health care workers shows that stress scores are strongly associated with a validated burnout measure (unpublished data), thus contributing to the construct validity of the stress summary score (Supplementary Table 2A, available online at <http://mcpiqjournal.org>).

## CONCLUSION

Physician stress during the COVID-19 pandemic is moderate overall, although it is considerably higher in certain organizations. The majority of surveyed US physicians are fearful of exposure or transmission. Stress is



higher among certain groups (women, inpatient physicians, early- or mid-career clinicians, and those in frontline specialties), associated with perceived anxiety/depression and workload, and less when there is a sense of feeling valued by one's organization. Stress summary scores vary by organization and specialty. Being aware of one's organizational stress may allow organizations to better understand the contributors to stress from COVID-related care.

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### SUPPLEMENTAL ONLINE MATERIAL

Supplemental material can be found online at <http://www.mayoclinicproceedings.org>. Supplemental material attached to journal articles has not been edited, and the authors take responsibility for the accuracy of all data.

**Abbreviations and Acronyms:** AMA = American Medical Association

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