



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.



## Impacts and challenges of the COVID-19 pandemic on emergency medicine physicians in the United States

Jackie Nguyen<sup>a</sup>, Amy Liu<sup>a</sup>, Mark McKenney, MD, MBA<sup>a,b</sup>, Huazhi Liu, MS<sup>c</sup>, Darwin Ang, MD, PhD, MPH<sup>c,d</sup>, Adel Elkbuli, MD, MPH<sup>a,\*</sup>

<sup>a</sup> Department of Surgery, Division of Trauma and Surgical Critical Care, Kendall Regional Medical Center, Miami, FL, USA

<sup>b</sup> Department of Surgery, University of South Florida, Tampa, FL, USA

<sup>c</sup> Department of Surgery, Ocala Regional Medical Center, Ocala, FL, USA

<sup>d</sup> Department of Surgery, University of Central Florida, Ocala, FL, USA

### ARTICLE INFO

#### Article history:

Received 20 January 2021

Received in revised form 9 March 2021

Accepted 29 March 2021

#### Keywords:

COVID-19 pandemic

Emergency physicians, burnout

Institutional support

Job satisfaction

American College of Emergency Physicians

### ABSTRACT

**Background:** Emergency medicine (EM) physicians have been on the front line of the COVID-19 pandemic. This study aims to determine the impact of COVID-19 pandemic and other related factors such as resource availability and institutional support on well-being, burnout and job-satisfaction of EM physicians in the United States.

**Methods:** A cross-sectional survey study of EM physicians was conducted through the Emergency Medicine Practice Research Network of the ACEP. The survey focused on resource adequacy, institutional support, well-being, and burnout. A total of 890 EM physicians were invited to participate. Both descriptive and risk adjusted, and multivariate regressions were performed with a statistical significance defined as  $p < 0.05$ .

**Results:** EM physicians' response rate was 18.7% (166) from 39 states. Burnout was reported by 74.7% (124) since the start of the pandemic. Factors contributing included work-related emotional strain and anxiety, isolation from family and friends, and increased workload. Those reporting inadequate resources felt ignored by their institutions ( $p < 0.0001$ ). Physicians who felt there was inadequate institutional support, were also dissatisfied with patient care resources ( $p = 0.001$ ). Physicians expressing job dissatisfaction were more likely to report feelings of burnout ( $p = 0.001$ ).

**Conclusion:** EM physicians face greater burnout in the COVID-19 pandemic. This may be compounded by resource scarcity, psychological stress, isolation, and job dissatisfaction. Many of the survey respondents reported inadequate mental health services and resources. The findings of this study may help identify solutions to mitigate these issues.

© 2021 Published by Elsevier Inc.

### 1. Introduction

The novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which causes coronavirus disease 2019 (COVID-19), has rapidly spread worldwide. The clinical course ranges from asymptomatic to severe [1–3]. The task of management and infection containment has largely fallen on emergency medicine (EM) physicians, who have become first-line of defense in the pandemic. They must isolate, diagnose, and treat patients with a highly infectious disease, while still managing other emergent cases.

Resources and staffing have become a growing concern nationwide [4–6]. The shortage of vital resources has resulted in greater risk of infection and increased work-related strain among EM physicians [7,8,9,10]. High-stakes rapid decision-making is routine in EM.

However, this can come with a significant psychological burden and increased mental, emotional, and physical exhaustion caused by job stress, resulting in burnout and affecting both health and well-being [11]. EM physicians consistently rank among the specialties with the highest burnout rates [12]. The higher risk of litigation, chronic fatigue from circadian rhythm disruption, and workload intensity have been identified as key reasons [13]. Although, 42% of physicians reported feelings of burnout in 2020, only a small portion of these individuals have sought professional help [12].

A longitudinal prospective cohort survey of 213 EM physicians found that feelings of isolation were also prevalent during the initial surge of the pandemic [14]. More than 50% of respondents reported relationship strain and isolation, which remained unchanged over the four-week study period. Furthermore, 66% of EM providers reported negative impacts on basic self-care [14]. Another recent survey study of 1300 EM physicians found that post-traumatic stress disorder (PTSD) was significant and a major source of stress was disinformation about COVID-19, PPE and workload [15]. This is concerning as higher levels of burnout

\* Corresponding author at: Department of Surgery, Kendall Regional Medical Center, 11750 Bird Road, Miami, FL 33175, USA.

E-mail address: [Adel.Elkbuli@HCAHealthcare.com](mailto:Adel.Elkbuli@HCAHealthcare.com) (A. Elkbuli).

have been associated with increased medical errors, lower patient satisfaction, unprofessional behavior, and prolonged ED wait times [16–18]. The COVID-19 pandemic has had a significant impact on EM physicians [19–21]. This study aims to survey EM physicians in the United States to ascertain changes in perspectives of burnout as a result of changes to resource levels, institutional support, well-being, and job satisfaction during the COVID-19 pandemic.

## 2. Methods

### 2.1. Study design and setting

In this cross-sectional study, an online 18-item survey was administered to US EM physicians between November 12th, 2020 to December 22nd, 2020 to determine the psychological and emotional impact of the COVID-19 pandemic on EM physicians, and the factors which may influence burnout.

### 2.2. Selection of participants

The Emergency Medicine Practice Research Network (EMPRN) was utilized to recruit participants. The EMPRN is a practice-based network created by the American College of Emergency Physicians (ACEP) consisting of approximately 890 EM physicians nationwide utilized for research in the advancement of EM [22]. EM physicians currently practicing in the US during the COVID-19 pandemic were eligible for enrollment. International physicians and resident physicians were not eligible.

### 2.3. Survey content and administration

The 18-item survey consists of original items and a number of modified questions from a previously validated instrument (**Supplementary File**). Basic demographic information such as gender, age, and geographic location were provided by the EMPRN. Questions regarding institution type and years in practice were included in this survey. Additional questions elicited information regarding opinions on resource levels, institutional support, well-being, and feelings of burnout. The well-being and burnout questions, specifically, were adapted from the Maslach Burnout Inventory-Human Services Survey for Medical Personnel (MBI-HSS (MP)). The MBI-HSS (MP) is a validated tool widely used to evaluate burnout [23,24]. The survey was comprised of multiple-choice, five-point agreement Likert scale, and five-point frequency Likert questions. An “Other” option for free responses was available where applicable.

Prior to dissemination, the survey was internally validated through a small pilot study conducted internally within our institution. The internal pilot study was utilized to refine language, test for face validity and assess survey questions clarity, and improve content and quality. Revisions were completed to ensure ease of understanding and consistency of the questions. The survey was then submitted to the ACEP Practice Management Manager and Research Surveys Committee for review and approval before distribution to the ACEP members through the EMPRN. Revisions were made to standardize survey questions based on the recommendations provided by the ACEP Practice Management Manager and Research Surveys Committee, and the ACEP survey guidelines [22]. Once approved by the ACEP Practice Management and Research Surveys Committee, the survey was directly distributed through ACEP to its members via the EMPRN webmail system.

The survey remained open for six weeks. Two reminder emails were sent on November 24th and December 17th. No identifying information was recorded. No incentives were offered to complete the survey. The human subjects review board at Nova Southeastern University deemed this study to be exempt. This study was performed in compliance with the standards outlined by the board.

