



# Stressors on frontline healthcare workers during the COVID-19 pandemic: a focus on moral injury and implications for the future

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## Abstract

**Objective** The COVID-19 pandemic has placed a psychological strain on health care workers (HCWs). To provide effective support, it is important to explore the stressors that HCWs face that place them at risk of negative psychological outcomes. However, there is a limited number of systematic qualitative studies on the stressors that HCWs faced in the United States of America (USA) during the first wave of the pandemic. Therefore, we explored the stressors that frontline HCWs in the USA experienced during the initial phase of the pandemic.

**Methods** We performed a qualitative study based on open-ended, semi-structured, one-on-one interviews conducted virtually among HCWs from June 1st to July 18th, 2020. We interviewed frontline HCWs ( $N=45$ ) including physicians, nurses, respiratory therapists, and patient care assistants who worked in various specialties and roles in 3 health systems across Connecticut, USA. We offered participants a \$25 gift card as a token of appreciation. We used inductive techniques derived from grounded theory to develop themes.

**Results** We identified 3 main themes related to stressors experienced by HCWs during the initial phase of the pandemic namely: (1) Stress of witnessing an unprecedented number of deaths and the impact on patient families; (2) Stress of changing work environment and unmet professional expectations and; (3) Concern for safety in personal life. Furthermore, we highlight experiences that HCWs faced that place them at risk of developing a moral injury.

**Conclusions** Our findings highlight stressors faced by HCWs that could aid in the provision of well-guided support to HCWs in the present and post-pandemic era.

**Keywords** COVID-19 pandemic · Moral injury · Healthcare worker · Stressors

## Background

The COVID-19 pandemic has placed a huge strain on healthcare workers (HCWs). Many studies have highlighted the negative psychological impact of the pandemic on HCWs however few qualitative studies have systematically explored the stressors that HCWs in the United States faced during the first wave of the COVID-19 pandemic, and the experiences that contributed to these negative psychological outcomes

(Bryant-Genevier et al. 2021; Couarraze et al. 2021; Firew et al. 2020; Li et al. 2021; Sirois et al. 2021).

Some qualitative studies in the United States explored the experiences of HCWs during the first wave. For example, a study performed among HCWs in New York identified major themes such as lack of resources, support and concern for their safety however, this study did not include the experiences of HCWs caring for acutely ill patients in inpatient settings (Sterling et al. 2020). Another qualitative study among physicians explored how disruptions in the work environment challenged their professional roles and relationships; however, this study was limited to physicians (Butler et al. 2021). A study evaluating the experiences of HCWs in the United States highlighted multiple themes from the individual to the community level that impacted HCWs experiences; however, the study involved qualitative analysis of comments obtained in a survey rather than in-depth qualitative data collection (Hennein et al. 2020).

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Qualitative studies from other parts of the world elaborate on stressors experienced by HCWs during the first wave of the pandemic; however, the differences in the health care system in the United States compared to other parts of the world warrant context-specific studies (Benneth et al. 2020; Nyashanu et al. 2020; Rucker et al. 2021; Sethi et al. 2020).

The goal of our study is to explore the stressors that HCWs in Connecticut, USA experienced during the initial phase of the pandemic. Given the cumulative nature of stress and the importance of providing effective well-informed support to manage the negative psychological impact of the pandemic on HCWs, it is important to adequately explore the lived experiences of HCWs during all phases of the COVID-19 pandemic including the initial phases (Juster et al. 2020). In addition, given the likely risk for future COVID-19 waves, a better understanding of these initial stressors could inform policies and practices to support HCWs and attend to stressors during additional waves.

## Methods

We provide extensive detail on the recruitment, sampling and data collection in a prior publication (Adeyemo et al. 2021). Briefly, we conducted a qualitative study utilizing in-depth, open-ended, one-on-one interviews with frontline HCWs who provided care to patients during the initial wave of the COVID-19 pandemic.

Author O.A. is a practicing obstetrician and gynecologist with training in qualitative research. Author S.T. is a medical student with clinical experience on the wards. Author S.F. is a Masters of Public Health candidate with training in qualitative methodology, and author D.K. is a public health researcher with extensive experience with a qualitative methodology. The interview guide (supplemental material) was developed through iterative discussions among three of the authors (O.A., S.T., and D.K.) and was informed by one author's (O.A.) experience working as a physician during the initial phase of the COVID-19 pandemic. A review of popular and academic literature on the experiences of HCWs both within and outside the hospital also informed the interview guide.

