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Snapshot Impact of COVID-19 on Mental Wellness in Nonphysician Otolaryngology Health Care Workers: A National Study

Aman Prasad[1], Alyssa M. Civantos[1], Yasmeen Byrnes[1], Kevin Chorath, MD[2], Seerat Poonia, MD[2], Changgee Chang, PhD[3], Evan M. Graboyes, MD, MPH[4], Andrés M. Bur, MD[5], Punam Thakkar, MD[6], Jie Deng, PhD[7], Rahul Seth, MD[8], Samuel Trosman, MD[9], Anni Wong, MD[9], Benjamin M. Laitman, MD, PhD[9], Janki Shah, MD[10], Vanessa Stubbs, MD[11], Qi Long, PhD[3], Garret Choby, MD[12], Christopher H. Rassekh, MD[2], Erica R. Thaler, MD[2], and Karthik Rajasekaran, MD[2]

Abstract

Objective. Nonphysician health care workers are involved in high-risk patient care during the COVID-19 pandemic, placing them at high risk of mental health burden. The mental health impact of COVID-19 in this crucial population has not been studied thus far. Thus, the objective of this study is to assess the psychosocial well-being of these providers.

Study Design. National cross-sectional online survey (no control group).

Setting. Academic otolaryngology programs in the United States.

Subjects and Methods. We distributed a survey to nonphysician health care workers in otolaryngology departments across the United States. The survey incorporated a variety of validated mental health assessment tools to measure participant burnout (Mini-Z assessment), anxiety (Generalized Anxiety Disorder–7), distress (Impact of Event Scale), and depression (Patient Health Questionnaire–2). Multivariable logistic regression analysis was performed to determine predictive factors associated with these mental health outcomes.

Results. We received 347 survey responses: 248 (71.5%) nurses, 63 (18.2%) administrative staff, and 36 (10.4%) advanced practice providers. A total of 104 (30.0%) respondents reported symptoms of burnout; 241 (69.5%), symptoms of anxiety; 292 (84.1%), symptoms of at least mild distress; and 79 (22.8%), symptoms of depression. Upon further analysis, development of these symptoms was associated with factors such as occupation, practice setting, and case load.

Conclusion. Frontline otolaryngology health care providers exhibit high rates of mental health complications, particularly anxiety and distress, in the wake of COVID-19. Adequate support systems must be put into place to address these issues.

Keywords

COVID-19, mental health, aerosolization, health care workers, psychiatric distress

[1]Perelman School of Medicine, University of Pennsylvania, Philadelphia, Pennsylvania, USA
[2]Department of Otorhinolaryngology, University of Pennsylvania, Philadelphia, Pennsylvania, USA
[3]Department of Biostatistics, Epidemiology and Informatics, University of Pennsylvania, Philadelphia, Pennsylvania, USA
[4]Department of Otolaryngology, Medical University of South Carolina, Charleston, South Carolina, USA
[5]Department of Otolaryngology, School of Medicine, University of Kansas, Kansas City, Kansas, USA
[6]Department of Otolaryngology, George Washington University, Washington, DC, USA
[7]Department of Nursing, University of Pennsylvania, Philadelphia, Pennsylvania, USA
[8]Department of Otolaryngology, University of San Francisco, San Francisco, California, USA
[9]Department of Otolaryngology, Mt. Sinai Health System, New York City, New York, USA
[10]Department of Otolaryngology, Cleveland Clinic, Cleveland, Ohio, USA
[11]Department of Otolaryngology, University of Miami, Miami, Florida, USA
[12]Department of Otolaryngology, Mayo Clinic, Rochester, Minnesota, USA

Corresponding Author:
Karthik Rajasekaran, MD, Department of Otorhinolaryngology–Head and Neck Surgery, University of Pennsylvania, 800 Walnut St, 18th Floor, Philadelphia, PA 19107, USA.
Email: Karthik.Rajasekaran@pennmedicine.upenn.edu

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It is evident that the spread of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has placed an unprecedented burden on health care systems in affected areas. While much of the population has been directed to stay at home or enact social distancing, health care workers have been placed in the unique scenario of having to continue work to maintain care for the influx of patients presenting with the 2019 novel coronavirus disease (COVID-19). The virus's rapid transmission and the disease's high hospitalization rate have led to high patient volume and increased demand on the health care system in many areas.[1]

The strain that this has created on health care infrastructure and employees has been multifaceted and intense. Hospitals have been reporting critical shortages of personal protective equipment (PPE), hospital beds, and ventilators, which raises concern for high rates of health care worker infection or mortality.[2] Such individuals may be at particularly increased risk of exposure when caring for patients undergoing mucosal or aerosol-generating procedures. Specifically, providers in the field of otolaryngology often perform such procedures, placing them at high risk and leading to increased infection rates of COVID-19.[3-6] Indeed, hotspot areas have shown that health care workers have been particularly affected by this pandemic, as evidence has shown disproportionate infection rates in this population.[7] In this context, health care workers are especially susceptible to emotional or psychological distress, particularly nurses or clinic staff with more direct and prolonged patient exposure. Nonphysician providers serve as an integral part of a health care team by engaging with patients on the frontlines and being in close proximity to them for extended periods.