### 2.4. Data analysis

All data were analyzed using SAS version 9.4 (SAS Institute Inc., Cary, NC, USA). Nonparametric data were evaluated by Fisher's exact test for proportions and the Wilcoxon Rank-Sum test for continuous data. Multivariable logistic regression was used for calculating the adjusted odds ratio for binary outcomes. Confounders were identified if there was either literature or a logical reason to support a variable having an independent effect on the exposure or outcome. The final regression model included age, gender, institution type, number of years in practice, resource availability, institutional support, and job satisfaction. *P*-values <0.05 were considered significant.

### 2.5. Study outcomes

The primary outcome was burnout. Burnout was defined by answering either “sometimes”, “often”, or “always” to question 14 of the survey. Not being burned out was defined by answering either “never” or “rarely”. Question 14 reads: *I feel more burned out because of the COVID-19 pandemic as compared to before it.* Secondary outcomes examined were resource availability, institutional support, and job satisfaction. Resource availability was defined by answering either “strongly agree” or “somewhat agree” to question one. Lack of resource availability was defined by either answering “neither agree nor disagree”, “somewhat disagree”, or “strongly disagree”. Question one reads: *Since the start of the COVID-19 pandemic (Jan 20th) to currently, I have felt supported by my institution through implementation of extra precautionary techniques and/or maintenance of adequate resource level (PPE, sanitation items, etc.).* Institutional support was defined by answering question four as either “strongly agree” or “somewhat agree”. Lack of institutional support was defined as either answering “neither agree nor disagree”, “somewhat disagree”, or “strongly disagree”. Question four reads: *I feel that my institution was prepared for the COVID-19 pandemic and has the proper guidelines/protocols in place needed for the identification, treatment, and isolation of COVID-19 patients.* Job satisfaction was defined as answering question 15 as either “strongly agree” or “somewhat agree”. Lack of job satisfaction was defined as either answering “neither agree nor disagree”, “somewhat disagree”, or “strongly disagree”. Question 15 reads: *I feel satisfied with my work since the start of the COVID-19 pandemic.*

### 2.6. Cohort groups and risk factors

To identify variables associated with each outcome, a stratified analysis was carried out by the presence or lack of certain risk factors. For the primary outcome burnout, it was stratified by either having resource availability, institutional support, job satisfaction, having mental health support, satisfaction with level of resources, attitudes towards patients and staff, and risk factors leading to being burned out. For the secondary outcome resource availability, it was further stratified by whether the physician felt that there was adequate level of SARS-CoV-2 testing for patients, whether they felt that the turnaround time for testing was adequate, whether they felt that their institution listened to their concerns, having mental health support, and whether or not they felt that they had adequate level of resources. For the secondary outcome of institutional support, it was further stratified by whether or not they felt that their institution listened to their concerns, if their institution had furloughed or laid off staff, if their institution offered mental health support, whether or not they felt that they had adequate level of resources, whether or not there was appropriate precautions to prevent colleague to colleague spread of COVID-19, and specific risk factors related to burnout. For the secondary outcome of job satisfaction, stratified analysis was carried out by whether or not the physicians felt that the institutions listened to their concerns, whether or not they had access to mental health counseling, whether or not there was appropriate precautions to prevent colleague to colleague spread

of COVID-19, whether or not they felt more callous towards patient and staff, whether or not they felt that their academic obligations were compromised, and if they felt more burned out.

### 3. Results

#### 3.1. Characteristics of study subjects

A total of 166 participants completed the survey; the response rate was 18.7% (166/890). There were respondents from 39 different states. One hundred twenty-one respondents (72.9%) were male. The largest age demographic represented respondents between 41 and 50 years old (33.1%). The largest institution demographic represented respondents practicing at community teaching hospitals (31.3%). The largest regional demographic represented respondents located in the Southern US (34.9%). The majority of respondents have practiced for >20 years (51.2%). Complete participant demographics are shown in Table 1.

#### 3.2. Well-being and burnout

A majority of participating EM physicians disclosed increased feelings of burnout since the start of the pandemic. There were three times as many physicians reporting burnout than those that did not (74.7% vs 25.3%) (Table 2). There was a statistically significant association between reported feelings of burnout and age ( $p = 0.04$ ) as well as gender ( $p = 0.01$ ). The age group with the highest proportion of reported burnout were those between 41 and 50 years; those in the oldest age group, 71–75, reported burnout in the lowest proportions. Of the physicians reporting burnout, 70.2% were white, 67.7% were male, 34.7% were employed at a community teaching hospital, 46.8% have been in practice for >20 years, and 37.1% are located in the Southern US.

Respondents reporting burnout also reported higher proportions of feeling callous towards patients and other staff compared to those

**Table 1**  
Characteristics of survey respondents.

Demographics (Total = 166)	n	%
<b>Age</b>		
32–40	22	13.3%
41–50	55	33.1%
51–60	42	25.3%
61–70	37	22.3%
71–75	10	6.0%
<b>Gender</b>		
Male	121	72.9%
Female	45	27.1%
<b>Race</b>		
White	121	72.9%
Black	1	0.6%
Hispanic	2	1.2%
Asian	7	4.2%
Other	35	21.1%
<b>Institution Type</b>		
University Teaching Hospital	42	25.3%
Community non-teaching hospital	45	27.1%
Community teaching hospital	52	31.3%
Combined	16	9.6%
Others	11	6.6%
<b>Practicing Years</b>		
≤5	4	2.4%
6–10	25	15.1%
11–20	51	30.7%
>20	85	51.2%
<b>Region</b>		
Midwest	34	20.5%
Northeast	28	16.9%
South	58	34.9%
West	37	22.3%
Unknown	9	5.4%

**Table 2**  
Reported feelings of burnout, resource availability, institutional support, and job satisfaction by surveyed emergency medicine physicians stratified by demographics. P-values were determined using Fisher's exact test.

Burnout	Yes: Sometimes/often/always feel burned out (n = 124)	No: Never/rarely feel burned out (n = 42)	p-value
<b>Age</b>			0.04
32–40	13.7% (17)	11.9% (5)	
41–50	37.9% (47)	19.1% (8)	
51–60	23.4% (29)	31.0% (13)	
61–70	21.8% (27)	23.8% (10)	
71–75	3.2% (4)	14.3% (6)	
<b>Gender</b>			0.01
Male	67.7% (84)	88.1% (37)	
Female	32.3% (40)	11.9% (5)	
<b>Race</b>			0.66
White	70.2% (87)	81.0% (34)	
Black	0.8% (1)	0.0% (0)	
Hispanic	1.6% (2)	0.0% (0)	
Asian	4.0% (5)	4.8% (2)	
Other	23.4% (29)	14.3% (6)	
<b>Institution Type</b>			0.17
University Teaching Hospital	25.0% (31)	26.2% (11)	
Community non-teaching hospital	23.4% (29)	38.1% (16)	
Community teaching hospital	34.7% (43)	21.4% (9)	
Combined	11.3% (14)	4.8% (2)	
Others	5.7% (7)	9.5% (4)	
<b>Practicing Years</b>			0.14
≤5	3.3% (4)	0.0% (0)	
6–10	14.6% (18)	16.7% (7)	
11–20	35.0% (43)	19.1% (8)	
>20	47.2% (58)	64.3% (27)	
<b>Region</b>			0.32
Midwest	22.6% (28)	14.3% (6)	
Northeast	16.1% (20)	19.1% (8)	
South	37.1% (46)	28.6% (12)	
West	20.2% (25)	28.6% (12)	
Unknown	4.0% (5)	9.5% (4)	
<b>Resource availability</b>	<b>Yes: Strongly agree/somewhat agree (n = 121)</b>	<b>No: Neither agree or disagree/Somewhat disagree/Strongly disagree (n = 45)</b>	<b>p-value</b>
<b>Age</b>			0.05
32–40	17.4% (21)	2.2% (1)	
41–50	30.6% (37)	40.0% (18)	
51–60	26.5% (32)	22.2% (10)	
61–70	19.8% (24)	28.9% (13)	
71–75	5.8% (7)	6.7% (3)	
<b>Gender</b>			0.84
Male	73.6% (89)	71.1% (32)	
Female	26.4% (32)	28.9% (13)	
<b>Race</b>			0.73
White	70.3% (85)	80.0% (36)	
Black	0.8% (1)	0.0% (0)	
Hispanic	1.7% (2)	0.0% (0)	
Asian	4.1% (5)	4.4% (2)	
Other	23.1% (28)	15.6% (7)	
<b>Institution Type</b>			0.77
University Teaching Hospital	24.0% (29)	28.9% (13)	
Community non-teaching hospital	26.5% (32)	28.9% (13)	
Community teaching hospital	33.1% (40)	26.7% (12)	
Combined	10.7% (13)	6.7% (3)	
Others	5.8% (7)	8.9% (4)	