## Participants

We recruited participants through emails sent through hospital and university listservs of healthcare systems (HCSs) in Connecticut, USA. Inclusion criteria for the study were HCWs who worked in Connecticut in a hospital or clinic. We purposively sampled HCWs who cared for acutely sick patients on inpatient floors such as the intensive care unit (ICU). We interviewed 45 HCWs who responded to the invitation to participate from June 1st to July 18th, 2020

until we reached saturation. Participants worked in varying roles and specialties across three major HCSs in Connecticut (Table 1). We offered participants a \$25 gift card as an incentive for participation. Authors (O.A., S.T., and D.K.) conducted interviews virtually via the online secure version of the Zoom software. The interviews lasted 47 min on average.

The research protocol was granted exemption status by the Yale University Institutional Review Board protocol number 2000028006. Verbal informed consent was obtained from all participants prior to participation in this study.

## Data analysis

Our analysis for this paper focused on stressors that HCWs experienced during the first wave of the COVID-19 pandemic. We used inductive techniques derived from grounded theory to develop themes and used an iterative and multi-stages coding process that draws on grounded theory approaches (Strauss and Corbin 2014). Authors (O.A., S.T., and D.K.) reviewed all the transcripts and developed a codebook.

Afterward, authors (O.A. and S.F.) independently reviewed all the codes and highlighted all the excerpts about stressors experienced by HCWs and developed emerging concepts. Authors O.A. and S.F. reviewed full transcripts to contextualize the excerpts and to consolidate themes. Finally, authors O.A. and S.F. wrote integrative memos to develop relationships between codes and concepts and discussed these memos with all 4 team members (O.A., S.F., D.K. and S.T.).

We used the qualitative analysis software Dedoose (Version 8.3.35, web application for managing, analyzing, and presenting qualitative and mixed-methods research data, 2020) to facilitate analysis.

## Results

We identified 3 main themes that capture the stressors on HCWs during the initial phase of the pandemic in Connecticut namely: (1) Stress of witnessing an unprecedented number of deaths and the impact on patient families; (2) Stress of changing work environment and unmet professional expectations; (3) Concern for safety in personal life.

1. Stress of witnessing an unprecedented number of deaths and impact on patient families

HCWs caring for patients in acute care settings witnessed an extraordinary number of patient deaths beyond what they had seen in the past during the initial phases of the

**Table 1** Characteristics of study participants (Adeyemo et al. 2021)

	Number (Percentage) Total N=45
<b>Specialty</b>	
Internal medicine	16 (35.6%)
Internal medicine subspecialties <sup>a</sup>	8 (17.8%)
Respiratory therapy	5 (11.1%)
Obstetrics and gynecology	10 (22.2%)
Other <sup>b</sup>	6 (13.3%)
<b>Clinical role</b>	
Attending physician	15 (33.3%)
Resident physician	19 (42.2%)
Respiratory therapist	5 (11.1%)
Registered nurse	3 (6.6%)
PCA/Tech	2 (4.4%)
Certified nurse midwife	1 (2.2%)
<b>Practice setting</b>	
Inpatient only	31 (68.8%)
Outpatient only	2 (4.4%)
Inpatient and outpatient	12 (26.6%)
<b>Number of patients diagnosed with COVID-19 cared for</b>	
0	4 (8.9%)
1 to 5	7 (15.5%)
11–20	4 (8.9%)
> 20	30 (66.6%)
<b>Age</b>	
25–29	12 (27.0%)
30–34	13 (29.0%)
35–39	10 (22.0%)
40–44	4 (8.9%)
45–49	1 (2.2%)
50–54	3 (6.6%)
55–59	2 (4.4%)
<b>Gender</b>	
Male	15 (33.0%)
Female	30 (67.0%)
<b>Race</b>	
Caucasian	33 (73.3%)
Asian	6 (13.3%)
Other <sup>c</sup>	6 (13.3%)
<b>Marital status</b>	
Not married	23 (51.0%)
Married	22 (49.0%)
<b>Children</b>	
Yes	20 (44.4%)
No	25 (55.5%)