There is strong precedence for times of uniquely high stress, such as pandemics, causing a significant increase in mental health burden among hospital workers. Studies evaluating the short-term or immediate impact of the 2003 SARS outbreak showed significant distress in up to 57% of health care workers, with a host of studies reaffirming these findings.[8-12] Similar observations were seen following the 2014 Ebola outbreak.[13,14] Such mental health impact poses a serious concern for care providers, as its effects can persist for years.[15,16] These concerns may be especially important for nurses and other staff involved in frontline care during the COVID-19 pandemic, given their intense, hands-on responsibilities and high rates of burnout or exhaustion.[17]

Given their susceptibility to infection based on their routine exposure to aerosol-generating procedures, employees working within otolaryngology may be uniquely affected by COVID-19-related psychosocial issues, as studies have demonstrated fear of infection as a major driving force of emotional distress in health care providers.[16-18] The impact on frontline nonphysician staff in this field is of additional importance given their crucial role in patient care. Unlike most otolaryngologists, nurses, advanced practice providers (APPs), and other nonphysician staff often have prolonged exposure to patients for the duration of their shift. Although mental health burden in the immediate wake of COVID-19 has begun to be investigated,[19-21] it has not been evaluated in this specific population. With this in mind, we aim to characterize and measure mental health outcomes in nonphysician health care workers in response to the COVID-19 pandemic.

Methods

Study Design

This study was reviewed by the University of Pennsylvania Institutional Review Board and determined to be a quality improvement initiative that was exempted from further review.

This national cross-sectional study was conducted from April 14 to April 25, 2020 during the COVID-19 pandemic in the United States. We distributed a self-administered anonymous survey to collect demographic and mental health data from nonphysician health care workers who care for otolaryngology patients at academic institutions throughout the United States. Due to the wide reach of the study, the survey was sent to a single point of contact: the otolaryngology residency program director at each institution, who was told to distribute it to the entire department staff. This would ensure that all staff members at each institution had the option of completing the survey. Nonphysician staff surveyed included operating room (OR) nurses, inpatient nurses, outpatient nurses, outpatient medical assistants, general OR staff, administrative staff, inpatient APPs, and outpatient APPs. When these individuals were categorized by occupation, OR nurses, inpatient nurses, and outpatient nurses were designated as ''nurse''; outpatient medical assistant, OR staff, and administrative staff as ''administrative staff''; and inpatient APPs and outpatient APPs as ''APP.'' For analysis by practice setting, OR nurses and OR staff were grouped as ''OR''; inpatient nurses and inpatient APPs as ''inpatient''; and outpatient nurses, outpatient medical assistants, administrative staff, and outpatient APPs as ''outpatient.'' Programs were categorized by location into 4 regions (Northeast, Midwest, South, and West) according to guidelines put forth by the US Census Bureau.[22]

Data Collection and Outcomes

Participation in the survey was voluntary, and individuals were able to terminate the survey at any point. A REDCap database was developed for this project and used to capture survey data. Data were accessible only by study personnel. All outcome data in this survey and study are self-reported by participants. Demographic and mental health data were collected. Demographic data included sex, age, occupation, and geographic location of respondents. Date of projected peak resource utilization for each state was obtained from the Institute for Health Metrics and Evaluation's COVID-19 Projections to categorize participants based on the ''surge status'' of their state.[23] States reaching their dates of projected peak resource use during our study period were in the

Table 1. Demographic Characteristics of the Study Population: Occupation, Setting, and Location.[a]

		Occupation			Setting			Location			
	Total	Nurse	Staff	APP	OR	Inpatient	Outpatient	Midwest	Northeast	South	West
Overall	347 (100)	248 (71.5)	63 (18.2)	36 (10.4)	90 (25.9)	150 (43.2)	107 (30.8)	127 (36.6)	169 (48.7)	45 (13.0)	6 (1.7)
Sex											
Men	32 (9.2)	17 (6.9)	15 (23.8)	0 (0.0)	18 (20.0)	7 (4.7)	7 (6.5)	10 (7.9)	14 (8.3)	8 (17.8)	0 (0.0)
Women	315 (90.8)	231 (93.1)	48 (76.2)	36 (100.0)	72 (80.0)	143 (95.3)	100 (93.5)	117 (92.1)	155 (91.7)	37 (82.2)	6 (100.0)
Age, y											
26-30	119 (34.3)	98 (39.5)	11 (17.5)	10 (27.8)	33 (36.7)	60 (40.0)	26 (24.3)	59 (46.5)	44 (26.0)	14 (31.1)	2 (33.3)
31-35	74 (21.3)	50 (20.2)	14 (22.2)	10 (27.8)	17 (18.9)	34 (22.7)	23 (21.5)	23 (18.1)	35 (20.7)	14 (31.1)	2 (33.3)
36-40	33 (9.5)	15 (6.0)	10 (15.9)	8 (22.2)	8 (8.9)	10 (6.7)	15 (14.0)	10 (7.9)	19 (11.2)	3 (6.7)	1 (16.7)
>40	121 (34.9)	85 (34.3)	28 (44.4)	8 (22.2)	32 (35.6)	46 (30.7)	43 (40.2)	35 (27.6)	71 (42.0)	14 (31.1)	1 (16.7)

Abbreviations: APP, advanced practice provider; OR, operating room.
[a]Values are presented as No. (%).

''surge''; states that had not reached their dates were ''pre-surge''; and states that were already past their dates were ''postsurge.'' Numbers of positive COVID-19 cases and numbers of COVID-19 deaths per state were obtained from the COVID Tracking Project.[24]

Various mental health outcomes were included in the study. Symptoms of burnout, anxiety, distress, and depression were assessed with validated measurement tools.[25-29] Burnout was measured with the Mini-Z burnout assessment (range, 1-5),[26,27] anxiety with the 7-item Generalized Anxiety Disorder scale (GAD-7; range, 0-21),[25] distress with the 15-item Impact of Event Scale (IES; range, 0-75),[28] and depression with the 2-item Patient Health Questionnaire (PHQ-2; range, 0-6).[29] The GAD-7 included a final question assessing the ''difficulty [that these problems] made it for you to do your work, take care of things at home, or get along with other people'' (range, 0-3). Furthermore, the IES was divided into 2 subscores: intrusion (range, 0-35) and avoidance (range, 0-40). Intrusion subscores assessed symptoms of ''unbidden thoughts and images, troubled dreams, strong pangs or waves of feelings, and repetitive behavior.''[28] The avoidance subscore measured ''ideational constriction, behavioral inhibition and counterphobic activity, and awareness of emotional numbness.''[28]