Table 2 (continued)

Burnout	Yes: Sometimes/often/always feel burned out (n = 124)	No: Never/rarely feel burned out (n = 42)	p-value
<i>Practicing Years</i>			0.60
≤5	1.7% (2)	4.4% (2)	
6–10	15.8% (19)	13.3% (6)	
11–20	32.5% (39)	26.7% (12)	
>20	50.0% (60)	55.6% (25)	
<i>Region</i>			0.66
Midwest	18.2% (22)	26.7% (12)	
Northeast	19.0% (23)	11.1% (5)	
South	34.7% (42)	35.6% (16)	
West	22.3% (27)	22.2% (10)	
Unknown	5.8% (7)	4.4% (2)	
<i>Institutional support</i>	Yes: Strongly agree/somewhat agree (n = 84)	No: Neither agree or disagree/somewhat disagree/strongly disagree (n = 82)	p-value
<i>Age</i>			0.67
32–40	13.1% (11)	13.4% (11)	
41–50	34.5% (29)	31.7% (26)	
51–60	25.0% (21)	25.6% (21)	
61–70	19.1% (16)	25.6% (21)	
71–75	8.3% (7)	3.7% (3)	
<i>Gender</i>			0.60
Male	75.0% (63)	70.7% (58)	
Female	25.0% (21)	29.3% (24)	
<i>Race</i>			0.67
White	70.2% (59)	75.6% (62)	
Black	1.2% (1)	0.0% (0)	
Hispanic	2.4% (2)	0.0% (0)	
Asian	4.8% (4)	3.7% (3)	
Other	21.4% (18)	20.7% (17)	
<i>Institution Type</i>			0.94
University Teaching Hospital	22.6% (19)	28.1% (23)	
Community non-teaching hospital	27.4% (23)	26.8% (22)	
Community teaching hospital	33.3% (28)	29.3% (24)	
Combined Others	9.5% (8) 7.1% (6)	9.8% (8) 6.1% (5)	
<i>Practicing Years</i>			0.93
≤5	2.4% (2)	2.5% (2)	
6–10	14.3% (12)	16.1% (13)	
11–20	33.3% (28)	28.4% (23)	
>20	50.0% (42)	53.1% (43)	
<i>Region</i>			0.61
Midwest	21.4% (18)	19.5% (16)	
Northeast	19.1% (16)	14.6% (12)	
South	29.8% (25)	40.2% (33)	
West	22.6% (19)	22.0% (18)	
Unknown	7.1% (6)	3.7% (3)	
<i>Job satisfaction</i>	Yes: Strongly agree/somewhat agree (n = 94)	No: Neither agree or disagree/somewhat disagree/strongly disagree (n = 72)	p-value
<i>Age</i>			0.84
32–40	14.9% (14)	11.1% (8)	
41–50	31.9% (30)	34.7% (25)	
51–60	23.4% (22)	27.8% (20)	
61–70	22.3% (21)	22.2% (16)	
71–75	7.5% (7)	4.2% (3)	
<i>Gender</i>			0.03
Male	79.8% (75)	63.9% (46)	
Female	20.2% (19)	36.1% (26)	
<i>Race</i>			0.85
White	71.3% (67)	75.0% (54)	
Black	1.1% (1)	0.0% (0)	
Hispanic	2.1% (2)	0.0% (0)	

Table 2 (continued)

Burnout	Yes: Sometimes/often/always feel burned out (n = 124)	No: Never/rarely feel burned out (n = 42)	p-value
Asian	4.3% (4)	4.2% (3)	
Other	21.3% (20)	20.8% (15)	
<i>Institution Type</i>			0.75
University Teaching Hospital	28.7% (27)	20.8% (15)	
Community non-teaching hospital	24.5% (23)	30.6% (22)	
Community teaching hospital	31.9% (30)	30.6% (22)	
Combined Others	8.5% (8) 6.4% (6)	11.1% (8) 6.9% (5)	
<i>Practicing Years</i>			0.74
≤5	2.1% (2)	2.8% (2)	
6–10	12.7% (12)	18.3% (13)	
11–20	30.9% (29)	31.0% (22)	
>20	54.3% (51)	47.9% (34)	
<i>Region</i>			0.71
Midwest	21.3% (20)	19.4% (14)	
Northeast	17.0% (16)	16.7% (12)	
South	30.9% (29)	40.3% (29)	
West	25.5% (24)	18.1% (13)	
Unknown	5.3% (5)	5.6% (4)	

who reported no burnout (36.1% vs 4.8%,  $p = 0.0001$ ). The most common feelings contributing to burnout were increased work-related emotional strain and anxiety, followed by isolation from family and friends, and then by increased workload (Table 3).

### 3.3. Resource availability

Most participants (72.9%) reported adequate availability of resources such as PPE and sanitation items since the start of the pandemic (Table 2). There was a statistically significant association between reported feelings of resource adequacy and age ( $p = 0.05$ ). Physicians age 32–40 reported feelings of resource adequacy in the highest proportions compared to all other age groups. Physicians who practice in the Southern US (34.7%) reported the most resource adequacy. Those employed at community teaching hospitals and those located in the Southern US reported the highest rate of feeling adequately supplied with necessary resources (33.1% and 34.7%, respectively). Participants employed at community non-teaching and those employed at university teaching hospitals each accounted for 28.9% of those who disagreed their institution maintained adequate resource levels. The highest proportion of physicians who did not feel there were adequate resource levels were those who had been practicing for >20 years (55.6%).

