



Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.



Longitudinal assessment of physician wellness during the COVID-19 pandemic

Rita Patel^{a,*}, Todd Foster^b

^a Ascension Peyton Manning Children's Hospital, Pediatrics

^b Ascension-St. Vincent Hospital-Indianapolis, Graduate Medical Education

ARTICLE INFO

Keywords:

Physician wellness
COVID-19 pandemic
Adaptation
Longitudinal

ABSTRACT

Physician wellness was greatly impacted during the COVID-19 pandemic. Busy clinical services, personal safety concerns, changing guidelines, and compassion fatigue weighed on physicians. Although studies have examined physician wellness, few have studied how it changed over time. A survey about wellness was distributed to 299 physicians at Ascension St. Vincent Hospital-Indianapolis March 2020, July 2020, November 2020, and March 2021. Physicians also free-texted about their well-being during the pandemic. Participation rates over the four time periods averaged 22.23%. Responses were compared among the time periods using Pearson Chi-Square and Fisher's Exact Tests. Six wellness factors (anxiety, worry about becoming ill, worry about infecting family, worry about caring for children, concern about personal finances) were reported as worse after the pandemic began, but statistically significantly improved over the course of the study. In contrast, seven wellness measures (increased issues with depression, frustration, hopelessness, fatigue, dread going to work, worry about missing work, worry about caring for family), that also worsened after the pandemic began, did not statistically improve over time. Physician wellness was impacted by the pandemic; however, not all measures followed the same course over time. Longitudinal assessments of wellness can help inform programs to best support physicians.

1. Introduction

The COVID-19 pandemic has had sudden, dramatic and far-reaching consequences on our society (Vahratian et al., 2021; Brooks et al., 2020; Galea et al., 2020; Mukhtar, 2020; Cava et al., 2005). Health care professionals, in particular, have had the burden of seeing the devastation of the disease first-hand while also being concerned about their own health and well-being (Byrne et al., 2021; Erdem and Lucey, 2021; Kazmerski et al., 2021; Cabarkapa et al., 2020; Rezaei, 2020; Zarefsky, 2020). Confusion from rapidly changing guidelines and information as well as challenges from deployment to other services to help cover patient care contributed additional stress (Kazmerski, 2021; Bansal et al., 2020; Restauri and Sheridan, 2020). At the same time, job security was threatened as health systems dealt with the financial implications of the pandemic (Cheney 2021, Kazmerski et al., 2021, Fincher, 2020, Gold, 2020). And, finally, like all of society, health care providers were concerned and grappling with their family's health and their children's education while coping with the isolation imposed by social distancing (Randell et al., 2021; Brooks et al., 2020; Brubaker, 2020; Shanafelt et al., 2020). Literature has shown that physician wellness was already

an issue before the pandemic (AAMC, 2021; Hartzband and Groopman, 2020; Shanafelt et al., 2020; Cull et al., 2019; Kalmoe et al., 2019; Friedberg et al., 2014), but several studies have shown that the wellness of health care professionals has suffered even more during this time (Rosenberg et al., 2021; Bansal et al., 2020; Cabarkapa et al., 2020; Conti et al., 2020; Dewey et al., 2020; Sanghavi et al., 2020; Friedberg et al., 2014). Increasing rates of anxiety, depression, and stress have been documented (Conti et al., 2020; Sanghavi et al., 2020; Shanafelt et al., 2020; Temsah et al., 2020). Other, more unexpected, consequences such as prejudice and discrimination secondary to concern that health care providers are at a higher risk of contracting COVID-19 have been described (Randell et al., 2021; Makino et al., 2020). Many institutions have proactively developed systems to handle the mental health needs of their work-force including such strategies as assessing the needs of its health care workers, developing task forces, creating mechanisms to assist with basic needs, increasing communication, and developing hotlines (Dewey et al., 2020; EclinicalMedicine, 2020; Feinstein et al., 2020; Gonzalez et al., 2020; Hou et al., 2020; Nochai-wong et al., 2020; Restauri and Sheridan, 2020; Ripp et al., 2020; Shapiro and McDonald, 2020).

* Corresponding author at: Pediatrics, Ascension Peyton Manning Children's Hospital, 8414 Naab Road, Indianapolis, Indiana, USA 46260.

E-mail address: rita.patel@ascension.org (R. Patel).

<https://doi.org/10.1016/j.psychres.2022.114739>

Received 21 September 2021; Received in revised form 20 July 2022; Accepted 21 July 2022

Available online 26 July 2022

0165-1781/© 2022 Elsevier B.V. All rights reserved.

It is also important to acknowledge that living organisms also have the ability to adapt to stress. Hans Selye described the general adaptation syndrome which represents “a generalised effort of the organism to adapt itself to new conditions (Selye, 1950: 1383–92).” As the pandemic has extended over a prolonged period, humans have similarly had to develop coping strategies to deal with the “new normal”.

Ascension St. Vincent Hospital-Indianapolis is a large health care campus in Indianapolis with over 4000 employees. Leadership instituted several changes to support the workforce during the pandemic; however, as expected, there were significant changes in the general well-being at the institution. Seeking to do a needs assessment to help inform how best to support physicians at our institution, the study team developed a survey at the start of the COVID-19 pandemic. It was distributed among staff and resident physicians to assess how the pandemic had affected wellness. As the pandemic persisted, the study team continued to periodically survey the physicians to explore how the wellness indicators changed over the first year of the COVID-19 pandemic.