<sup>a</sup>Includes pulmonary critical care, palliative care, hepatology, geriatrics, infectious disease, hematology/oncology

<sup>b</sup>Includes emergency medicine, pediatrics, anesthesiology, Patient care assistant/Technician (PCA/Tech)

<sup>c</sup>Includes Black, Middle Eastern, Hispanic

COVID-19 pandemic. Witnessing this magnitude of suffering and death was challenging as this quote illustrates,

... I think I can't tell you the number of people I pronounced dead and how many times I've had to zoom with families so they could say goodbye to their loved one .... And very emotionally taxing, too, like, you know, in a concentrated period of time, do like four death certificates in one day or something like that. You know, I think probably total I pronounced like 20 people, which is, you know, I think for my career in like a two and a half month timeframe is a ton...Participant 24 Internal Medicine (IM) Attending

Due to strict restrictions in hospital visitations, many sick and dying patients didn't have loved ones with them in the hospital which created an emotional toll on HCWs. One participant described,

... It was so I mean, exhausting is the word that I think, right? ... it was really hard and it was sad. You know, you're sad for these people that, you know, this is how... this is the end of their life. And they know that their loved ones aren't here with them or I mean... And I've done this for 20 years, and this was way more draining than normal, right, because we had so many patients die. And, you know, again, like I said, they were all dying alone... Participant 40 Intensive Care Unit (ICU) Attending

HCWs were also often charged with enforcing the strict hospital visitation policies. For some HCWs, telling family members that they could not visit their critically ill loved ones in the hospital or that they had very limited time to be at the bedside, made them feel callous as another participant noted,

... But now with new precautions where no family is allowed to enter for more than fifteen minutes, like having an individual die in your care and then telling that family member like you only have 15 minutes here and then you have to leave. It's kind of inhuman to be, say that to have to tell another person that, like you only have a limited amount of time to express your grief and then you have to get out. So that's an emotional challenge that we had to encounter. Participant 39 Patient Care Assistant (PCA)

Some participants still provided comfort to patients and families even to the detriment of their personal safety. A participant described instances where they broke the rules to provide humanistic care to dying patients, noting,

A lot of the patients were alone. And having to witness patients die alone was really, really hard and trying to be there for them, but also limit the amount of time

you're spending in the room, which we definitely failed at that, we did not follow the hospital policies very well. I think it was impossible for us to not stay in the room when someone was suffering, when someone had questions when someone was dying... Participant 22, Pediatric hospitalist

As the above quote illustrates, the initial phase of the pandemic created atypical tensions for HCWs between the desire to aid suffering, the desire to preserve personal safety as well as the desire to follow hospital protocol, tensions likely fueled by their professional identities as caregivers.

Another consequence of restricting visitors in the hospital was that HCWs often had to have difficult goals of care conversations over the phone with the loved ones of admitted patients, particularly patients who were critically ill. A resident noted,

... I realize how difficult it is to actually give updates over the phone...because the virus is so aggressive and patients, you know, deteriorate so quickly, it was very difficult for a lot of the families to get a good grasp of, you know, and understand that maybe your mom is not the person that she was a week ago... And then even trying to discuss code status, that is, you know, things like that that take a pretty long process for the most part. Yeah, it was certainly very difficult... Participant 20 IM resident

In addition, some HCWs bore the burden of making difficult life and death decisions.

One pediatrician who was re-assigned to care for adults during the pandemic noted how having the responsibility of making these difficult decisions made him feel like he was playing a “deity role”. The participant noted,

[hospitals]...have allowed doctors to make a unilateral decision to place someone as a DNR/ DNI code, which means that if two attending doctors examined the patient and reviewed their case and agreed that doing chest compressions or intubating would be futile in a patient with COVID, they could make them DNR/ DNI, even if the family did not agree...I think it felt like playing God in a way that I never want to do again in my life. And I've yeah, I've really struggled with that, the decision emotionally and just morally after making it. Participant 22 Pediatric hospitalist

In addition, some HCWs also expressed feeling guilty for being thanked by family members and the community for the care they provided, particularly when the HCWs felt like they were providing inadequate care due to poor patient outcomes. As one participant noted,

.... I think in a way, you feel a little bit of guilt because like a lot of families are like, "oh, you're

doing so much for them" when reality, we didn't really have anything that we could do other than support them. I mean, we were using drugs, like, maybe they do something, but we don't really know and if they are having an effect, it's probably a very modest effect... In a way, I sort of felt like a little like, you feel like a little bit of like guilt because you wish you could do more for the patients than you can do (Participant 1 IM resident).