Respondents reporting burnout noted resource and supply inadequacy (sanitation items, hospital beds, and ventilators) for treating COVID-19 positive patients at higher proportions compared to those who did not report burnout (21.8% vs 2.4%,  $p = 0.004$ ) (Table 3). However, after adjusting for confounding factors (age, gender, institution type, number of years in practice, institutional Support, job Satisfaction), the odds of burnout were not significantly increased with feelings of resource inadequacy (Table 4a). Furthermore, a greater proportion of respondents reporting feelings of inadequate resource availability also expressed that SARS-CoV-2 testing for their patients was inadequate compared to those who reported sufficient resources (44.4% vs 26.5%,  $p = 0.03$ ) (Table 5). None of the respondents reporting feelings of inadequate resources felt there was sufficient testing compared to 11.6% of those who felt adequately supplied ( $p = 0.02$ ). A greater proportion of those who reported feelings of resource inadequacy also strongly disagreed that there was adequate turnaround time for SARS-CoV-2



**Table 3**  
Reported feelings of burnout (yes/no) stratified by various survey questions.

Burnout	Yes: Sometimes/often/always feel burned out (n = 124)	No: never/rarely feel burned out (n = 42)	p-value
<i>Professional counseling and/or mental health support was offered by my institution as a result of the impact on workload and stress from the COVID-19 pandemic</i>			
Strongly disagree	14.5% (18)	9.5% (4)	0.41
Disagree	13.7% (17)	14.3% (6)	0.93
Neutral	12.1% (15)	19.1% (8)	0.26
Agree	29.8% (37)	26.2% (11)	0.65
Strongly Agree	29.8% (37)	31.0% (13)	0.89
<i>I am satisfied with the level of resources (sanitation items, hospital beds capacity, ventilators, medications, administration support etc.) provided by my institution to treat COVID-19 patients</i>			
Strongly disagree	21.8% (27)	2.4% (1)	0.004
Disagree	23.4% (29)	11.9% (5)	0.11
Neutral	12.1% (15)	16.7% (7)	0.45
Agree	29.8% (37)	38.1% (16)	0.32
Strongly Agree	12.9% (16)	31.0% (13)	0.01
<i>I feel more callous towards patients, staff, family, and/or people around me as a result of my work during the COVID-19 pandemic</i>			
Never	23.0% (28)	59.5% (25)	<0.0001
Rarely	32.0% (39)	33.3% (14)	0.82
Sometimes	36.1% (44)	4.8% (2)	0.0001
Often	7.4% (9)	2.4% (1)	0.25
Always	1.6% (2)	0.0% (0)	0.41
<i>What, if anything, is/are contributing your feeling of burnout? Select all that apply</i>			
Increased emotional strain/anxiety from work	29.6% (102)	29.8% (17)	0.97
Increased workload	19.7% (68)	14.0% (8)	0.31
Isolation from family/friends	26.4% (91)	22.8% (13)	0.57
Lack of institutional support	12.8% (44)	12.3% (7)	0.92
Need for a safe place to go after work	6.7% (23)	8.8% (5)	0.56
Other	4.9% (17)	12.3% (7)	0.03

test results compared to those who reported adequate resources (55.6% vs. 35.5%,  $p = 0.02$ ).

Respondents who felt that they had inadequate resource availability either disagreed or strongly disagreed that their institutions listened to them ( $p < 0.0001$ ). Additionally, more disagreed that they had adequate professional counseling and support compared to those who felt that adequately supplied (24.4% vs 9.9%,  $p = 0.02$ ).

### 3.4. Institutional support

Participants were ambivalent regarding the adequacy of institutional support during the COVID-19 pandemic. There was no significant difference in feelings of institutional support; 50.6% of the respondents agreed and 49.4% disagreed that their institutions were prepared with proper guidelines and protocols (Table 2). Of the physicians who

**Table 4a**  
Feelings of burnout as reported by surveyed emergency medicine physicians in relation to resource availability.

Burnout	Yes: Sometimes/often/always feel burned out	Resource availability	
		Yes: Strongly agree/Somewhat agree (N = 121)	No: Neither agree or disagree/somewhat disagree/strongly disagree (N = 45)
Burnout	Yes: Sometimes/often/always feel burned out	71.1% (86)	84.4% (38) 2.24 (0.91, 5.48) 2.16 (0.63, 7.39) <sup>a</sup>
	No: Never/rarely feel burned out	28.9% (35)	15.6% (7) 0.45 (0.18, 1.10) 0.46 (0.14, 1.59) <sup>a</sup>

<sup>a</sup> Adjusted Odds Ratio by: Age, Gender, Institution Type, # of Years in Practice, Institutional Support, Job Satisfaction.

reported feeling inadequate institutional support, the largest proportions were between ages 41–50 (31.7%), white (70.7%), employed at a community teaching hospital (29.3%) or university teaching hospital (28.1%), have been in practice for >20 years (53.1%), and located in the Southern US (40.2%).

There was no significantly increased odds of burnout associated with feeling a lack of institutional support (Table 4b). A larger proportion of respondents who felt a lack of institutional support strongly disagreed that they were satisfied with the resources available to their patients compared to those who felt supported (26.8% vs. 7.1%,  $p = 0.001$ ) (Table 6). However, even among those who felt that they had adequate institutional support, the majority felt increased emotional strain and anxiety from work ( $p = 0.03$ ).

### 3.5. Job satisfaction

A majority of respondents (56.6%) reported feelings of job satisfaction since the start of the COVID-19 pandemic (Table 2). There was a statistically significant association between reported job satisfaction and gender ( $p = 0.03$ ). Women reported job dissatisfaction in higher proportions than men (57.8% vs. 38.0%). Physicians located in the Southern US reported the highest proportion of job dissatisfaction (40.3%) compared to those in other regions. Job satisfaction was higher among those who felt their institution listened to them, compared to those who did not (44.7% vs. 27.8%,  $p = 0.03$ ) (Table 7). Those who reported job satisfaction also reported greater availability of professional counseling ( $p = 0.003$ ). A greater proportion of those who were satisfied with their jobs reported that they rarely saw their clinical responsibilities as hurting their academic obligations, compared to those who were dissatisfied (20.9% vs. 4.4%,  $p = 0.003$ ).

Physicians reporting burnout were also more likely to report job dissatisfaction (aOR 6.94; 95% CI 2.47, 19.54) (Table 4c). This remained even when adjusting for age, gender, institution, number of years in practice, and sense of resource adequacy. There was also a positive correlation between feelings of burnout and a sense of lack of resources or institutional support. However, these relationships were not statistically significant. Additionally, among respondents reporting burnout, those who also reported job dissatisfaction were more likely to feel burnout due to COVID-19, compared to those who were satisfied with their jobs ( $p = 0.001$ ) (Table 7).

## 4. Discussion

The COVID-19 pandemic has placed tremendous strain on the US health care system. As the number of cases increases, there is a related increase in admission rates from the ED. [25] Previous surveys have broadly evaluated the mental health of EM physicians, although none have looked at which specific pandemic-related factors contribute to their burnout.

The findings of our survey are consistent with previous literature that EM physicians face greater psychological burdens since the pandemic onset [26]. A recent nationwide poll conducted by ACEP found

**Table 4b**  
Feelings of burnout as reported by surveyed emergency medicine physicians in relation to institutional support.

		Institutional support	
		Yes: Strongly agree/somewhat agree (N = 84)	No: Neither agree or disagree/somewhat disagree/strongly disagree (N = 82)
Burnout	Yes: Sometimes/Often/Always Feel Burned Out	69.1% (58)	80.5% (66) 1.82 (0.89, 3.73) 1.26 (0.49, 3.20) <sup>a</sup>
	No: Never/Rarely Feel Burned Out	30.9% (26)	19.5% (16) 0.55 (0.27, 1.12) 0.80 (0.31, 2.03) <sup>a</sup>

<sup>a</sup> Adjusted Odds Ratio by: Age, Gender, Institution Type, # of Years in Practice, Resource Availability, Job Satisfaction.

**Table 4c**  
Feelings of burnout as reported by surveyed emergency medicine physicians in relation to job satisfaction.

		Job satisfaction	
		Yes: Strongly agree/somewhat agree (N = 94)	No: Neither agree or disagree/somewhat disagree/strongly disagree (N = 72)
Burnout	Yes: Sometimes/Often/Always Feel Burned Out	61.7% (58)	91.7% (66) 6.72 (2.64, 17.11) 6.94 (2.47, 19.54) <sup>a</sup>
	No: Never/Rarely Feel Burned Out	38.3% (36)	8.3% (6) 0.15 (0.06, 0.38) 0.14 (0.05, 0.41) <sup>a</sup>

<sup>a</sup> Adjusted Odds Ratio by: Age, Gender, Institution Type, # of Years in Practice, Resource Availability, Institutional Support.