2. Methodology

On March 11th, 2020, the World Health Organization declared COVID-19 a pandemic. The initial intention of this project was quality improvement in order to help leadership address wellness during the pandemic. The Healthcare Personnel & COVID-19 Survey (Appendix A) was developed and first distributed to Ascension St. Vincent Hospital-Indianapolis personnel on March 16th, 2020. The authors used the Maslach Burnout Inventory and informal focus groups to guide the formation of the survey. The goal was to create a simple tool that physicians would find easy to complete and would resonate with the issues they were experiencing. Since no identifying information was collected among participants, survey responses were not matched or paired to individuals. Instead, the responses acted as the representation of physicians at our facility, with the expectation that participation rates would allow the sample to adequately represent the Ascension St. Vincent physician population. All responses were self-rated comparisons of how their current status compared to how they felt before the pandemic.

The survey solicited feedback among physicians and confidentiality was ensured in the consent language for possible participants. The initial survey cohort acted as the baseline response and the survey was implemented as a repeatable instrument that was distributed multiple times to track well-being through the pandemic. Physician responses were collected and compared in a cohort fashion with each time period being its own group at Baseline (March 16th, 2020), 8 weeks (May 11th, 2020), & 16 weeks (July 6th, 2021). The project was then converted to a human subjects research study to focus on the wellness factors questioned on each of the initial QI surveys (Ascension St. Vincent IRB #20,210,027). The authors included in this human subjects research protocol the intention to survey physicians at our facility again at the 1 year mark (March 16th, 2021).

Demographics collected from the survey periods were compared to the institution demographics provided by our facility human resources to ensure that our respondents were representative of the physician population. Wellness factors were presented to participants in three categories including health issues, work issues, and life issues. Some wellness topics were covered on all four surveys (i.e., baseline, 8-week, 16-week, 1 year); others were only discussed on two of the surveys (i.e., baseline and 8-weeks or 8-weeks and 16 weeks) based on feedback from our respondents.

Physician leadership was approached with the goals of the study and permitted distribution of the survey to hospital associates. REDCap (Harris et al., 2009) was used to create and distribute the survey link to Ascension St. Vincent Hospital-Indianapolis physicians using automated survey invitations to email physician listservs and a hyperlink included in COVID-19 update emails from hospital leadership. The surveys remained open for two weeks after each distribution. At the close of each

survey, aggregated results were compiled. De-identified, aggregated results reports were sent to hospital leadership for consideration.

Resident and staff physician responses were compared to one another using Pearson Chi-Square and/or Fisher’s Exact Tests to determine if they could be grouped together as one cohort or if their responses would need to be considered separately. Demographics variables from the physicians were compared to the demographic distribution of the entire resident and staff physician group at the hospital using similar tests. The baseline, 8-week, 16-week, and 1 year survey responses were treated as cohorts and the difference in the distribution of responses was compared among these cohorts using Pearson Chi-Square and Fisher’s Exact Tests. A p value less than 0.05 signified a statistical difference in the distribution of the responses among these cohorts. When a wellness factor and the distribution of responses was found to be statistically significantly different between survey time periods, the survey response counts of “Somewhat worse since the pandemic” and “Much worse since the pandemic” were combined. This combination allowed the calculation of relative risk ratios. These relative risk ratios were calculated to reflect the change in “worse” ratings for the later time period examined. SPSS 24.0 (IBM, 2016) was utilized for descriptive and inferential statistics.

3. Results

Resident and Staff Physician demographics and responses were compared to one another within the completed baseline, 8-week, 16-week, and 1 year surveys and did not significantly differ in distribution among job descriptions (hospital-based vs. clinic-based) ($\chi^2=0.11, p = 0.74$), care of COVID/PUI patients ($\chi^2=0.16, p = 0.69$), sex ($\chi^2=0.06, p = 0.97$), age ($z=-0.04, p = 0.97$), or how many had children or extended family living within their home ($\chi^2=1.55, p = 0.21$). A comparison of staff and resident physician responses was completed among the self-reported wellness factors and statistical results can be seen in Table 1. There were no statistically significant differences in the distribution of responses among staff and resident physicians at baseline, 8-weeks, and 16-weeks. These findings supported the combination of staff and resident physician responses into one cohort group.

Participation rates and demographic characteristics of the combined resident-staff physician cohort from each survey period can be found in Table 2. Physician participation rates ranged from 18.4% at 8 weeks to

Table 1
Initial Resident-Staff Physician Comparison.

Wellness Variables	Baseline		8 Weeks		16 Weeks	
	χ^2	p*	χ^2	p*	χ^2	p*
Health Issues						
Insomnia	0.54	0.76	0.58	0.22		
Depression		0.55	0.26	0.92		
Anxiety	0.31	0.86	0.66	0.85		
Frustration			0.28	0.16		
Feelings of Hopelessness		0.28	0.20	0.91		
Fatigue			0.19	0.28		
Work Issues						
Dread going into work	0.22	0.90	0.49	0.47		
Worrying about contracting an illness from your patients	0.91	0.63	0.29	0.06		
Conflict with coworkers		0.14	0.99			
Worry about missing work	1.94	0.38	0.29	0.21		
Life Issues						
Worry about infecting your children and/or family			0.58	0.34		
Worry about caring for your children		0.27	0.68	0.36		
Worry about caring for your extended family	0.46	0.79	0.28	0.15		
Personal Finances		0.80	0.81	0.31		
Conflict with Family		0.59	0.09			

*Pearson Chi-Squares produce a chi-square statistic and a p value. Fisher’s Exact Tests have no test statistic associated and only produce a p value.