The total scores of these measurement tools were interpreted as follows:

Mini-Z: burnout defined as a score ≥ 3
GAD-7: anxiety scored as normal (0-4), mild (5-9), moderate (10-14), and severe (15-21)
IES: distress scored as subclinical (0-8), mild (9-25), moderate (26-43), and severe (44-75)
PHQ-2: a score of 3 as the cutoff for a positive depression screening requiring further evaluation with the more in-depth PHQ-9

These categories were based on values established in the literature.[25-29]

Statistical Analysis

To compare the distribution of symptoms across multiple groups, the chi-square independence test was used for categorical variables, and the Wilcoxon rank sum test and Kruskal-Wallis test were used for ordinal variables. Multivariate logistic regression was used to determine predictive factors for the presence of burnout, anxiety, distress, and depression, in which 2 outcome variables were made binary: anxiety (normal vs all other categories) and distress (subclinical vs all other categories). Training level, setting, sex, age, and number of positive cases were included as covariates in these models. Location, surge status, and number of deaths were found to be strongly colinear with number of positive cases and were thus excluded from this analysis. All tests were 2-sided, and P values $<.05$ were considered statistically significant; 95% CIs were also constructed, where applicable. All data analyses were performed with R software (v 3.6.3).

Results

Baseline Characteristics

A total of 347 individuals completed the survey. **Tables 1** and **2** list the demographic variables for the entire population. Of the entire study population, 248 (71.5%) were categorized as nurses, 63 (18.2%) as administrative staff, and 36 (10.4%) as APPs. A minority of respondents were men (n = 32, 9.2%) while the remaining (n = 315, 90.8%) were women. Of all nonphysician health care workers surveyed, 90 (25.9%) worked in an OR setting, 150 (43.2%) in an inpatient setting, and 107 (30.8%) in an outpatient setting. Geographically, 127 (36.6%) respondents worked in the Midwest, 169 (48.7%) in the Northeast, 45 (13.0%) in the South, and 6 (1.7%) in the West. Of the study population, 49.3% (171 respondents) worked in states with <20,000 cases, and the same number (171 respondents, 49.3%) worked in states with <1000 deaths. The remaining (n = 176, 50.7%) worked in states with >20,000 cases and >1000 deaths.

Table 2. Demographic Characteristics of the Study Population: Surge, Cases, and Deaths.[a]

		Surge			Cases		Deaths	
	Total	Pre	Surge	Post	<20,000	>20,000	<1000	>1000
Overall	347 (100)	9 (2.6)	290 (83.6)	48 (13.8)	171 (49.3)	176 (50.7)	171 (49.3)	176 (50.7)
Sex								
Men	32 (9.2)	0 (0.0)	26 (9.0)	6 (12.5)	18 (10.5)	14 (8.0)	18 (10.5)	14 (8.0)
Women	315 (90.8)	9 (100.0)	264 (91.0)	42 (87.5)	153 (89.5)	162 (92.0)	153 (89.5)	162 (92.0)
Age, y								
26-30	119 (34.3)	2 (22.2)	104 (35.9)	13 (27.1)	72 (42.1)	47 (26.7)	72 (42.1)	47 (26.7)
31-35	74 (21.3)	2 (22.2)	59 (20.3)	13 (27.1)	37 (21.6)	37 (21.0)	36 (21.1)	38 (21.6)
36-40	33 (9.5)	3 (33.3)	27 (9.3)	3 (6.2)	13 (7.6)	20 (11.4)	13 (7.6)	20 (11.4)
>40	121 (34.9)	2 (22.2)	100 (34.5)	19 (39.6)	49 (28.7)	72 (40.9)	50 (29.2)	71 (40.3)

[a]Values are presented as No. (%).

Distress

Eighty-four (24.2%) respondents reported mild distress; 128 (36.9%), moderate distress; and 80 (23.1%), severe distress. Distribution of distress scores was significantly different by occupation, with nurses experiencing the highest reported symptoms (P = .015; **Tables 3** and **4**). Distress was further analyzed by its 2 subscores: intrusiveness and avoidance. Among the entire study population, the median intrusiveness score was 15.0 (interquartile range, 7.0-22.0), and the median avoidance score was 16.0 (interquartile range, 8.0-22.0). Intrusiveness scores were significantly higher for individuals in states with >20,000 cases and >1000 deaths (P = .036 and P = .050, respectively; **Table 5**). Multivariate logistic regression did not show a significant association between symptoms of distress and the covariates analyzed (**Table 6**).

Burnout

Burnout was reported among 30.0% of those surveyed (104 respondents). There was a significant difference in rates of burnout among health care workers working in various settings (P = .005). Based on these results, nonphysician workers in the inpatient setting experienced the highest rates of burnout during this study period (56 respondents, 37.3%). Additionally, burnout was significantly associated with surge status, with a greater proportion of individuals surveyed during their states' COVID-19 surge (n = 95, 32.8%) experiencing burnout when compared with those in presurge (n = 0, 0.0%) or postsurge (n = 9, 18.8%; P = .020; **Tables 3** and **4**). Following multivariate logistic analysis on the presence of burnout, practice setting and age were strongly predictive of burnout (P = .036 and P = .029, respectively). Those in outpatient settings had significantly lower odds of experiencing burnout than those in inpatient settings (odds ratio, 0.40; 95% CI, 0.20-0.82; P = .012). Additionally, individuals aged 31 to 35 years (odds ratio, 2.15; 95% CI, 1.12-4.11; P = .021) and 36 to 40 years (odds ratio 2.62; 95% CI, 1.09-6.28; P = .031) were more likely to experience burnout than those aged 26 to 30 years (**Table 6**).