Some HCWs continued to carry the burden of the suffering they witnessed as this participant noted,

.... And, you know, there's just a lot of a lot of pain, I think, to kind of go through that with people and, you know, you're not going to stop thinking about certain things for those folks. Even now ...Participant 23 ICU Attending

## 2. Stress of changing work environment and unmet professional expectations

Many participants pointed out how the chaotic and rapidly changing work environment was a source of stress. The clinical work environment was often described as a war zone as one participant noted,

... You know, we felt like we were at war with an invisible enemy... Participant 32 Obstetrics and Gynecology (OBGYN) resident

The novelty and severity of the pandemic in the initial stages as well as the risk of transmission created rapid changes in clinical workflow and guidelines including changes in patient interactions that placed an extra burden on HCWs and impacted their work satisfaction. As one participant noted,

Firstly, there were big changes to the way that we worked. There were new policies coming in every day. In some cases, we were being given different instructions on an hour-to-hour basis. There were new algorithms being implemented and they were being changed quite frequently. And also the extra use of PPE meant that our working environment was less enjoyable than previous... Participant 34 OBGYN Attending.

In addition, many frontline HCWs worked longer hours in highly stressful environments and were assigned new clinical responsibilities as one participant noted,

But, you know, the days are long, like long workdays, like 12-hour shifts. So, you know, by the end of the seven-day stretch, you're you know, you're putting in

like 80 plus hours. So it's just exhausting. Participant 24 ICU attending

In addition, the unpredictability of schedules was another cause of stress as noted by this trainee,

But I think the uncertainty of my schedule has caused a lot of distress... We could suddenly be called into work and then have to cancel everything that we had to do. So, I think that caused the most distress from anything... Participant 11 IM resident

Some HCWs also described how the high acuity and volume of patient care at work didn't always give them time to process events as noted by this participant,

You know, I mean, I can't tell you the number of times I came home crying because, I mean, at the end of the day, it was also overwhelming... And I think sometimes it was like being on the front line and like being so busy. You don't always have time to process in the moment or the day to day. And so, you know, you're kind of just like, I got to go, go, go. I got to do, do, do... Participant 24 IM Attending

Furthermore, several HCWs noted how the high patient volume and acuity made them question the adequacy of the care they provided to patients as noted,

Like, you know, you wonder if you did your job right. Did you put the settings in right? Because things are happening in such a fast pace. You know, you've got to really be sure what you're doing. And then sometimes it's all a blur. Like, you don't even know what we did. I mean, for me anyway, it's like, did I do that with that person or that person or was that person on a rate of 20 or the other one? You know, it's very easy to get, you know, confused as to where what ended up who got what ... Participant 45 Respiratory Therapist (RT)

An IM subspecialist described guilt associated with the perception of not being able to provide adequate care to patients, and the potential future mental health toll of these experiences and sentiments. The participant noted,

I think mental health is going to be kind of a rebound epidemic in some ways, kind of physicians and nurses having kind of PTSD kind of symptoms and things like that, especially those who have been on the frontlines, kind of what it's been termed the moral injury of not being able to treat patients as we feel we should be treating them because of the situation restrictions and PPE things like that... Participant 21 IM subspecialist

### 3. Concern for safety in personal life

The initial phases of the pandemic were plagued by inadequate personal protective equipment (PPE), inadequate testing capabilities and unknowns about the degree of transmissibility of the virus, all which contributed to the fear of personal safety. Many frontline HCWs reported a significant degree of anxiety and stress over their personal safety and the risk that they could expose their family members and close contacts. As one participant noted,