87% of surveyed EM physicians had experienced more stress due to the pandemic; 72% reported feelings of burnout; 73% felt uncomfortable seeking mental health treatment due to the perceived stigma [27]. Rodriquez et al. found that greater than 90% of surveyed EM physicians during the pandemic reported changes in their behavior which included decreased affection towards friends and family [28]. Our results further

support these findings as among surveyed participants, three times the number of EM physicians noted increased feelings of burnout and callousness towards loved ones since the start of the pandemic.

The significant number of EM physicians reporting burnout may be attributable to the immense emotional and mental burden of frontline work during the pandemic. However, our study found no statistically

**Table 5**  
Feelings of resource availability (yes/no) stratified by various survey questions.

Resource availability	Yes: Sometimes/often/always (n = 121)	No: Neither agree or disagree/somewhat disagree/strongly disagree (n = 45)	p-value
<i>During the COVID-19 pandemic, I felt the needed level of testing for COVID-19 for patients was adequate</i>			
Strongly disagree	26.5% (32)	44.4% (20)	0.03
Disagree	32.2% (39)	33.3% (15)	0.89
Neutral	5.0% (6)	8.9% (4)	0.35
Agree	24.8% (30)	13.3% (6)	0.11
Strongly agree	11.6% (14)	0.0% (0)	0.02
<i>During the COVID-19 pandemic, I felt the turnaround time for COVID-19 test results was adequate for patients</i>			
Strongly disagree	35.5% (43)	55.6% (25)	0.02
Disagree	36.4% (44)	31.1% (14)	0.53
Neutral	5.0% (6)	6.7% (3)	0.67
Agree	15.7% (19)	4.4% (2)	0.05
Strongly agree	7.4% (9)	2.2% (1)	0.21
<i>I feel that my institution listens when I voice concerns related to the COVID-19 pandemic</i>			
Strongly disagree	2.5% (3)	28.9% (13)	<0.0001
Disagree	7.4% (9)	33.3% (15)	<0.0001
Neutral	24.0% (29)	20.0% (9)	0.59
Agree	45.5% (55)	15.6% (7)	0.0004
Strongly agree	20.7% (25)	2.2% (1)	0.004
<i>Professional counseling and/or mental health support was offered by my institution as a result of the impact on workload and stress from the COVID-19 pandemic</i>			
Strongly disagree	11.6% (14)	17.8% (8)	0.30
Disagree	9.9% (12)	24.4% (11)	0.02
Neutral	11.6% (14)	20.0% (9)	0.16
Agree	28.9% (35)	28.9% (13)	1
Strongly agree	38.0% (46)	8.9% (4)	0.0003
<i>I am satisfied with the level of resources (sanitation items, hospital beds capacity, ventilators, medications, administration support etc.) provided by my institution to treat COVID-19 patients</i>			
Strongly disagree	6.6% (8)	44.4% (20)	<0.0001
Disagree	17.4% (21)	28.9% (13)	0.10
Neutral	10.7% (13)	20.0% (9)	0.12
Agree	42.2% (51)	4.4% (2)	<0.0001
Strongly agree	23.1% (28)	2.2% (1)	0.002

**Table 6**  
Feelings of institutional support (yes/no) stratified by various survey question.

Institutional support	Yes: Strongly agree/somewhat agree (n = 84)	No: Neither agree or disagree/somewhat disagree/strongly disagree (n = 82)	p-value
<i>I feel that my institution listens when I voice concerns related to the COVID-19 pandemic</i>			
Strongly disagree	1.2% (1)	18.3% (15)	0.0002
Disagree	7.1% (6)	22.0% (18)	0.01
Neutral	25.0% (21)	20.7% (17)	0.51
Agree	45.2% (38)	29.3% (24)	0.03
Strongly agree	21.4% (18)	9.8% (8)	0.04
<i>My institution has furloughed/laid off significant numbers of healthcare workers during the COVID-19 pandemic</i>			
Strongly disagree	32.1% (27)	19.5% (16)	0.06
Disagree	16.7% (14)	13.4% (11)	0.56
Neutral	11.9% (10)	20.7% (17)	0.12
Agree	23.8% (20)	28.1% (23)	0.53
Strongly agree	15.5% (13)	18.3% (15)	0.63
<i>Professional counseling and/or mental health support was offered by my institution as a result of the impact on workload and stress from the COVID-19 pandemic</i>			
Strongly disagree	9.5% (8)	17.1% (14)	0.15
Disagree	13.1% (11)	14.6% (12)	0.77
Neutral	9.5% (8)	18.3% (15)	0.10
Agree	33.3% (28)	24.4% (20)	0.21
Strongly agree	34.5% (29)	25.6% (21)	0.21
<i>I am satisfied with the level of resources (sanitation items, hospital beds capacity, ventilators, medications, administration support etc.) provided by my institution to treat COVID-19 patients</i>			
Strongly disagree	7.1% (6)	26.8% (22)	0.001
Disagree	14.3% (12)	26.8% (22)	0.05
Neutral	7.1% (6)	19.5% (16)	0.02
Agree	46.4% (39)	17.1% (14)	<0.0001
Strongly agree	25.0% (21)	9.8% (8)	0.01
<i>If you were infected with COVID-19, who is/are the most likely source(s) of the infection?</i>			
Colleagues	1.2% (1)	3.7% (3)	0.30
Family	6.0% (5)	7.3% (6)	0.72
Friends	1.2% (1)	4.9% (4)	0.17
Neighbors	2.4% (2)	0.0% (0)	0.16
Patient	17.9% (15)	14.6% (12)	0.57
Unknown	8.3% (7)	7.3% (6)	0.81
Not applicable	63.1% (53)	62.2% (51)	0.90
<i>If you were infected with COVID-19 do you suspect or worry you may have infected others including but not limited to family, friends, patients, or colleagues? Select one</i>			
Yes	32.1% (27)	30.0% (24)	0.69
No	4.8% (4)	7.5% (6)	0.49
Not applicable	63.1% (53)	62.5% (50)	0.78
	Yes: Strongly agree/Somewhat agree (n = 180)	No: Neither agree or disagree/Somewhat disagree/Strongly disagree (n = 222)	p-value
<i>What, if anything, is/are contributing your feeling of burnout? Select all that apply</i>			
Increased emotional strain/anxiety from work	35.0% (63)	25.2% (56)	0.03
Increased workload	18.9% (34)	18.9% (42)	1
Isolation from family/friends	29.4% (53)	23.0% (51)	0.14
Lack of institutional support	7.8% (14)	16.7% (37)	0.01
Need for a safe place to go after work	5.0% (9)	8.6% (19)	0.17
Other (please specify)	3.9% (7)	7.7% (17)	0.11

significant difference in the number of respondents endorsing versus denying burnout. A previous study investigating the mental health effects of the COVID-19 pandemic on healthcare workers found that healthcare workers felt that they and their loved ones were more susceptible to infection due to the shortage of supplies and resources [29]. Increased patient volume and work intensity were also named as contributing factors to this group's decline in overall mental health [29]. Additionally, the highly infectious nature of the virus and lack of definitive management guidelines or viable treatment options were found to be at least partly responsible for the mental health decline as well [30]. Lai et al. noted a significant proportion of surveyed healthcare workers reported insomnia, anxiety, depression, and distress symptoms due to treating patients with COVID-19 [31]. Our survey also found the most cited factors contributing to EM physician burnout to be increased work-related emotional strain and anxiety, isolation from family and friends, and increased workload. However, no significant difference was found for citing these contributors between respondents reporting feelings of burnout and those who did not.