Table 2
Hospital Staff and Resident Physician Demographics.

		n (%)	%	
Survey Participation Rates (N = 299)	Baseline	61	20.40%	
	8-week	55	18.40%	
	16-week	71	23.70%	
	1 Year	79	26.40%	
Age Categories				
	Total	8-week	16-week	1 Year
18–24	1			
25–34	204 (70.8%)	22 (50.0%)	26 (44.8%)	20 (29.9%)
35–44	49 (17.0%)	10 (22.7%)	16 (27.6%)	18 (26.9%)
45–54	20 (6.9%)	8 (18.2%)	9 (15.5%)	19 (28.4%)
55–64	15 (5.2%)	4 (9.1%)	7 (12.1%)	10 (14.9%)
65+	10			
x ² , p	x ² =9.86, p = 0.02	x ² =107.79, p<0.001	x ² =47.24, p<0.001	
Sex				
	Total	8-week	16-week	1 year
Female	157	33	42	53
Male	142	20	26	25
x ² , p	x ² =1.72, p = 0.19	x ² =1.91, p = 0.17	x ² =5.98, p = 0.01	
Ethnicity				
	Total	8-week	16-week	1 year
American Indian/Alaska Native	0	N/A	N/A	N/A
Asian	50 (16.7%)	N/A	N/A	N/A
Black/African American	14 (4.7%)	N/A	N/A	N/A
Hispanic/Latino	8 (2.7%)	N/A	N/A	N/A
Native Hawaiian / Pacific Islander	1 (0.3%)	N/A	N/A	N/A
White	223 (74.6%)	N/A	N/A	N/A
Unknown	3 (1.0%)	N/A	N/A	N/A

26.4% at the 1 year survey. The age, sex, and ethnic demographics for hospital physicians are listed in Table 2 as well. The baseline survey did not record demographics as the initial focus was to compare responses among job families and encourage confidential participation for quality improvement purposes. The follow-up surveys did request respondents to divulge their age category and sex. The total values for residents and staff physicians combined are presented along with the values from the 8-week, 16-week, and 1 year survey. The distribution of responses was compared to values obtained from the Human Resources department and showed no statistically significant difference in the distribution of males and females compared to the total hospital values except for the 1 year survey results showing proportionally more female physicians responding. In terms of age, there were statistically significant differences in age categories among respondents on the 8-week ($x^2=9.86, p = 0.02$), 16-week ($x^2=107.70, p<0.001$), and 1 year ($x^2=47.24, p<0.001$) surveys when compared to the total hospital values for physicians. Physicians in the 25–34 year age group were under-sampled compared to the other age groups.

Responses to each individual wellness topic are presented in Table 3. Additionally, Table 4 highlights factorial comparison of the survey time periods for wellness factors found to be statistically significantly different over the course of the pandemic seen in Table 3. All these factors improved over time with more respondents reporting that this factor was approaching pre-pandemic levels. None of the factors worsened over time and this point is reflected in the calculation of the relative risk ratios.

Among the health issues presented, anxiety ($x^2=13.07, p = 0.01$) was the only factor that showed statistically significant changes over time compared to baseline values. Over a third of physicians (36.1%) reported their anxiety being “Much worse since the pandemic”

on the baseline survey, 14.0% on the 8-week survey, 17.1% on the 16-week survey, and 9.2% on the 1 year survey. Among the variables in Tables 3 and 4, the trend was that more physicians rated these health issues as similar to before the pandemic as time progressed. Although not statistically significantly different, this increase in “same as before the pandemic” responses were seen for “Feelings of Hopelessness” and “Insomnia” as well. In contrast, depression, frustration, and fatigue were static among physicians over time.

For work issues, a statistically significant difference in the distribution of responses was found for the topic “Worrying about contracting an illness from your patients” ($x^2=40.39, p<0.001$). Similar to anxiety, higher response rates were found for “somewhat worse” and “much worse” during the baseline survey. These rates increased in the “same as before the pandemic” option as time progressed.

Under life issues, a statistically significant difference in the distribution of responses over time was found for the issues “Worry about infecting your children and/or family” ($x^2=11.11, p = 0.03$); “Worry about caring for your children” ($x^2=14.72, p = 0.01$); and “Personal Finances” ($x^2=13.15, p = 0.04$). The significant difference for “Worry about infecting your children and/or family” was reflected in the increase of physicians (42.3%) responding on the 1 year survey that they felt the “same as before the pandemic”. Physician responses to “Worry about caring for your children” showed an increase in the number of physicians stating their worry was the “same as before the pandemic” between baseline and 8 weeks. For “Personal Finances”, physician responses did not reveal a significant difference in response distributions until the 1 year survey. For these statistically significantly different wellness categories, the data shows that as time progressed, this worry diminished among physicians.