Anxiety

Of those surveyed, 69.5% (241 respondents) experienced some form of anxiety, with 31.7% (110 respondents) reporting moderate or severe anxiety; 68.6% also indicated that their symptoms of anxiety made their work or daily routine at least ''somewhat difficult'' to maintain. Individuals in states with >20,000 cases and >1000 deaths experienced greater difficulty with maintaining routine tasks when compared with individuals in states with fewer cases and deaths (P = .016 and P = .025, respectively; **Tables 3** and **4**). There was a significant difference in the distribution of anxiety severity among health care workers in different occupations (P = .040). Additionally, individuals working in states with >20,000 COVID-19 cases reported significantly increased anxiety severity when compared with those working in states with <20,000 cases (P = .030). The same was true for respondents in states with >1000 COVID-19-related deaths versus <1000 deaths (P = .029). Multivariate logistic regression also showed that occupation was predictive of the presence of anxiety (P = .011). This analysis further demonstrated that age was associated with anxiety (P = .031) and that those aged 36 to 40 years were more likely to experience anxiety than those aged 26 to 30 years (odds ratio, 2.96; 95% CI, 1.05-8.32; P = .040; **Table 6**).

Depression

In total, 79 (22.8%) respondents screened positive for depression on the PHQ-2. The proportion of individuals who screened positive for depression was significantly different by occupation, with administrative staff reporting the highest rates of depressive symptoms (P = .031; **Tables 3** and **4**). Multivariate logistic analysis further demonstrated that occupation was significantly predictive of depression (P = .026) and that APPs were significantly less likely to screen positive for depressive symptoms when compared with administrative staff (odds ratio, 0.22; 95% CI, 0.06-0.76; P = .016; **Table 6**).

Table 3. Symptom Severity of Burnout, Anxiety, Distress, and Depression Measurements: Occupation, Setting, Sex, and Age.[a]

		Occupation				Setting				Sex			Age				
	Total	Nurse	Staff	APP	*P* value	OR	Inpatient	Outpatient	*P* value	Men	Women	*P* value	26-30	31-35	36-40	>40	*P* value
Distress																	
Subclinical	55 (15.9)	35 (14.1)	14 (22.2)	6 (16.7)		13 (14.4)	18 (12.0)	24 (22.4)		7 (21.9)	48 (15.2)		19 (16.0)	12 (16.2)	4 (12.1)	20 (16.5)	
Mild	84 (24.2)	55 (22.2)	12 (19.0)	17 (47.2)		22 (24.4)	37 (24.7)	25 (23.4)		9 (28.1)	75 (23.8)		34 (28.6)	19 (25.7)	5 (15.2)	26 (21.5)	
Moderate	128 (36.9)	95 (38.3)	25 (39.7)	8 (22.2)	**.015**	30 (33.3)	61 (40.7)	37 (34.6)	.325	9 (28.1)	119 (37.8)	.618	47 (39.5)	24 (32.4)	15 (45.5)	42 (34.7)	.509
Severe	80 (23.1)	63 (25.4)	12 (19.0)	5 (13.9)		25 (27.8)	34 (22.7)	21 (19.6)		7 (21.9)	73 (23.2)		19 (16.0)	19 (25.7)	9 (27.3)	33 (27.3)	
Burnout																	
Negative	243 (70.0)	165 (66.5)	49 (77.8)	29 (80.6)	.076	62 (68.9)	94 (62.7)	87 (81.3)	**.005**	24 (75.0)	219 (69.5)	.659	88 (73.9)	45 (60.8)	20 (60.6)	90 (74.4)	.096
Positive	104 (30.0)	83 (33.5)	14 (22.2)	7 (19.4)		28 (31.1)	56 (37.3)	20 (18.7)		8 (25.0)	96 (30.5)		31 (26.1)	29 (39.2)	13 (39.4)	31 (25.6)	
Anxiety																	
Normal	106 (30.5)	64 (25.8)	24 (38.1)	18 (50.0)		22 (24.4)	40 (26.7)	44 (41.1)		8 (25.0)	98 (31.1)		36 (30.3)	20 (27.0)	6 (18.2)	44 (36.4)	
Mild	131 (37.8)	99 (39.9)	20 (31.7)	12 (33.3)		35 (38.9)	59 (39.3)	37 (102.8)		14 (43.8)	117 (37.1)		46 (38.7)	26 (35.1)	15 (45.5)	44 (36.4)	
Moderate	65 (18.7)	53 (21.4)	9 (14.3)	3 (8.3)	**.040**	20 (22.2)	28 (18.7)	17 (15.9)	.137	7 (21.9)	58 (18.4)	.746	22 (18.5)	17 (23.0)	7 (21.2)	19 (15.7)	.743
Severe	45 (13.0)	32 (12.9)	10 (15.9)	3 (8.3)		13 (14.4)	23 (15.3)	9 (8.4)		3 (9.4)	42 (13.3)		15 (12.6)	11 (14.9)	5 (15.2)	14 (11.6)	
Difficulty																	
Not difficult	109 (31.4)	69 (27.8)	23 (36.5)	17 (47.2)		22 (24.4)	48 (32.0)	39 (36.4)		11 (34.4)	98 (31.1)		35 (29.4)	25 (33.8)	7 (21.2)	42 (34.7)	
Somewhat difficult	205 (59.1)	151 (60.9)	37 (58.7)	17 (47.2)	.178	56 (62.2)	87 (58.0)	62 (57.9)	.075	18 (56.2)	187 (59.4)	.866	74 (62.2)	44 (59.5)	19 (57.6)	68 (56.2)	.359
Very difficult	28 (8.1)	24 (9.7)	2 (3.2)	2 (5.6)		8 (8.9)	14 (9.3)	6 (5.6)		3 (9.4)	25 (7.9)		9 (7.6)	3 (4.1)	6 (18.2)	10 (8.3)	
Extremely difficult	5 (1.4)	4 (1.6)	1 (1.6)	0 (0.0)		4 (4.4)	1 (0.7)	0 (0.0)		0 (0.0)	5 (1.6)		1 (0.8)	2 (2.7)	1 (3.0)	1 (0.8)	
Depression																	
Negative	268 (77.2)	194 (78.2)	42 (66.7)	32 (88.9)	**.031**	67 (74.4)	117 (78.0)	84 (78.5)	.761	25 (78.1)	243 (77.1)	>.999	98 (82.4)	58 (78.4)	25 (75.8)	87 (71.9)	.281
Positive	79 (22.8)	54 (21.8)	21 (33.3)	4 (11.1)		23 (25.6)	33 (22.0)	23 (21.5)		7 (21.9)	72 (22.9)		21 (17.6)	16 (21.6)	8 (24.2)	34 (28.1)	