Not only did our survey demonstrate EM physicians face greater burnout from the pandemic, but it also shows that a greater proportion of EM physicians reported inadequate professional counseling and

support as a component of inadequate resource availability. We also found that physicians reporting job satisfaction noted greater availability of such services. These findings highlight the importance of mental health services [26]. Physicians with access to readily available psychological support services have shown reduced burnout rates [32]. Moreover, distressed physicians were found to benefit from confidential, secure mental health services as well exhibiting again decreased burnout rates and increased professional fulfillment [33]. Unfortunately, the limited access to mental health support and services during pandemic closures has further worsened issues of anxiety, psychological distress, and depression [29]. This is especially concerning as a few ED physicians have died by suicide as a result of the strain of the COVID-19 pandemic [34,35].

The results of this survey also indicate a relationship between job dissatisfaction and burnout; EM physicians reporting feelings of burnout were more likely to express job dissatisfaction. This finding is consistent with existing literature on physicians in other specialties [36,37]. Interestingly, our survey found that physicians age 41–60 reported the highest proportion of job dissatisfaction and burnout. This seems to suggest that those most at risk of burnout are mid-career physicians. The Medscape National Physician Burnout & Suicide Report



**Table 7**  
Feelings of job satisfaction (yes/no) stratified by various survey questions.

Job satisfaction	Yes: Strongly agree/somewhat agree (n = 94)	No: Neither agree or disagree/somewhat disagree/strongly disagree (n = 72)	p-value
<i>I feel that my institution listens when I voice concerns related to the COVID-19 pandemic</i>			
Strongly disagree	5.3% (5)	15.3% (11)	0.03
Disagree	12.8% (12)	16.7% (12)	0.48
Neutral	19.2% (18)	27.8% (20)	0.19
Agree	44.7% (42)	27.8% (20)	0.03
Strongly agree	18.1% (17)	12.5% (9)	0.33
<i>Professional counseling and/or mental health support was offered by my institution as a result of the impact on workload and stress from the COVID-19 pandemic</i>			
Strongly disagree	10.6% (10)	16.7% (12)	0.26
Disagree	10.6% (10)	18.1% (13)	0.17
Neutral	9.6% (9)	19.4% (14)	0.07
Agree	29.8% (28)	27.8% (20)	0.78
Strongly agree	39.4% (37)	18.1% (13)	0.003
<i>If you were infected with COVID-19 do you suspect or worry you may have infected others including but not limited to family, friends, patients, or colleagues? Select one</i>			
Yes	31.2% (29)	31.0% (22)	0.97
No	7.5% (7)	4.2% (3)	0.38
Not applicable	61.3% (57)	64.8% (46)	0.67
<i>I feel more callous towards patients, staff, family, and/or people around me as a result of my work during the COVID-19 pandemic</i>			
Never	37.6% (35)	25.4% (18)	0.09
Rarely	36.6% (34)	26.8% (19)	0.18
Sometimes	22.6% (21)	35.2% (25)	0.08
Often	3.2% (3)	9.9% (7)	0.08
Always	0.0% (0)	2.8% (2)	0.11
<i>I feel my academic obligations (research, teaching, etc.) have been negatively impacted by my clinical responsibilities due to the COVID-19 pandemic</i>			
Never	29.7% (27)	23.2% (16)	0.34
Rarely	20.9% (19)	4.4% (3)	0.003
Sometimes	23.1% (21)	33.3% (23)	0.17
Often	17.6% (16)	30.4% (21)	0.06
Always	8.8% (8)	8.7% (6)	0.97
<i>I feel more burned out because of the COVID-19 pandemic as compared to before it</i>			
Never	10.6% (10)	5.6% (4)	0.24
Rarely	27.7% (26)	2.8% (2)	<0.0001
Sometimes	42.6% (40)	38.9% (28)	0.64
Often	14.9% (14)	31.9% (23)	0.01
Always	4.3% (4)	20.8% (15)	0.001

2020: The Generational Divide reported similar findings [12]. In their evaluation of suicide among surgeons, Elkbuli et al. found that middle aged physicians comprised the majority of completed suicides [38]. Dryby et al. evaluated differences in physician satisfaction and burnout by career stage [39]. They found mid-career physicians, defined as having 11–20 years of work experience, were more likely to have burnout and high emotional exhaustion compared to physicians at other career stages, and were more likely to consider leaving the medical field. These findings persisted even after controlling for factors such as gender, specialty, and institution type. The mid-career peak burnout may be attributable to dissatisfaction with career progress, home or personal conflicts, and long work hours and call days; dissonance between mid-career expectations and reality may impact burnout and warrants further investigation [39].

Conversely, physicians with >20 years of practice were less likely to report burnout. Del Carmen et al. assessed burnout of physicians in a large academic center. They noted that when compared to mid-career physicians, those in their late-career were less vulnerable to burnout [40]. Dryby et al. also found late-career physicians demonstrate lower levels of burnout and higher job satisfaction when compared to early and mid-career physicians [39]. Peisah et al. investigated this trend and identified two key factors that allow for the lower burnout levels seen in late-career physicians [41]. The authors found that as

experienced physicians are more aware of burnout, they have delineated personal boundaries from their professional responsibilities to protect themselves. Furthermore, the accumulated clinical experience of late-career physicians has fostered confidence in their abilities and in so liberated them from the stressors of providing quality healthcare [41].

We also found that EM physicians who were satisfied with their career, more likely to feel listened to by their institutions. They were also more likely to feel that they were able to carry on with obligations outside their clinical duties such as research or education. It is important to recognize this phenomenon. A sense of control over practice environment and autonomy can aid in not only increasing job satisfaction and reducing burnout but also can improve the quality of healthcare provided and physician adherence to guidelines [42].

Our survey found that the highest proportion of physicians reporting burnout were in the South, followed by the Midwest, and the Western US. However, there was no statistically significant difference in the proportion reporting burnout versus no burnout in any region. This may be due to the greater number of survey respondents were from these regions. The geographic distribution of respondents may not be completely representative. The analysis of differences in survey responses between regions may limit the overall generalizability due to the variations in COVID-19 exposure surges, severity of cases and fatalities, and resource utilization. Also, it is possible that regional differences in responses can be linked to dissimilarities in provincial politics however, it is not possible to make definitive conclusions on the effect of politics in survey responses. Of note, the lowest number of respondents were from the Northeast, one of the regions initially most impacted by COVID-19 [43,44].

While our study focused on the effect of COVID-19 on feelings of burnout among EM physicians, it may be appropriate to examine effects in other medical specialties and non-medical fields as well. EM physicians may not be alone in feeling increased burnout due to recent events. Jha et al. evaluated the COVID-19-related burnout among interventional pain specialists and found that 98% of responding practices were negatively affected by the pandemic, and 52% of responding physicians reported burnout. However, they also found that 76% of those surveyed previously felt this way earlier in their careers [45].