4. Discussion

Within the first few weeks after the pandemic was recognized by the WHO, the survey revealed a significant number of physicians reporting worsening mental health as well as increasing concerns about work and family. Increased levels of anxiety were the most predominant with 80.4% ($n = 49$) reporting worsening anxiety post-pandemic. Nearly half reported insomnia ($n = 30, 49.2%$) and a third endorsed worsening depressive symptoms ($n = 22, 36%$). Concerns about work included most significantly a worsening concern about contracting an illness ($n = 50, 83.3%$) and worry about missing work ($n = 28, 46.7%$). Despite the increasing stressors, few physicians reported increased conflicts with co-workers ($n = 8, 13.3%$). Physicians also reported increasing stressors outside of work including caring for children ($n = 28, 52.8%$) and extended family ($n = 43, 72.9%$) as well as financial concerns ($n = 24, 40%$).

Comments included, “It has affected all my clinical and personal interactions. I feel isolated and have a sense of dread.”

“The pandemic has really shaken me. I have kids and other family that live in other parts of the country which feels terrifying. I worry a LOT about contracting the virus at work.”

“Everyone is exalting the courage of health care providers, but I don’t feel courageous...just scared”

The second time period was 2 months after the start of the pandemic and showed that some of the symptoms reported by the physicians at the start of the pandemic had been somewhat ameliorated, but others remained static. Increased anxiety was now reported by 66% ($n = 32$) of physicians, a significant decrease. Other measures that trended towards normal included worry about caring for children ($n = 16, 32%$) as well as concerns about personal finances ($n = 15, 29.4%$). Other measures such as depressive symptoms, fatigue, frustration, and hopelessness continued to be reported as worse compared to before the pandemic.

In response to feedback received after the first survey, we added a free text box inviting physicians to share how the pandemic affected them in a positive way. Responses focused mostly on increased gratitude, more time with family, and feeling less rushed.

Table 3
Comparison of Self-Reported Physician Wellness Issues.

Wellness Issues	Survey Time Period	Same as before the pandemic n (%)	Somewhat worse since the pandemic n (%)	Much worse since the pandemic n (%)	(χ^2) p
Health Issues					
Insomnia	Baseline	31 (50.8)	21 (34.4)	9 (14.8)	(12.05) 0.06
	8-Weeks	30 (60.0)	14 (28.0)	6 (12.0)	
	16-Weeks	50 (75.8)	11 (16.7)	5 (7.6)	
	1 Year	55 (72.4)	17 (22.4)	4 (5.3)	
Depression	Baseline	39 (63.9)	19 (31.1)	3 (4.9)	(3.61) 0.73
	8-Weeks	32 (66.7)	15 (31.3)	1 (2.1)	
	16-Weeks	46 (67.6)	18 (26.5)	4 (5.9)	
	1 Year	42 (56.8)	26 (35.1)	6 (8.1)	
Anxiety	Baseline	12 (19.7)	27 (44.3)	22 (36.1)	(21.73) 0.001
	8-Weeks	17 (34.0)	26 (52.0)	7 (14.0)	
	16-Weeks	29 (41.4)	29 (41.4)	12 (17.1)	
	1 Year	34 (44.7)	35 (46.1)	7 (9.2)	
Frustration	8-Weeks	15 (31.3)	21 (43.8)	12 (25.0)	(0.95) 0.92
	16-Weeks	24 (34.3)	33 (47.1)	13 (18.6)	
	1 Year	28 (36.4)	33 (42.9)	16 (20.8)	
	Baseline	33 (54.1)	22 (36.1)	6 (9.8)	
Feelings of Hopelessness	8-Weeks	30 (62.5)	14 (29.2)	4 (8.3)	(6.95) 0.33
	16-Weeks	50 (73.5)	13 (19.1)	5 (7.4)	
	1 Year	53 (70.7)	16 (21.3)	6 (8.0)	
	Baseline	33 (54.1)	22 (36.1)	6 (9.8)	
Fatigue	8-Weeks	25 (49.0)	20 (39.2)	6 (11.8)	(2.03) 0.73
	16-Weeks	30 (44.1)	31 (45.6)	7 (10.3)	
	1 Year	37 (48.7)	27 (35.5)	12 (15.8)	
	Baseline	26 (43.3)	20 (33.3)	14 (23.3)	
Dread Going to Work	8-Weeks	25 (49.0)	18 (35.3)	8 (15.7)	(7.00) 0.32
	16-Weeks	42 (61.8)	20 (29.4)	6 (8.8)	
	1 Year	41 (53.9)	24 (31.6)	11 (14.5)	
	Baseline	10 (16.7)	17 (28.3)	33 (55.0)	
Worrying about contracting an illness from your patients	8-Weeks	13 (26.0)	20 (40.0)	17 (34.0)	(40.39) <0.001
	16-Weeks	22 (31.0)	34 (47.9)	15 (21.1)	
	1 Year	39 (50.0)	30 (38.5)	9 (11.5)	
	Baseline	52 (86.7)	6 (10.0)	2 (3.3)	
Conflict with Co-Workers	8-weeks	38 (76.0)	11 (22.0)	1 (2.0)	(6.09) 0.19
	1 Year	66 (88.0)	6 (8.0)	3 (4.0)	
	Baseline	32 (53.3)	18 (30.0)	10 (16.7)	
	8-Weeks	35 (67.3)	13 (25.0)	4 (7.7)	
Worry about missing work	16-Weeks	39 (55.7)	22 (31.4)	9 (12.9)	(8.04) 0.24
	1 Year	55 (72.4)	14 (18.4)	7 (9.2)	
	Baseline	11 (21.2)	20 (38.5)	21 (40.4)	
	8-Weeks	11 (21.2)	20 (38.5)	21 (40.4)	
Life Issues	16-Weeks	16 (22.9)	27 (38.6)	27 (38.6)	(11.11) 0.03
	1 Year	33 (42.3)	28 (35.9)	17 (21.8)	
	Baseline	25 (47.2)	8 (15.1)	20 (37.7)	
	8-Weeks	34 (68.0)	9 (18.0)	7 (14.0)	
Worry about caring for your children	16-Weeks	41 (62.1)	17 (25.8)	8 (12.1)	(18.41) 0.01
	1 Year	53 (69.7)	12 (15.8)	11 (14.5)	
	Baseline	16 (27.1)	23 (39.0)	20 (33.9)	
	8-Weeks	22 (44.9)	14 (28.6)	13 (26.5)	
Worry about caring for your extended family	16-Weeks	30 (42.9)	24 (34.3)	16 (22.9)	(10.69) 0.10
	1 Year	40 (51.3)	26 (33.3)	12 (15.4)	
	Baseline	36 (60.0)	18 (30.0)	6 (10.0)	
	8-Weeks	36 (70.6)	9 (17.6)	6 (11.8)	
Personal Finances	16-Weeks	48 (70.6)	17 (25.0)	3 (4.4)	(13.15) 0.04
	1 Year	62 (82.7)	12 (16.0)	1 (1.3)	
	Baseline	48 (81.4)	10 (16.9)	1 (1.7)	
	8-Weeks	39 (78.0)	10 (20.0)	1 (2.0)	
Conflict with Family	1 Year	54 (71.1)	19 (25.0)	3 (3.9)	(2.30) 0.68