Abbreviations: APP, advanced practice provider; OR, operating room.

[a]Values are presented as No. (%). Bold indicates $P < .05$.

Table 4. Symptom Severity of Burnout, Anxiety, Distress, and Depression Measurements: Location, Surge, Cases, and Deaths.[a]

		Location					Surge				Cases			Deaths		
	Total	Midwest	Northeast	South	West	*P* value	Pre	Surge	Post	*P* value	<20,000	>20,000	*P* value	<1000	>1000	*P* value
Distress																
Subclinical	55 (15.9)	22 (17.3)	24 (14.2)	9 (20.0)	0 (0.0)		2 (22.2)	44 (15.2)	9 (18.8)		31 (18.1)	24 (13.6)		30 (17.5)	25 (14.2)	
Mild	84 (24.2)	37 (29.1)	33 (19.5)	13 (28.9)	1 (16.7)		4 (44.4)	67 (23.1)	13 (27.1)		48 (28.1)	36 (20.5)		48 (28.1)	36 (20.5)	
Moderate	128 (36.9)	44 (34.6)	66 (39.1)	14 (31.1)	4 (66.7)	.350	3 (33.3)	109 (37.6)	16 (33.3)	.549	58 (33.9)	70 (39.8)	.141	59 (34.5)	69 (39.2)	.197
Severe	80 (23.1)	24 (18.9)	46 (27.2)	9 (20.0)	1 (16.7)		0 (0.0)	70 (24.1)	10 (20.8)		34 (19.9)	46 (26.1)		34 (19.9)	46 (26.1)	
Burnout																
Negative	243 (70.0)	87 (68.5)	113 (66.9)	38 (84.4)	5 (83.3)	.116	9 (100.0)	195 (67.2)	39 (81.2)	**.020**	123 (71.9)	120 (68.2)	.519	123 (71.9)	120 (68.2)	.519
Positive	104 (30.0)	40 (31.5)	56 (33.1)	7 (15.6)	1 (16.7)		0 (0.0)	95 (32.8)	9 (18.8)		48 (28.1)	56 (31.8)		48 (28.1)	56 (31.8)	
Anxiety																
Normal	106 (30.5)	41 (32.3)	47 (27.8)	16 (35.6)	2 (33.3)		4 (44.4)	81 (27.9)	21 (43.8)		56 (32.7)	50 (28.4)		55 (32.2)	51 (29.0)	
Mild	131 (37.8)	52 (40.9)	58 (34.3)	17 (37.8)	4 (66.7)		3 (33.3)	111 (38.3)	17 (35.4)		70 (40.9)	61 (34.7)		71 (41.5)	60 (34.1)	
Moderate	65 (18.7)	23 (18.1)	32 (18.9)	10 (22.2)	0 (0.0)	.111	2 (22.2)	56 (19.3)	7 (14.6)	.238	32 (18.7)	33 (18.8)	**.030**	32 (18.7)	33 (18.8)	**.029**
Severe	45 (13.0)	11 (8.7)	32 (18.9)	2 (4.4)	0 (0.0)		0 (0.0)	42 (14.5)	3 (6.2)		13 (7.6)	32 (18.2)		13 (7.6)	32 (18.2)	
Difficulty																
Not difficult	109 (31.4)	38 (29.9)	56 (33.1)	14 (31.1)	1 (16.7)		3 (33.3)	85 (29.3)	21 (43.8)		51 (29.8)	58 (33.0)		50 (29.2)	59 (33.5)	
Somewhat difficult	205 (59.1)	82 (64.6)	90 (53.3)	28 (62.2)	5 (83.3)	.259	6 (66.7)	175 (60.3)	24 (50.0)	.470	111 (64.9)	94 (53.4)	**.016**	111 (64.9)	94 (53.4)	**.025**
Very difficult	28 (8.1)	7 (5.5)	18 (10.7)	3 (6.7)	0 (0.0)		0 (0.0)	25 (8.6)	3 (6.2)		9 (5.3)	19 (10.8)		10 (5.8)	18 (10.2)	
Extremely difficult	5 (1.4)	0 (0.0)	5 (3.0)	0 (0.0)	0 (0.0)		0 (0.0)	5 (1.7)	0 (0.0)		0 (0.0)	5 (2.8)		0 (0.0)	5 (2.8)	
Depression																
Negative	268 (77.2)	106 (83.5)	122 (72.2)	35 (77.8)	5 (83.3)	.146	8 (88.9)	223 (76.9)	37 (77.1)	.700	139 (81.3)	129 (73.3)	.100	139 (81.3)	129 (73.3)	.100
Positive	79 (22.8)	21 (16.5)	47 (27.8)	10 (22.2)	1 (16.7)		1 (11.1)	67 (23.1)	11 (22.9)		32 (18.7)	47 (26.7)		32 (18.7)	47 (26.7)	

[a]Values are presented as No. (%). Bold indicates $P < .05$.