During the early days, it was very stressful to work. You weren't sure if you're going to take the disease home, myself included. A lot of us didn't go home during that time. So, we were separated from our family and we were working around the clock... Participant 28 ICU Attending

The inadequate PPE and testing in the initial stages of the pandemic was a source of stress and concern about safety for many HCWs. As noted,

Yes, so I know early, early on when there is a lot of concern about how much PPE was going to be available and what was going to be supplied to us... Participant 13 IM resident

Some HCWs sought to address their fear of infecting their close home contacts by developing cleaning rituals that also added an extra level of burden after long days at work. As one participant explained,

... And I think one of the things that has been frustrating is like as soon as I come home, I have like a ritual where I like my husband, like opens the gate for me so that I don't even have to touch the gate. He opens the back door. He gives me like Lysol... And so that in and of itself takes like 40 minutes when I get home. And so for me, it's like I work 14 hours a day. I come home. I have another, like, hour of things to do before I can actually even interact with my son... Participant 37 OBGYN Resident

Some HCWs stated that they either isolated themselves from their family and close contacts or chose not to visit loved ones. Some HCWs who lived alone also expressed struggles with loneliness due to isolation and precautions against transmission. As one resident noted,

So, I think it's been hard to feel like. You're going through this very stressful time where you're taking care of people that are really sick and you're worried about you getting sick and being in their position. And at the end of the day, you don't really have somebody that can, like, even give you a hug and make you feel better, like you have to keep your distance. Participant 12 IM resident

Unfortunately, the fear of being diagnosed with COVID-19 and dying was a real possibility for some HCWs in the early phase of the pandemic where there were no known effective therapeutics or vaccinations. A participant who tested positive early in the pandemic when there was great concern about the associated mortality described the impact of that diagnosis,

The evening the results came. So, the first thing we did was once we learned that I am positive, to call friends and close family friends and to ensure that they would agree to, we have one son who is 12, to look after him... if something happens to us. And the second thing we did is we never had, we were always postponing our wills. So, we called a lawyer and I arranged the lawyer to come to the street, not even house, across the porch. So, he brought in another lawyer with him and as a witness and we signed our wills. Participant 42  
OBGYN Attending

## Discussion

The COVID-19 pandemic has created stressful work conditions for many HCWs that have implications for the present and future. We describe the stressors experienced by HCWs in Connecticut, USA during the first wave of the COVID-19 pandemic. Participants in our study expressed emotional distress witnessing an unusually high volume of deaths and patients dying alone. In addition, participants in our study expressed stress and guilt about their limited medical knowledge and inability to provide effective treatment to patients, a finding that was echoed in other studies on the experiences of frontline HCWs in other parts of the world during the first wave of the pandemic (Ohta et al. 2021; Hines et al. 2020; Rucker et al. 2021). Similar to publicized knowledge, participants in our study also expressed concerns for their safety in the setting of inadequate PPE and concerns about the virulence of the virus and risk of transmission (AAMC 2020; Cohen et al. 2020; Hennein et al. 2020; Ranney et al. 2020; Shechter et al. 2020).

Our study participants expressed having a sense of guilt about certain negative outcomes, perceived suboptimal care due to mistakes made, lack of resources, lack of knowledge, inadequate staffing and strict isolation precautions, which were experiences that could place HCWs at risk of moral injury (Kopacz et al. 2019; Cartolovni et al. 2021). The concept of moral injury (MI), developed out of post-traumatic stress disorder (PTSD), can be described as psychological distress that one may feel due to an action or inaction that violates one's ethical or moral code in high stakes situations, in the case of HCWs, their professional code to save lives and "do no harm" (Cartolovni et al. 2021; Raudenska

et al. 2020). The initial phase of the pandemic was a high-stake period in the absence of therapeutics and vaccinations against a potentially deadly virus as well as limited personal protective equipment (AAMC 2020; Cohen et al. 2020; Hennein et al. 2020; Ranney et al. 2020; Shechter et al. 2021).