“Increased connections with some family and friends. Better relationships at work with people extending grace and kindness to each other.”

“Cleaner air and less traffic.”

“There has been some increased awareness of gratitude, focus on ‘core’ work and less conflict about distractions.”

At the 4 month mark after the start of the pandemic, several issues continued to affect physicians. Measures that persisted as being worse after the start of the pandemic included depression ($n = 22$, 32.4%), frustration ($n = 46$, 65.7%), fatigue ($n = 38$, 55.9%), dread going to

work ($n = 26$, 38.2%), and feelings of hopelessness ($n = 18$, 26.5%). However, although vaccines were not yet available and there continued to be surges, other measures began to trend towards the new normal. Anxiety, although still a significant concern, decreased to 58.5% ($n = 41$) of respondents who felt it was worse than before the pandemic. The concern of contracting an illness from a patient trended down to 69% ($n = 49$) as did concern about personal finances ($n = 20$, 29.4%)

Comments now seemed to indicate a decrease in the initial fear, but that was replaced with fatigue and resignation as well as frustration with the politicizing of the pandemic.

Table 4
Post-Hoc Comparisons of Wellness Factors Found Significantly Different.

	Test	Baseline - 8-Weeks	Baseline - 16-Weeks	Baseline - 1 Year	8-weeks - 16 weeks	16-Weeks - 1 Year
Anxiety	χ^2	7.62	9.49	17.88	1.31	2.03
	p	0.02*	0.01*	<0.001*	0.52	0.36
	Relative Risk (95% Confidence Interval)	0.80 (0.63 - 1.03)	0.73 (0.58 - 0.92)	0.69 (0.54 - 0.87)	0.73 (0.58 - 0.92)	0.94 (0.71 - 1.25)
Worrying about contracting an illness from your patients	χ^2	4.89	16.11	32.68	2.5	6.17
	p	0.09	<0.001*	<0.001*	0.29	0.05
	Relative Risk (95% Confidence Interval)	0.93 (0.75 - 1.15)	0.70 (0.55 - 0.88)	0.63 (0.48 - 0.81)	0.91 (0.73 - 1.14)	0.72 (0.55 - 0.95)
Worry about infecting your children and/or family	χ^2	**	**	**	0.06	7.78
	p				0.97	0.02*
	Relative Risk (95% Confidence Interval)				0.98 (0.81–1.18)	0.75 (0.59 - 0.94)
Worry about caring for your children	χ^2	7.61	10.97	9.67	0.99	2.17
	p	0.02*	0.004*	0.01*	0.61	0.34
	Relative Risk (95% Confidence Interval)	0.61 (0.38–0.98)	0.72 (0.48–1.07)	0.57 (0.37–0.88)	1.18 (0.71–1.97)	0.80 (0.50–1.27)
Personal Finances	χ^2	2.29	N/A	N/A	2.8	N/A
	p	0.32	0.34	0.01*	0.25	0.23
	Relative Risk (95% Confidence Interval)	0.74 (0.43–1.24)	0.74 (0.45–1.19)	0.43 (0.24–0.78)	1.00 (0.57–1.76)	0.59 (0.32–1.09)

N/A = A Fisher’s Exact Test was required as the sample cross-tabulation violated the assumptions of the Pearson Chi-Square Test. Relative Risk Ratios (RR) were calculated by comparing the responses to "Same as before the pandemic" and the combination of "Somewhat worse since the pandemic" and "Much worse since the pandemic". The RR represents the later time period.