The following limitations should be considered when interpreting the results of this study. The response rate of 18.7% was relatively low and may represent some level of nonresponse bias. It is possible that increased workload or burnout itself may present a barrier to survey completion. Because of the low response rate and small sample size, this survey may not reflect the sentiment and attitudes of all EM physicians. Instead, it offers useful insights from EM colleagues who are actively participating in the care of COVID-19 patients and who are members of the ACEP and EMPRN. Their experiences across the country are likely similar to many of their colleagues. Several attempts were made to maximize the response rate; reminder emails were sent two and four weeks after the initial dispersal of the survey through the EMPRN online mail system. Additionally, the cross-sectional nature of this study only allows for momentary insight into the perspective of the respondents. This survey was distributed after a peak in US COVID-19 incidence, which may have some effect on responses regarding institutional resources and support. It may be of value to reexamine the effects of vaccine availability on EM physician responses to burnout. Geographic differences in COVID-19 burden may also account for any regional differences in sentiment; there were notable differences in response rate and peak case incidence between states. The majority of respondents of this survey were male and white; therefore, the generalizability of these findings may be limited; the perspective of female and minority EM physicians may be under-reported. This is interesting to note as the literature has demonstrated high levels of burnout and lower perceived control over work environment among female EM physicians [46–48]. Those who are mid-career are seven-fold more likely to seriously contemplate leaving the field when compared to their male counterparts [47].

Additionally, prior studies have found minority physicians report race-related struggles such as discrimination, microaggressions, and feelings of marginalization contributing to higher levels of career dissatisfaction and contemplation of switching careers [49–51]. Therefore, more investigation of these two under-reported groups is needed.

There are no studies that we are aware of that evaluate burnout as a result of COVID-19 between different medical specialties. In the future, this survey may be distributed to other specialty professional societies to examine potential differences between groups. Interestingly, in the study conducted by Wu and colleagues in Wuhan, China, evaluating burnout among physicians in frontline COVID-19 work areas and non-COVID-19 wards, there was significantly lower burnout in the frontline group [52]. Further investigation on whether burnout is related to front-line work versus COVID-19-related stress, in general, may be needed.

## 5. Conclusion

EM physicians face many stressors from the inherent high-stakes nature of the field, which may be further heightened in the COVID-19 pandemic. EM physician burnout may be compounded by perceived resource scarcity, psychological stress, isolation, and job dissatisfaction. The importance of mental health support for EM physicians is highlighted by the report of inadequate mental health services and resources by many of the survey respondents. It may be valuable to reexamine shifting attitudes and the evolution of contributing factors through the progression of this pandemic. The findings of this study may help identify solutions to mitigate these issues.

## Author contribution

Study design and conception: Adel Elkbuli, Jackie Nguyen.

Data collection, interpretation and analysis: Adel Elkbuli, Jackie Nguyen, Amy Liu, Huazhi Liu, Darwin Ang, Mark McKenney.

Manuscript preparation: Adel Elkbuli, Jackie Nguyen, Amy Liu, Mark McKenney, Darwin Ang.

Critical revision of manuscript: Adel Elkbuli, Jackie Nguyen, Amy Liu, Huazhi Liu, Mark McKenney, Darwin Ang.

All authors read and approved the final manuscript.

## Funding

None.

## Declaration of Competing Interest

Authors disclose no competing interest.

## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ajem.2021.03.088>.

## References

- Clark A, Jit M, Warren-Gash C, et al. Global, regional, and national estimates of the population at increased risk of severe COVID-19 due to underlying health conditions in 2020: a modelling study. *Lancet Glob Health*. 2020;8(8):e1003–17.
- Fu L, Wang B, Yuan T, et al. Clinical characteristics of coronavirus disease 2019 (COVID-19) in China: A systematic review and meta-analysis. *J Infect*. 2020;80(6):656–65. <https://doi.org/10.1016/j.jinf.2020.03.041> S0163-4453(0120)30170-30175.
- W-J Guan, Ni Z-Y, Hu Y, et al. Clinical characteristics of coronavirus disease 2019 in China. *N Engl J Med*. 2020;382(18):1708–20.
- Ehrlich H, McKenney M, Elkbuli A. Strategic planning and recommendations for healthcare workers during the COVID-19 pandemic. *Am J Emerg Med*. 2020;38(7):1446–7.
- Ehrlich H, McKenney M, Elkbuli A. Protecting our healthcare workers during the COVID-19 pandemic. *Am J Emerg Med*. 2020;38(7):1527–8.
- Ehrlich H, McKenney M, Elkbuli A. Defending the front lines during the COVID-19 pandemic: Protecting our first responders and emergency medical service personnel. *Am J Emerg Med*. 2021;40:213–4. <https://doi.org/10.1016/j.ajem.2020.05.068> S0735-6757(0720)30429-30420.
- Emanuel EJ, Persad G, Upshur R, et al. Fair allocation of scarce medical resources in the time of COVID-19. *N Engl J Med*. 2020;382(21):2049–55.
- Moghadas SM, Shoukat A, Fitzpatrick MC, et al. Projecting hospital utilization during the COVID-19 outbreaks in the United States. *Proc Natl Acad Sci*. 2020;117(16):9122–6.
- Adams JG, Walls RM. Supporting the health care workforce during the COVID-19 global epidemic. *JAMA*. 2020;323(15):1439–40.
- Livingston E, Desai A, Berkwits M. Sourcing personal protective equipment during the COVID-19 pandemic. *JAMA*. 2020;323(19):1912–4. <https://doi.org/10.1001/jama.2020.5317>.
- Salvagioni DAJ, Melanda FN, Mesas AE, González AD, Gabani FL, SMD Andrade. Physical, psychological and occupational consequences of job burnout: a systematic review of prospective studies. *PLoS One*. 2017;12(10):e0185781.
- Medscape National Physician Burnout & Suicide Report 2020: The Generational Divide. Medscape; 2020 <https://www.medscape.com/slideshow/2020-lifestyle-burnout-6012460> Accessed May 18th, 2020.
- Stehman CR, Testo Z, Gershaw RS, Kellogg AR. Burnout, drop out, suicide: physician loss in emergency medicine, part I. *West J Emerg Med*. 2019;20(3):485–94.
- Kelker H, Yoder K, Musey P, et al. Longitudinal prospective study of emergency medicine provider wellness across ten academic and community hospitals during the initial surge of the COVID-19 pandemic. *Res Sq*. 2020. <https://doi.org/10.21203/rs.3.rs-87786/v1> rs.3.rs-87786. Published 2020 Oct 15.
- Marco CA, Larkin GL, Feesser VR, Monti JE, Vearrier L. ACEP ethics committee. Post-traumatic stress and stress disorders during the COVID-19 pandemic: survey of emergency physicians. *J Am Coll Emerg Phys Open*. 2020 Nov 2;1(6):1594–601. <https://doi.org/10.1002/emp2.12305>.
- Halbesleben JRB, Rathert C. Linking physician burnout and patient outcomes: exploring the dyadic relationship between physicians and patients. *Health Care Manage Rev*. 2008;33(1):29–39.
- Shanafelt TD, Gradishar WJ, Kosty M, et al. Burnout and career satisfaction among US oncologists. *J Clin Oncol*. 2014;32(7):678–86.
- Shanafelt TD, Balch CM, Bechamps G, et al. Burnout and medical errors among American surgeons. *Ann Surg*. 2010;251(6):995–1000.
- Preti E, Di Mattei V, Perego G, et al. The psychological impact of epidemic and pandemic outbreaks on healthcare workers: rapid review of the evidence. *Curr Psychiatry Rep*. 2020;22(8):43.
- Walton M, Murray E, Christian MD. Mental health care for medical staff and affiliated healthcare workers during the COVID-19 pandemic. *Eur Heart J Acute Cardiovasc Care*. 2020;9(3):241–7.
- Chew NWS, Lee GKH, Tan BYQ, et al. A multinational, multicentre study on the psychological outcomes and associated physical symptoms amongst healthcare workers during COVID-19 outbreak. *Brain Behav Immun*. 2020;88:559–65.
- American College of Emergency Physicians. Emergency Medicine Practice Research Network (EMPRN). In; 2020.
- Rohland BM, Kruse GR, Rohrer JE. Validation of a single-item measure of burnout against the Maslach burnout inventory among physicians. *Stress Health*. 2004;20(2):75–9.
- Iwanicki EF, Schwab RL. A cross validation study of the Maslach burnout inventory. *Educ Psychol Meas*. 1981;41(4):1167–74.
- Jeffery MM, D'Onofrio G, Paek H, et al. Trends in emergency department visits and hospital admissions in health care systems in 5 states in the first months of the COVID-19 pandemic in the US. *JAMA Intern Med*. 2020;180(10):1328–33.
- Santarone K, McKenney M, Elkbuli A. Preserving mental health and resilience in frontline healthcare workers during COVID-19. *Am J Emerg Med*. 2020;38(7):1530–1.
- American College of Emergency Physicians. Mental Health among Emergency Physicians. [https://www.emergencyphysicians.org/globalassets/emphysicians/all-pdfs/acep20\\_mental-health-poll-analysis.pdf](https://www.emergencyphysicians.org/globalassets/emphysicians/all-pdfs/acep20_mental-health-poll-analysis.pdf); 2020. Accessed Nov 9, 2020.
- Rodríguez RM, Medak AJ, Baumann BM, et al. Academic emergency medicine Physicians' anxiety levels, stressors, and potential stress mitigation measures during the acceleration phase of the COVID-19 pandemic. *Acad Emerg Med*. 2020;27(8):700–7. <https://doi.org/10.1111/acem.14065>.
- Ayanian JZ. Mental Health Needs of Health Care Workers Providing Frontline COVID-19 Care. *JAMA Health Forum*; 2020 [https://jamanetwork.com/channels/healthforum/fullarticle/2764228?utm\\_content=weekly\\_highlights&utm\\_term=040420&utm\\_source=silverchair&utm\\_campaign=jama\\_network&cmp=1&utm\\_medium=email#top](https://jamanetwork.com/channels/healthforum/fullarticle/2764228?utm_content=weekly_highlights&utm_term=040420&utm_source=silverchair&utm_campaign=jama_network&cmp=1&utm_medium=email#top) Accessed May 17th, 2020.
- Spoorthy MS, Pratapa SK, Mahant S. Mental health problems faced by healthcare workers due to the COVID-19 pandemic-a review. *Asian J Psychiatr*. 2020;51:102119.
- Lai J, Ma S, Wang Y, et al. Factors associated with mental health outcomes among health care workers exposed to coronavirus disease 2019. *JAMA Netw Open*. 2020;3(3):e203976.
- Marchalik D, Brems J, Rodriguez A, et al. The impact of institutional factors on physician burnout: a national study of urology trainees. *Urology*. 2019;131:27–35.
- Olson K, Marchalik D, Farley H, et al. Organizational strategies to reduce physician burnout and improve professional fulfillment. *Curr Probl Pediatr Adolesc Health Care*. 2019;49(12):100664.
- Kelly M. Remembering Emergency Physician Dr. Lorna Breen. ACEP; 2020 <https://www.acepnow.com/article/remembering-emergency-physician-dr-lorna-breen/> Accessed January 14, 2021.
- Lieberman C. Coronavirus: Quebec Doctor's Death by Suicide Sends Shockwaves Through Canada's Medical Community. *Global News*; 2021 <https://globalnews.ca/news/7569318/coronavirus-doctor-karine-dion/> Accessed January 14, 2021.