Some studies have sought to quantify MI in HCWs as a result of the COVID-19 pandemic however these studies do not explore the experiences that could lead to MI as our study does (Amsalem et al. 2021; Dale et al. 2021; Mantri et al. 2021; Thomas et al. 2021). A few studies qualitatively explore stressors that could lead to MI among HCWs, however, these studies are limited by small numbers of participants (Ducharlet et al. 2021; Farrell and Hayward 2022; Kreh et al. 2021). Our study expands on published literature on the lived experiences of frontline HCWs caring for critically ill patients during the initial phase of the pandemic that place them at risk of MI. Many participants in our study likened their experiences on the frontlines to being at war. Notably, a study that quantified MI among HCWs in Maryland, USA showed that the HCWs that worked during the first wave of the pandemic had the same MI scores compared to military service members exposed to 7-month war zone deployment although, this was found more so in reporting a sense of betrayal by others (Hines et al. 2020).

The stressors identified in our study have implications for the present and future. It is important to monitor and evaluate for MI among HCWs. There is a need to provide support to HCWs to help them work through these emotions including providing opportunities for debriefing and counseling. While MI has been shown to contribute negatively to psychological adjustment, the long-term impact on developing post-traumatic stress disorder (PTSD) post-pandemic needs to be studied (Williamson et al. 2018, 2020). Factors that have been associated with stress levels during the COVID-19 pandemic were reflected in our findings and include perceived workplace stress, shift work, inpatient care duty, sleep disturbance, lack of support at work, excessive workload as well as lack of time for meditation, and insufficient information (Hines et al. 2021; Magnavita et al. 2021). Therefore, it is important to mitigate these risk factors in the work environment.

A strength of our study is that it explores various work stressors encountered by HCWs who cared for acutely ill patients during the first wave of the pandemic revealing themes that highlight the risk of MI. A limitation of the study is that the participants were restricted to HCWs that practiced in Connecticut. However, our findings mirror themes outlined in other settings around the world (Bennett et al. 2020; Ohta et al. 2021; Rucker et al. 2021). Another limitation was the relatively small number of nurses we could recruit. Multiple studies show that nurses that cared for patients during the COVID-19 pandemic are at increased risk of developing MI compared to HCWs in other roles

thus, further studies on the experiences of nurses are needed (Dale et al. 2021; Mantri et al. 2021). Finally, there is a need for further qualitative research to explore how stressors faced by HCWs have evolved throughout the course of the COVID-19 pandemic.

## Conclusion

With continued changes in the work environment in the setting of the multiple waves of the pandemic it is important to manage the impact of chronic and cumulative stressors on HCWs. Our study highlights the stressors faced by frontline HCWs during the initial phase of the pandemic and highlights how these stressors could increase the risk of MI. We hope that this provides policymakers and healthcare systems with the information needed to provide well-guided emotional and psychological assessment and support to HCWs during additional waves of the pandemic and in the post-pandemic era.

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**Availability of data and material** The datasets that were generated for this research are not publicly available due to the confidential nature of the data with respect to their experiences at work and with their employers.

## Declarations

**Conflict of interest** The authors have no relevant financial or non-financial interests to disclose.

**Prior presentation** This paper was presented as a virtual poster presentation titled “Experiences of health care workers during initial phases of the COVID-19 pandemic in Connecticut: A qualitative study on Oct 21, 2021 at the American Public Health Association (APHA) annual meeting.