*P<0.05.

**No Baseline Measurement for this Wellness Factor.

“Earlier feelings of fear, anxiety have mostly given way to a resigned numbness after the loss of a friend working abroad as a pediatric physician.”

“The initial terror has abated. But now it has been replaced by frustration about things like politicizing masks and more hopelessness, feeling that this is never going to be over.”

“The anxiety of the unknown and now the ever increasing false narratives about the virus coupled with increasing politicization has been very stressful and frustrating.”

There were similar themes in the positive effects free text box.

“Increased appreciation for the simple things in life, downtime with family, spending time outdoors in nature and focusing on being grateful.”

“The quiet and stillness has been amazing with less traffic, less airplane noise and increased presence of natural sounds like birds!”

“I have been exercising a lot. So: I have lost 25 pounds since this started, and have gone from obese to merely overweight”.

We concluded our study in March 2021, one year after the pandemic was officially declared. Physicians overall showed resolution of some measured parameters but persistence of others. Although vaccines were available at this point, physicians still reported issues with frustration, feelings of hopelessness, and depression that were worse than before the pandemic. However, other measured variables such as anxiety, concern about caring for family members, infecting family members, and personal finances continued to trend towards pre-pandemic levels.

The repeated assessment of wellness factors allowed the authors to categorize the wellness factors in three different categories. Wellness factors either were 1) not perceived as worse than before the pandemic at any point during the study period, 2) initially reported as worse than before the pandemic and remained a static concern throughout the study period, and 3) reported worse than before the pandemic but improved over the study period (Table 5).

The results from this study support previous research showing profound effects of the pandemic on the well-being of physicians. Unlike previous studies, however, we sought to see how these measures changed over time. Self-report of symptoms from attending and resident physicians at this institution at the start of the pandemic showed that

Table 5
Wellness Factors Categorized by Longitudinal Survey of Hospital Physicians.

Not perceived as worse than before the pandemic at any point during the study period
Conflict with co-workers
Initially reported as worse than before the pandemic and remained a static concern throughout the study period
Frustration
Fatigue
Dread going into work
Depression
Worry about missing work
Feelings of hopelessness
Conflict with family
Reported worse than before the pandemic but improved over the study period
Anxiety
Worrying about contracting an illness from your patients
Worry about infection your children and/or family
Worry about caring for your children
Personal finances
Insomnia
Worry about caring for your extended family

issues ranging from depression and anxiety to concerns about work and family were worse after the pandemic. Many of these wellness concerns remained static over time including feelings of depression and hopelessness; however, other measures such as feelings of anxiety as well as worry about caring or infecting family and financial concerns improved over the course of the year. Why these measures improved is unclear. Could this be a manifestation of the General Adaptation Syndrome by which we are biologically programmed to adapt to stress? To accept the “new normal?” Or, are physicians pressured to be health care heroes and be a strong positive presence despite the stresses that surround them? Or, finally, did the availability of vaccines provide a sense of hope. The pandemic is not over and physicians will continue to need to respond to it. As we now struggle with yet another surge and continue to be challenged by sub-optimal vaccination rates, it will be important to continue to monitor how health care workers are coping. Finally, the COVID pandemic will certainly not be the last challenge faced by the health care

community and there needs to be continued work in learning how to best support them.

Limitations to this study include that we used an untested and rapidly deployed survey tool that was modified over the study period based on feedback. Secondly, although the survey was disseminated to the same physician group, we did not match results to individuals. This action was taken to avoid identifiers and offer anonymity to those physicians who participated. Third, our average response rate over the four time periods was 22.23%. There are several reasons that may explain our lower response rate. The physicians we surveyed were dispersed throughout multiple departments on a medical campus with over 4000 employees. Although our administration allowed us permission to survey physicians, the survey came directly from the authors of the manuscript with voluntary consent to complete it. Finally, we adhered to a fixed amount of time that surveys were open for completion (i.e., two weeks) which may have limited the response rate. Yet, we acknowledge, given the relatively low rate, that response bias may have occurred. Those who participated may have had differing problems with mental health and wellness issues, either positive or negative. Anecdotally, one physician did mention to the authors that they declined to participate because the survey “offended” them, feeling that our investigation of their wellness during a pandemic was inappropriate and that they did not appreciate us “studying their pain”. A fourth limitation of the survey did not specify definitions of each variable, instead allowing physicians to self-report how they felt each wellness indicator was

impacted by the pandemic. Finally, since the survey was limited to one institution, it may not be generalizable to other populations. Future surveys of physician wellness should continue the longitudinal methodology employed here in order to replicate results. Understanding which wellness issues affect physicians more significantly should be considered in developing wellness programs during health crises and outside of them as well.

Funding source

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

The authors wish to acknowledge the following individuals in their assistance in the development or completion of this project: Dr. Curt Ward, Dr. Laurel Fick, Dr. Anthony Martin, Dr. William Swigart, and Dr. Jeffrey Rothenberg.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:[10.1016/j.psychres.2022.114739](https://doi.org/10.1016/j.psychres.2022.114739).