Table 5. Intrusiveness and Avoidance Scores From IES in Total Cohort and Subgroups.[a]

	Intrusive score	*P* value	Avoidance score	*P* value
Total	15.0 (7.0-22.0)	—	16.0 (8.0-22.0)	—
Occupation				
Nurse	15.5 (8.0-23.0)		16.0 (9.0-22.0)	
Staff	15.0 (5.0-21.0)	.072	17.0 (6.0-24.0)	**.042**
APP	11.0 (5.0-19.0)		10.0 (5.0-15.3)	
Setting				
OR	15.0 (8.2-23.0)		16.0 (8.2-24.0)	
Inpatient	16.0 (7.2-22.5)	.073	16.0 (9.0-22.0)	.516
Outpatient	13.0 (4.5-21.0)		15.0 (5.5-22.0)	
Sex				
Men	9.0 (3.0-19.0)	.108	14.0 (6.5-24.3)	.99
Women	15.0 (7.0-23.0)		16.0 (8.0-22.0)	
Age, y				
26-30	14.0 (7.0-21.0)		15.0 (7.0-20.0)	
31-35	15.0 (5.0-21.0)	.126	16.0 (9.0-22.0)	.349
36-40	19.0 (8.0-25.0)		18.0 (12.0-22.0)	
>40	16.0 (7.0-23.0)		16.0 (8.0-24.0)	
Location				
Midwest	13.0 (5.5-21.0)		15.0 (7.0-20.0)	
Northeast	17.0 (8.0-23.0)	.076	16.0 (9.0-23.0)	.415
South	15.0 (4.0-21.0)		16.0 (6.0-22.0)	
West	17.0 (12.0-22.0)		16.5 (12.0-19.5)	
Surge				
Pre	8.0 (5.0-19.0)		16.0 (5.0-18.0)	
Surge	15.0 (7.0-22.8)	.206	16.0 (8.0-22.0)	.393
Post	12.5 (5.0-21.0)		14.0 (6.0-22.3)	
Cases				
<20,000	14.0 (5.5-21.0)	**.036**	15.0 (7.0-20.5)	.114
>20,000	17.0 (8.0-23.0)		16.0 (9.0-23.0)	
Deaths				
<1000	15.0 (6.0-21.0)	**.05**	15.0 (7.0-21.0)	.172
>1000	17.0 (8.0-23.0)		16.0 (9.0-23.0)	

Abbreviations: APP, advanced practice provider; IES, Impact of Event Scale; OR, operating room.

[a]Values are presented as median (interquartile range). Bold indicates $P < .05$.

Discussion

In this study, we conducted a large cross-sectional survey of nonphysician health care workers in otolaryngology departments across the nation. Participants were grouped by occupation, practice setting, sex, age, and location to determine the impact of these factors on respondents' mental health. A majority of participants were female and were nurses. A plurality of respondents worked in the inpatient setting and were in the Northeast United States. Our sample was likely representative of the general population by sex, as previous national surveys have shown the proportion of males in nursing professions to be slightly <10%.[30,31] We ultimately found that adverse symptoms of mental health in the wake of the COVID-19 pandemic were highly prevalent in otolaryngology health care workers and varied by factors such as occupation, practice setting, age, and number of positive cases. The implications of these findings are profound. Our prior work suggests that physicians in otolaryngology have experienced increased levels of anxiety and distress during this pandemic and that these outcomes are similarly associated with factors including local case load.[21] It is equally important to evaluate similar outcomes in nonphysician providers, and results indicate that this population is also heavily affected by the cognitive toll of COVID-19.

Out of 347 total respondents, 104 (30.0%) reported symptoms of burnout; 241 (69.5%), symptoms of anxiety; 292 (84.1%), symptoms of distress; and 79 (22.8%), symptoms of depression. These rates of psychological burden among frontline health care workers are alarmingly high, particularly for anxiety and distress, and raise concern for the long-term impact or mental health sequelae of COVID-19. Although historic or previously recorded rates of mental illness do not serve as ideal controls, they may serve as a convenient point of reference that can provide context for new findings. In this context, it has been shown that baseline rates of anxiety and severe stress in nonphysician health care providers are roughly 32.4% and 41.2%, respectively.[17,32,33] Our data indicate that anxiety and distress may be more prevalent among otolaryngology workers in the context of COVID-19. Reasons for these findings are likely multifactorial, centering on increased concern about caring for patients with tracheotomies, performing oral hygiene on patients, infection, longer work hours, and PPE shortages. It is worth noting that those working in otolaryngology are at higher risk of exposure to aerosols, which could lead to increased exposure to pathogens such as COVID-19, thus raising this cohort's risk for mental health burden.[6,34,35]