## References

- Adeyemo OO, Tu S, Keene D (2021) How to lead health care workers during unprecedented crises: A qualitative study of the COVID-19 pandemic in Connecticut, USA. *PLoS ONE* 16(9):e0257423
- Amsalem D, Lazarov A, Markowitz JC et al (2021) Psychiatric symptoms and moral injury among US healthcare workers in the COVID-19 era. *BMC Psychiatry* 21(1):546
- Association of American Medical Schools. “Where is all the PPE?”. <https://www.aamc.org/news-insights/where-all-ppe>. Accessed Mar 2021
- Bennett P, Noble S, Johnston S et al (2020) COVID-19 confessions: a qualitative exploration of healthcare workers experiences of working with COVID-19. *BMJ Open* 10:e043949. <https://doi.org/10.1136/bmjopen-2020-043949>
- Bryant-Genevier J, Rao CY, Lopes-Cardozo B et al (2021) Symptoms of depression, anxiety, post-traumatic stress disorder, and suicidal ideation among state, tribal, local, and territorial public health workers during the COVID-19 Pandemic—United States, March–April 2021. *MMWR Morb Mortal Wkly Rep* 70(26):947–952. <https://doi.org/10.15585/mmwr.mm7026e1> (**Corrected and republished in: MMWR Morb Mortal Wkly Rep. 2021 Dec 03;70(48):1679. PMID: 34197362; PMCID: PMC8248597.**)
- Butler CR, Wong SPY, Vig EK, Neely CS (2021) Professional Roles and Relationships during the COVID-19 pandemic: a qualitative study among US clinicians. *BMJ Open* 11:e047782. <https://doi.org/10.1136/bmjopen-2020-047782>
- Čartolovni A, Stolt M, Scott PA, Suhonen R (2021) Moral injury in healthcare professionals: a scoping review and discussion. *Nurs Ethics* 28(5):590–602. <https://doi.org/10.1177/0969733020966776>
- Cohen J, Rodgers YVM (2020) Contributing factors to personal protective equipment shortages during the COVID-19 pandemic. *Prev Med* 141:106263. <https://doi.org/10.1016/j.ypmed.2020.106263>
- Couarraze S, Delamarre L, Marhar F et al (2021) The major worldwide stress of healthcare professionals during the first wave of the COVID-19 pandemic—the international COVISTRESS survey. *PLoS ONE* 16(10):e0257840
- Dale LP, Cuffe SP, Sambuco N et al (2021) Morally distressing experiences, moral injury, and burnout in Florida healthcare providers during the COVID-19 pandemic. *Int J Environ Res Public Health* 18:12319
- Ducharlet K, Trivedi M, Gelfand SL et al (2021) Moral distress and moral injury in nephrology during the COVID-19 pandemic. *Semin Nephrol* 41(3):253–261
- Farrell CM, Hayward BJ (2022) Ethical dilemmas, moral distress, and the risk of moral injury. *Acad Med*. <https://doi.org/10.1097/ACM.0000000000004536>
- Firew T, Sano ED, Lee JW et al (2020) Protecting the front line: a cross-sectional survey analysis of the occupational factors contributing to healthcare workers’ infection and psychological distress during the COVID-19 pandemic in the USA. *BMJ Open* 10(10):e042752. <https://doi.org/10.1136/bmjopen-2020-042752>. **PMID:33087382;PMCID:PMC7580061**
- Hennein R, Lowe S (2020) A hybrid inductive-abductive analysis of health workers’ experiences and wellbeing during the COVID-19 pandemic in the United States. *PLoS ONE* 15:10
- Hines SE, Chin KH, Levine AR, Wickwire EM (2020) Initiation of a survey of healthcare worker distress and moral injury at the onset of the COVID-19 surge. *Am J Ind Med* 63(9):830–833. <https://doi.org/10.1002/ajim.23157> (**Epub 2020 Jul 16. PMID: 32677108; PMCID: PMC7404965.**)
- Hines SE, Chin KH, Glick DR, Wickwire EM (2021) Trends in moral injury, distress, and resilience factors among healthcare workers