Appendix A. Healthcare Personnel & COVID-19 Survey (Template)

As health care providers, we are on the front lines of the COVID-19 pandemic. The stress of taking care of patients and worrying about our families and own health can take a toll. Please help us get a sense of the impact of the COVID-19 pandemic on your wellness. This survey is completely voluntary and your responses will remain confidential. If you have any questions, please reach out to Rita Patel, MD MPH at rita.patel@ascension.org. Thank you.

Health Issues – Since the initiation of the COVID-19 pandemic, how much of the following are an issue for you?

	Same as before the pandemic	Somewhat worse since the pandemic	Much worse since the pandemic
Insomnia	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Depression	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Anxiety	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Frustration	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Feelings of hopelessness	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fatigue	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Work Issues – Since the initiation of the COVID-19 pandemic, how much of the following are an issue for you?

	Same as before the pandemic	Somewhat worse since the pandemic	Much worse since the pandemic
Dread going into work	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Worrying about contracting an illness from your patients	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Worry about missing work	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

(continued on next page)

(continued)

	Same as before the pandemic	Somewhat worse since the pandemic	Much worse since the pandemic
Conflict with Co-Workers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Life Issues – Since the initiation of the COVID-19 pandemic, how much of the following are an issue for you?			
Worry about infecting your children and/or family	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Worry about caring for your children	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Worry about caring for your extended family	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Personal Finances	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Conflict with Family			

References

Association of American Medical Colleges. 2021. "AAMC Statement on Commitment to Clinician Well-Being and Resilience." aamc.org, <https://www.aamc.org/news-in-sights/wellbeing/faculty>. (accessed 17 May 2021).

Bansal, P., et al., 2020. Clinician wellness during the COVID-19 pandemic: extraordinary times and unusual challenges for the allergist/immunologist. *J. Allergy Clin. Immunol. Pract.* 8 (6), 1781–1790.

Brooks, S.K., et al., 2020. The psychological impact of quarantine and how to reduce it: rapid review of the evidence. *Lancet* 395, 912–920. [https://doi.org/10.1016/S0140-6736\(20\)20460-8](https://doi.org/10.1016/S0140-6736(20)20460-8).

Brubaker, L., 2020. Women physicians and the COVID-19 pandemic. *JAMA* 324 (9), 835–836. <https://doi.org/10.1001/jama.2020.14797>.

Byrne, L.M., et al., 2021. GME on the frontlines-health impacts of COVID-19 across ACGME-accredited programs. *J. Grad. Med. Educ.* 13 (1), 145–152. <https://doi.org/10.4300/JGME-D-20-01539.1>.

Cabarkapa, S., et al., 2020. The psychological impact of COVID-19 and other viral epidemics on frontline healthcare workers and ways to address it: a rapid systematic review. *Brain Behav. Immun. Health* 8, 100144. <https://doi.org/10.1016/j.bbih.2020.100144>.

Cava, M.A., et al., 2005. The experience of quarantine for individuals affected by SARS in Toronto. *Public Health Nurs.* 22 (5), 398–406.

Conti, C., et al., 2020. Fragile heroes. The psychological impact of the COVID-19 pandemic on health-care workers in Italy. *PLoS One* 15 (11), e0242538. <https://doi.org/10.1371/journal.pone.0242538>.

Cull, W.L., et al., 2019. Longitudinal analyses of pediatrician burnout. *Acad. Pediatr.* 19 (3), 256–262.

Dewey, Charlene, et al., 2020. Supporting clinicians during the COVID-19 pandemic. *Ann. Intern. Med.* 172 (11), 752–753. <https://www.acpjournals.org/doi/full/10.7326/M20-1033> (accessed 5 May 2021).

EClinicalMedicine, editor, 2020. Caring for people who care: supporting health workers during the COVID 19 pandemic. *EClinicalMedicine* 28 (100667). *ScienceDirect*. <https://www.sciencedirect.com/science/article/pii/S2589537020304119> (accessed 4 May 2021).

Erdem, H., Lucey, D.R., 2021. Healthcare worker infections and deaths due to COVID-19: a survey from 37 nations and a call for WHO to post national data on their website. *Int. J. Infect. Dis.* 102, 239–241. <https://doi.org/10.1016/j.ijid.2020.10.064>.

Feinstein, R.E., et al., 2020. A health care workers mental health crisis line in the age of COVID-19. *Depress. Anxiety* 37, 822–826.

Fincher, J.W., 2020. ACP: Falsely Accusing Physicians of Overcounting COVID-19 Deaths for Financial Gain is Reprehensible. *ACP Newsroom* [Philadelphia], 25 October 2020. <https://www.acponline.org/acp-newsroom/acp-falsely-accusing-physicians-of-overcounting-covid-19-deaths-for-financial-gain-is-reprehensible>. accessed 5 May 2021.

Friedberg, M.W., et al., 2014. Factors affecting physician professional satisfaction and their implications for patient care, health systems, and health policy. *Rand Health Q* 3 (4), 1–7. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5051918/?repo=printable>. accessed 10 May 2021.

Galea, S., et al., 2020. The mental health consequences of COVID-19 and physical distancing: the need for prevention and early intervention. *JAMA Intern. Med.* 180 (6), 817–818. <https://doi.org/10.1001/jamainternmed.2020.1562>.