- [36] Siu C, Yuen SK, Cheung A. Burnout among public doctors in Hong Kong: cross-sectional survey. *Hong Kong Med J*. 2012;18(3):186–92.
- [37] Shanafelt TD, Balch CM, Bechamps GJ, et al. Burnout and career satisfaction among American surgeons. *Ann Surg*. 2009;250(3):463–71.
- [38] Elkbuli A, Sutherland M, Shepherd A, et al. Factors influencing US physician and surgeon suicide rates 2003–2017: Analysis of the CDC-National Violent Death Reporting System. *Ann Surg*. 2020. <https://doi.org/10.1097/SLA.0000000000004575>.
- [39] Dyrbye LN, Varkey P, Boone SL, Satele DV, Sloan JA, Shanafelt TD. Physician satisfaction and burnout at different career stages. *Mayo Clin Proc*. 2013;88(12):1358–67.
- [40] del Carmen MG, Herman J, Rao S, et al. Trends and factors associated with physician burnout at a multispecialty academic faculty practice organization. *JAMA Netw Open*. 2019;2(3):e190554.
- [41] Peisah C, Latif E, Wilhelm K, Williams B. Secrets to psychological success: why older doctors might have lower psychological distress and burnout than younger doctors. *Aging Ment Health*. 2009;13(2):300–7.
- [42] Waddimba AC, Mohr DC, Beckman HB, Mahoney TL, Young GJ. Job satisfaction and guideline adherence among physicians: moderating effects of perceived autonomy support and job control. *Soc Sci Med*. 2019;233:208–17.
- [43] Miller IF, Becker AD, Grenfell BT, Metcalf CJE. Disease and healthcare burden of COVID-19 in the United States. *Nat Med*. 2020;26(8):1212–7.
- [44] Centers for Disease Control and Prevention. COVID-19 Cases, Deaths, and Trends in the US|CDC COVID Data Tracker. [https://covid.cdc.gov/covid-data-tracker/#cases\\_totalcases](https://covid.cdc.gov/covid-data-tracker/#cases_totalcases); 2020. Accessed January 13, 2021.
- [45] Jha SS, Shah S, Calderon MD, Soin A, Manchikanti L. The effect of COVID-19 on interventional pain management practices: a physician burnout survey. *Pain Physician*. 2020;23(4s):S271–82.
- [46] Soltanifar A, Pishbin E, Attaran Mashhadi N, Najaf Najafi M, Siahtir M. Burnout among female emergency medicine physicians: a nationwide study. *Emerg Med Australas*. 2018;30(4):517–22.
- [47] Lall MD, Perman SM, Garg N, et al. Intention to leave emergency medicine: mid-career women are at increased risk. *West J Emerg Med*. 2020;21(5):1131–9.
- [48] Zhang Q, Mu M-C, He Y, Cai Z-L, Li Z-C. Burnout in emergency medicine physicians: A meta-analysis and systematic review. *Medicine*. 2020;99(32):e21462.
- [49] Nunez-Smith M, Pilgrim N, Wynia M, et al. Health care workplace discrimination and physician turnover. *J Natl Med Assoc*. 2009;101(12):1274–82.
- [50] Osseo-Asare A, Balasuriya L, Huot SJ, et al. Minority resident Physicians' views on the role of race/ethnicity in their training experiences in the workplace. *JAMA Netw Open*. 2018;1(5):e182723.
- [51] Wu Y, Wang J, Luo C, et al. A Comparison of Burnout Frequency Among Oncology Physicians and Nurses Working on the Frontline and Usual Wards During the COVID-19 Epidemic in Wuhan, China. *J Pain Symptom Manage*. 2020;60(1):e60–5. <https://doi.org/10.1016/j.jpainsymman.2020.04.008>.
- [52] Wu Y, Wang J, Luo C, et al. A comparison of burnout frequency among oncology physicians and nurses working on the frontline and usual wards during the COVID-19 epidemic in Wuhan, China. *J Pain Symptom Manage*. 2020;60(1):e60–5.