Our findings show that respondents in the outpatient setting experience lower rates of burnout than those in an inpatient service or the OR. Perhaps nurses or APPs who take care of critically ill hospitalized patients have more prolonged contact with them and lack adequate PPE, thus increasing their cognitive burden or stress and leading to burnout. This is exacerbated by the fact that inpatient staff may generally be present during high-risk, aerosolizing procedures. Additionally, inpatient and OR staff may have longer work hours, further contributing to their emotional exhaustion.[36] Upon controlling for variables on multivariate analysis, we found that individuals aged 31 to 35 years and 36 to 40 years were more likely to experience burnout than younger respondents (26-30 years). People aged 36 to 40 years were also more likely to experience anxiety than those aged 26 to 30 years. These age-related findings may be partially explained by the fact that older, more experienced workers have greater responsibility in ensuring optimal patient management in a pandemic setting. Furthermore, older individuals may be more likely to have larger domestic households and may fear spreading the disease to family members, which has been highlighted as a concern among health care workers.[37,38]

The severity distributions of anxiety, distress, and depression were significantly different by occupation, as shown in

Table 6. Factors Associated With Symptoms of Burnout, Anxiety, Distress, and Depression Following Multivariable Logistic Regression.[a]

	Participants with symptoms / total, No. (%)	Adjusted odds ratio (95% CI)	*P* value	
			Category	Overall
Distress				
Occupation				
Staff	49/63 (77.8)	1 [Reference]	—	.867
Nurse	213/248 (85.9)	1.27 (0.54-3.00)	.591	
APP	30/36 (83.3)	1.15 (0.38-3.53)	.804	
Setting				
Inpatient	132/150 (88.0)	1 [Reference]	—	.240
Outpatient	83/107 (77.6)	0.52 (0.23-1.15)	.108	
OR	77/90 (85.6)	0.91 (0.40-2.03)	.812	
Sex				
Men	25/32 (78.1)	1 [Reference]	—	.421
Women	267/315 (84.8)	1.50 (0.56-4.03)	.421	
Age, y				
26-30	100/119 (84.0)	1 [Reference]	—	.871
31-35	62/74 (83.8)	1.10 (0.49-2.50)	.813	
36-40	29/33 (87.9)	1.64 (0.49-5.44)	.418	
>40	101/121 (83.5)	1.08 (0.52-2.22)	.835	
Positives				
<20,000	140/171 (81.9)	1 [Reference]	—	.321
>20,000	152/176 (86.4)	1.36 (0.74-2.51)	.321	
Burnout				
Occupation				
Staff	14/63 (22.2)	1 [Reference]	—	.250
Nurse	83/248 (33.5)	1.19 (0.53-2.65)	.677	
APP	7/36 (19.4)	0.55 (0.18-1.66)	.289	
Setting				
Inpatient	56/150 (37.3)	1 [Reference]	—	**.036**
Outpatient	20/107 (18.7)	0.40 (0.20-0.82)	**.012**	
OR	28/90 (31.1)	0.76 (0.42-1.38)	.367	
Sex				
Men	8/32 (25.0)	1 [Reference]	—	.512
Women	96/315 (30.5)	1.36 (0.55-3.36)	.512	
Age, y				
26-30	31/119 (26.1)	1 [Reference]	—	**.029**
31-35	29/74 (39.2)	2.15 (1.12-4.11)	**.021**	
36-40	13/33 (39.4)	2.62 (1.09-6.28)	**.031**	
>40	31/121 (25.6)	1.11 (0.60-2.04)	.743	
Positives				
<20,000	48/171 (28.1)	1 [Reference]	—	.611
>20,000	56/176 (31.8)	1.14 (0.69-1.86)	.611	
Anxiety				
Occupation				
Staff	39/63 (61.9)	1 [Reference]	—	**.011**
Nurse	184/248 (74.2)	1.81 (0.87-3.78)	.113	
APP	18/36 (50.0)	0.55 (0.22-1.36)	.194	
Setting				
Inpatient	110/150 (73.3)	1 [Reference]	—	.472
Outpatient	63/107 (58.9)	0.72 (0.38-1.37)	.316	
OR	68/90 (75.6)	1.08 (0.57-2.05)	.816	

(continued)

Table 6. (continued)

	Participants with symptoms / total, No. (%)	Adjusted odds ratio (95% CI)	*P* value	
			Category	Overall
Sex				
Men	24/32 (75.0)	1 [Reference]	—	.384
Women	217/315 (68.9)	0.66 (0.26-1.67)	.384	
Age, y				
26-30	83/119 (69.7)	1 [Reference]	—	**.031**
31-35	54/74 (73.0)	1.30 (0.66-2.57)	.445	
36-40	27/33 (81.8)	2.96 (1.05-8.32)	**.040**	
>40	77/121 (63.6)	0.75 (0.42-1.34)	.332	
Positives				
<20,000	115/171 (67.3)	1 [Reference]	—	.176
>20,000	126/176 (71.6)	1.41 (0.86-2.33)	.176	
		Depression		
Occupation				
Staff	21/63 (33.3)	1 [Reference]	—	**.026**
Nurse	54/248 (21.8)	0.46 (0.21-1.02)	.056	
APP	4/36 (11.1)	0.22 (0.06-0.76)	**.016**	
Setting				
Inpatient	33/150 (22.0)	1 [Reference]	—	.490
Outpatient	23/107 (21.5)	0.67 (0.31-1.45)	.314	
OR	23/90 (25.6)	1.04 (0.54-2.00)	.913	
Sex				
Men	7/32 (21.9)	1 [Reference]	—	.316
Women	72/315 (22.9)	1.64 (0.62-4.35)	.316	
Age, y				
26-30	21/119 (17.6)	1 [Reference]	—	.472
31-35	16/74 (21.6)	1.31 (0.62-2.76)	.485	
36-40	8/33 (24.2)	1.39 (0.52-3.68)	.508	
>40	34/121 (28.1)	1.68 (0.88-3.21)	.116	
Positives				
<20,000	32/171 (18.7)	1 [Reference]	—	.217
>20,000	47/176 (26.7)	1.40 (0.82-2.40)	.217	

[a]The multivariable logistic regression results are found in the "Overall" *P* value. The "Category" *P* value corresponds to that for each category vs the reference. Bold indicates $P < .05$.