Gold, J., 2020. Pediatric practices struggle to adapt and survive amid COVID-19. *KHN* [San Francisco], 14 April 2020. <https://khn.org/news/pediatric-practices-struggle-to-adapt-and-survive-amid-covid-19/>. accessed 5 May 2021.

Gonzalez, Adam, et al., 2020. Supporting health care workers during the COVID-19 pandemic: mental health support initiatives and lessons learned from an academic medical center. *Psychol. Trauma: Theory Res. Pract. Policy* 12 (S1), S168–S170.

Harris, P.A., et al., 2009. Research electronic data capture (REDCap) - A metadata-driven methodology and workflow process for providing translational research informatics support. *J. Biomed. Inform.* 42 (2), 377–381.

Hartzband, P., Groopman, J., 2020. Physician burnout, interrupted. *N. Engl. J. Med.* 382 (26), 2485–2487. <https://doi.org/10.1056/NEJMp2003149>.

Hou, T., et al., 2020. Social support and mental health among health care workers during Coronavirus Disease 2019 outbreak: a moderated mediation model. *PLoS One* 15 (5), e0233831. <https://doi.org/10.1371/journal.pone.0233831> accessed 5 May 2021.

IBM Corp, 2016. *IBM SPSS Statistics for Windows*. Version 24.0. Armonk, NY, IBM Corp.

Kalmoe, M.C., et al., 2019. Physician suicide: a call to action. *Mo. Med.* 116 (3), 211–216. PMID: 31527944.

Kazmerski, Traci M., et al., 2021. Pediatric faculty and trainee attitudes toward the COVID-19 pandemic. *Hosp. Pediatr.* 11 (2), 198–207.

Makino, M., et al., 2020. Mental health crisis of Japanese health care workers under COVID-19. *Psychol. Trauma: Theory Res. Pract. Policy* 12 (S1), S136–S137.

Mukhtar, S., 2020. Mental health and emotional impact of COVID-19: applying health belief model for medical staff to general public of Pakistan. *Brain Behav. Immun.* 87, 28–29.

Nochaiwong, S., et al., 2020. Mental health circumstances among health care workers and general public under the pandemic situation of COVID-19 (HOME-COVID-19). *Medicine* (Baltimore). 99, 26 (e20751).

Randell, K.A., et al., 2021. Parenting pressures among academic pediatricians during the COVID-19 pandemic. *Pediatrics* 147 (4), e2020033159.

Restauri, Nicole, Sheridan, Alison, 2020. Burnout and posttraumatic stress disorder in the coronavirus disease 2019 (COVID-19) pandemic: intersection, impact, and interventions. *J. Am. Coll. Radiol.* 17 (7), 921–926.

Rezaei, Nima., 2020. COVID-19 affects healthy pediatricians more than pediatric patients. *Infect. Control Hosp. Epidemiol.* 41, 1106–1107. <https://doi.org/10.1017/ice.2020.139>.

Ripp, Jonathan, et al., 2020. Attending to the emotional well-being of the health care workforce in a New York City health system during the COVID-19 pandemic. *Acad. Med.* 95 (8), 1136–1139.

Rosenberg, Abby R., et al., 2021. Exploring the Impact of the Coronavirus Pandemic on Pediatric Palliative Care Clinician Personal and Professional Well-Being: a Qualitative Analysis of U.S. Survey Data. *J. Pain Symptom Manage.* 61 (4), 805–811. <https://doi.org/10.1016/j.jpainsymman.2020.09.037>.

Sanghavi, Pooja B., et al., 2020. Effect of the Coronavirus Disease 2019 (COVID-19) Pandemic on Pediatric Resident Well-Being. *J. Med. Educ. Curric.* 7, 1–5. <https://doi.org/10.1177/2382120520947062>.

Selye, Hans., 1950. Stress and the general adaptation syndrome. *Br. Med. J.* 17 (1), 1383–1392, 4667.

Shanafelt, Tait, et al., 2020. Understanding and Addressing Sources of Anxiety Among Health Care Professionals During the COVID-19 Pandemic. *JAMA* 323 (21), 2133–2134. <https://doi.org/10.1001/jama.2020.5893>.

Shapiro, Jo, McDonald, Timothy B., 2020. Supporting Clinicians during Covid-19 and Beyond - Learning from Past Failures and Envisioning New Strategies. *N. Engl. J. Med.* 383 (27), e142 (1)-e142(3). <https://www.nejm.org/doi/full/10.1056/NEJMp2024834>. accessed 5 May 2021.

Tensah, Mohamad-Hani, et al., 2020. The psychological impact of COVID-19 pandemic on health care workers in a MERS-CoV endemic country. *J. Infect. Public Health* 13, 877–882.

Vahratian, Anjel, et al., 2021. Symptoms of Anxiety or Depressive Disorder and Use of Mental Health Care Among Adults During the COVID-19 Pandemic - United States. August 2020-February 2021 Morbidity and Mortality Weekly Report - CDC 70 (13), 490–494. <https://doi.org/10.15585/mmwr.mm7013e2>.

Zarefsky, Marc. 2020. "Will mom get sick? Life as a physician mother during the pandemic." *AMA Association*. 13 October 2020, <https://www.ama-assn.org/deliver-care/health-equity/will-mom-get-sick-life-physician-mother-during-pandemic>. (accessed 11 May 2021).