- at the beginning of the COVID-19 pandemic. *Int J Environ Res Public Health* 18:488. <https://doi.org/10.3390/ijerph18020488>
- Juster RP, McEwen BS, Lupien SJ (2020) Allostatic load biomarkers of chronic stress and impact on health and cognition. *Neurosci Biobehav Rev* 35(1):2–16. <https://doi.org/10.1016/j.neubiorev.2009.10.002> (Epub 2009 Oct 12 PMID: 19822172)
- Kopacz MS, Ames D, Koenig HG (2019) It's time to talk about physician burnout and moral injury. *Lancet Psychiatry* 6(11):e28. [https://doi.org/10.1016/S2215-0366\(19\)30385-2](https://doi.org/10.1016/S2215-0366(19)30385-2) (PMID: 31631880)
- Kreh A, Brancaleoni R, Magalini SC et al (2021) Ethical and psychosocial considerations for hospital personnel in the Covid-19 crisis: moral injury and resilience. *PLoS ONE* 16(4):e0249609. <https://doi.org/10.1371/journal.pone.0249609>
- Li Y, Scherer N, Felix L, Kuper H (2021) Prevalence of depression, anxiety and posttraumatic stress disorder in health care workers during the COVID-19 pandemic: a systematic review and meta-analysis. *PLoS ONE* 16(3):e0246454. <https://doi.org/10.1371/journal.pone.0246454>
- Magnavita N, Soave PM, Antonelli M (2021) Prolonged stress causes depression in frontline workers facing the COVID-19 pandemic—a repeated cross-sectional study in a COVID-19 Hub-hospital in central Italy. *Int J Environ Res Public Health* 18(14):7316. <https://doi.org/10.3390/ijerph18147316>
- Mantri S, Song YK, Lawson JM, Berger EJ, Koenig HG (2021) Moral injury and burnout in health care professionals during the COVID-19 pandemic. *J Nerv Ment Dis* 10:720–726. <https://doi.org/10.1097/NMD.0000000000001367>
- Nyashanu M, Pfende F, Ekpenyong M (2020) Exploring the challenges faced by frontline workers in health and social care amid the COVID-19 pandemic: experiences of frontline workers in the English Midlands region. *UK J Interprof Care* 34(5):655–661. <https://doi.org/10.1080/13561820.2020.1792425>
- Ohta R, Matsuzaki Y, Itamoch S (2021) Overcoming the challenge of COVID-19: a grounded theory approach to rural nurse's experiences. *J Gen Fam Med* 22:134–140
- Peccoralo LA, Pietrzak RH, Feingold JH et al (2022) A prospective cohort study of the psychological consequences of the COVID-19 pandemic on frontline healthcare workers in New York City. *Int Arch Occup Environ Health*. <https://doi.org/10.1007/s00420-022-01832-0>
- Ranney ML, Griffeth V, Jha AK (2020) Critical supply shortages – the need for ventilators and personal protective equipment during the COVID-19 pandemic. *NEJM* 382:e41
- Raudenská J, Steinerová V, Javůrková A et al (2020) Occupational burnout syndrome and post-traumatic stress among healthcare professionals during the novel coronavirus disease 2019 (COVID-19) pandemic. *Best Pract Res Clin Anaesthesiol* 34(3):553–560. <https://doi.org/10.1016/j.bpa.2020.07.008> (Epub Jul 18 PMID: 33004166)
- Rucker F, Hardstedt M, Rucker S et al (2021) From chaos to control- experiences of healthcare workers during early phase of the COVID-19 pandemic a focus group study. *BMC Health Serv Res* 21:1219
- Sethi BA, Sethi A, Ali S, Aamir HS (2020) Impact of Coronavirus disease (COVID-19) pandemic on health professionals. *Pak J Med Sci* 36(S4):S6–S11. <https://doi.org/10.12669/pjms.36.COVID19-S4.2779>
- Shechter A, Diaz F, Moise N, Anstey DE et al (2020) Psychological distress, coping behaviors, and preferences for support among New York healthcare workers during the COVID-19 pandemic. *Gen Hosp Psychiatry* 66:1–8. <https://doi.org/10.1016/j.genhosppsych.2020.06.007> (Epub 2020 Jun 16. PMID: 32590254; PMCID)
- Sirois FM, Owens J (2021) Factors associated with psychological distress in health-care workers during an infectious disease outbreak: a rapid systematic review of the evidence. *Front Psychiatry* 11:589545. <https://doi.org/10.3389/fpsy.2020.589545>
- Sterling MR, Tseng E, Poon A et al (2020) Experiences of home health care workers during the coronavirus disease 2019 pandemic a qualitative analysis. *JAMA Intern Med* 180(11):1453–1459. <https://doi.org/10.1001/jamainternmed.2020.3930>
- Strauss A, Corbin J (2014) Basics of qualitative research: techniques and procedures for developing grounded theory, 4th edn. Sage publishing, Thousand Oaks
- Williamson V, Stevelink SAM, Greenberg N (2018) Occupational moral injury and mental health: systematic review and meta-analysis. *Br J Psychiatry* 212(6):339–346
- Williamson V, Murphy D, Greenberg N (2020) COVID-19 and experiences of moral injury in front-line key workers. *Occup Med (lond)* 70(5):317–319. <https://doi.org/10.1093/ocmed/kqaa052>. PMID: 32239155; PMCID: PMC7184422

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