Tables 3 and **4**. Nurses demonstrated the highest rates of anxiety or distress symptoms. Administrative staff, however, seemed to experience increased rates of depression as measured by the PHQ-2 survey. This questionnaire serves as a screening tool for depression; therefore, anyone with a positive screening score requires follow-up via the PHQ-9 survey. By these standards, 33.3% of administrative staff require additional evaluation, while only 21.8% and 11.1% of nurses or APPs require follow-up, respectively. These findings reiterate the emphasis that we must place on monitoring and addressing the mental health implications of COVID-19.

We examined the effect of contextual variables, such as geographic location and pandemic severity, on mental health outcomes. On univariate analysis, state case counts >20,000 and >1000 deaths by state were associated with increased anxiety and increased difficulty with maintaining daily tasks, as measured by the GAD-7. Upon further analysis, we found that location, surge status, case count, and deaths were strongly colinear. Therefore, out of these variables, we chose to include only case count as a covariate in our multivariable logistic regression models. Surprisingly, number of positive cases was not associated with burnout, anxiety, distress, or depression in this analysis, perhaps due to low statistical power.

Overall, our results showing high rates of mental health sequelae in health care workers in the era of COVID-19 are consistent with similar findings in prior outbreaks, such as SARS in 2003.[8-12,15,16] In the latter, the outbreak was found to increase the odds of depression and stress even years after the initial surge of cases.[16,39] As our study and others have begun to demonstrate the mental health toll that

COVID-19 is taking on health care workers, it is imperative that we provide increased screening and support for those on the frontlines.[19,20] Such interventions could entail psychological assistance hotlines, group activities or meetings, increased workplace accommodations for rest, increased work-related benefits, and safer work environments. Our findings serve as an important baseline for future studies evaluating the effect of COVID-19 on nonphysician providers.

Limitations

We acknowledge several limitations to our study for consideration. First, our sample did not have an even geographic distribution among the 4 regions analyzed. In particular, the Midwest and Northeast were overrepresented relative to the South and West. This may limit the generalizability and scope of our results. Additionally, because we were not able to gain longitudinal survey data, we are unable to determine what proportion of participants experienced symptoms of burnout, anxiety, distress, or depression prior to COVID-19. Additionally, as stated previously, positive screening scores on the PHQ-2 survey require further evaluation of participants via the longer PHQ-9 survey. Unfortunately, due to the scope and time frame of this study, we were unable to perform individual follow-up and collect those data. Prospective long-term data may help researchers elucidate whether onset of certain psychiatric disorders may develop in response to a sustained pandemic environment. As with many survey-based studies, nonresponse bias may be present, and our response rate may have been lower due to survey fatigue. Although we chose to send the survey to otolaryngology program directors to serve as a central point of contact for further distribution, we are unable to confirm whether all program directors indeed sent the survey to their entire departments.

Conclusion

In this national cross-sectional survey-based study, we evaluated the mental health response of nonphysician health care workers in otolaryngology in response to the COVID-19 pandemic. Our results show a high prevalence of psychological symptoms, particularly anxiety and distress, many of which were significantly associated with factors such as practice setting, occupation, and case count. Our results serve as an initial point of reference for future studies examining the mental health impact of COVID-19 on providers. In this context, it is imperative that we encourage adequate mental health support and specialized interventions to care for our frontline health care workers in the midst of this pandemic and beyond.

Author Contributions

Aman Prasad, substantial contributions to the conception or design of the work, drafting the work for important intellectual content, final approval and agree to be accountable; **Alyssa M. Civantos**, acquisition and interpretation of the data or work, drafting the work, final approval and agree to be accountable; **Yasmeen Byrnes**, substantial contributions to the conception or design of the work, drafting the work, final approval and agree to be accountable; **Kevin Chorath**, analysis of the work, revising it critically, final approval and agreement to be accountable; **Seerat Poonia**, analysis of the work, revising it critically, final approval and agreement to be accountable; **Changgee Chang**, analysis of the work, revising it critically, final approval and agreement to be accountable; **Evan M. Graboyes**, acquisition of data for the work, revising it critically, final approval and agreement to be accountable; **Andrés M. Bur**, acquisition of data for the work, revising it critically, final approval and agreement to be accountable; **Punam Thakkar**, acquisition of data for the work, revising it critically, final approval and agreement to be accountable; **Jie Deng**, acquisition of data for the work, revising it critically, final approval and agreement to be accountable; **Rahul Seth**, acquisition of data for the work, revising it critically, final approval and agreement to be accountable; **Samuel Trosman**, acquisition of data for the work, revising it critically, final approval and agreement to be accountable; **Anni Wong**, acquisition of data for the work, revising it critically, final approval and agreement to be accountable; **Benjamin M. Laitman**, acquisition of data for the work, revising it critically, final approval and agreement to be accountable; **Janki Shah**, acquisition of data for the work, revising it critically, final approval and agreement to be accountable; **Vanessa Stubbs**, acquisition of data for the work, revising it critically, final approval and agreement to be accountable; **Qi Long**, acquisition of data for the work, revising it critically, final approval and agreement to be accountable; **Garret Choby**, acquisition of data for the work, revising it critically, final approval and agreement to be accountable; **Christopher H. Rassekh**, acquisition of data for the work, revising it critically, final approval and agreement to be accountable; **Erica R. Thaler**, acquisition of data for the work, revising it critically, final approval and agreement to be accountable; **Karthik Rajasekaran**, substantial contributions to the conception or design of the work, interpretation of data and the work, revising it critically for important intellectual content, final approval and agree to be accountable.

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