# Psychological Effects of Long COVID on Healthcare Workers

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## Introduction

The COVID-19 pandemic has had a dramatic social and mental health impact on the general population, with profound effects on healthcare workers (HCWs). There is evidence that during the pandemic compared to non-HCWs, HCWs have endorsed more psychological symptoms including depression, anxiety, and sleep problems, as well as more overall psychological distress [1]. In addition, being diagnosed with the virus is a risk factor for psychiatric symptoms both short and long term, with 6-month outcome data revealing that survivors of COVID-19 have elevated rates of anxiety disorders and psychotic disorders [2]. Most of the research on the psychological effects of the pandemic has focused on psychological symptoms and quality of life, with insufficient attention paid to the impact on burnout, moral injury, resilience, post-traumatic growth, and flourishing[3].

Only recently have scholars investigated the psychological effects of the post-acute sequelae of SARS CoV-2 infection (PASC). Individuals diagnosed with PASC, known as patients with long COVID (aka "long haulers"), have heterogeneous symptoms, high overall symptom burden, and multi-system involvement [4, 5]. The rates of PASC vary dramatically, but it appears that 1 out of 50 people have symptoms that persist beyond 12 weeks [6]. In terms of their psychological functioning, individuals with long COVID have elevated rates of mental health symptoms and psychiatric disorders (Lopez-Leon et al., 2021). Frequently endorsed mental health symptoms include uncertainty and fear, isolation, mood changes including low mood and sadness, fatigue, abnormal sleep/sleep disorder, brain fog, attentional difficulties, and to a less extent psychotic symptoms including paranoia and hallucinations [4, 7-9]. In terms of mental health disorders, individuals with long COVID have high rates of anxiety, including new onset social anxiety (mean = 13%), depression (mean = 12%), obsessive-compulsive disorder (mean = 2%), and PTSD (mean = 1%) [7]. Their quality of life is also negatively impacted [4, 8]. Recent evidence indicates that HCWs with long COVID have disruption in their work, social, and home lives [10]. A variety of etiological explanations have been offered regarding the high rates of psychological difficulties among patients with long COVID. These difficulties have been attributed to the direct effects of the infection, side effects of medications, inflammation/excessive immune response, olfactory nerve plus depression, social aspects of having a potentially fatal illness, environmental and societal factors such as perceived stigma, and the exacerbation of pre-existing psychiatric conditions [11, 12].

Unfortunately, to date, virtually no empirical focus has been devoted to the unique effects of PASC on HCWs. This lack of research is concerning considering recent stories in the popular press about the fact that many HCWs struggle with the impact of PASC on their psychological well-being. Further, strategies to effectively address the psychological sequelae of PASC have yet to be determined. There have been recent calls for developing treatment guidelines for individuals with long COVID, especially approaches that reflect lived experience [12]. Optimally, findings from this mixed methods investigation can contribute to the treatment guidelines that target psychological well-being.

## Study Questions, Aims, and Hypotheses

To advance our understanding of the psychological impact of COVID-19 and the unique psychological effects of COVID-19 on HCWs, particularly those with long COVID, as well as to create a Wellness Toolkit of strategies for HCWs with long COVID, we propose a hybrid quantitative-qualitative investigation with the ultimate goal of optimally meeting the psychological needs of this particularly vulnerable yet very resilient population.

The specific aims and associated hypotheses for the quantitative components of the investigation are as follows:

1) Compare the psychological symptoms, levels of burnout and moral injury, quality of life, resilience, post-traumatic growth, and flourishing of HCWs with long COVID to HCWs without long COVID but with a prior history of COVID
    a. It is hypothesized that compared to HCWs without long COVID but with a prior history of COVID-19, HCWs with long COVID will endorse more psychological symptoms (anxiety, depression, PTSD), burnout and moral injury; and lower levels of quality of life, resilience, post-traumatic growth, and flourishing
2) Compare the psychological symptoms, levels of burnout and moral injury, quality of life, resilience, post-traumatic growth, and flourishing of HCWs with long COVID to demographically matched non-HCWs with long COVID
    a. It is hypothesized that compared to demographically matched non-HCWs with long COVID, HCWs with long COVID will endorse more psychological symptoms (anxiety, depression, PTSD), burnout and moral injury; and lower levels of quality of life, resilience, post-traumatic growth, and flourishing

The specific aim and hypothesis of the qualitative component of the investigation are to:

3) Collect and analyze focus group data from HCW with long COVID related to psychological supports that would optimize their recovery
    a. We anticipate that information gleaned from these focus groups will enable us to develop a toolkit of contextually responsive and evidence-informed best practices for wellness strategies (Wellness Toolkit)

**Study Methods**

**Sample**. The sample for the quantitative component of the project will include 150 adults aged 18-64; 50 HCWs with long COVID, 50 HCWs without long COVID but with a history of COVID-19, and 50 non-HCWs that are demographically matched to the HCWs with long COVID. To be included in one of the two HCW groups, individuals must identify as a physician, nurse, advanced practice provider, psychologist, pharmacist, or allied health professional (e.g., respiratory therapist, physical therapist, occupational therapist). To be categorized as having PASC, participants must endorse symptoms of COVID-19 that have persisted for 8 weeks or more (NIH definition). To be categorized as not having PASC but having a history of COVID-19, the HCW must have had a positive test for COVID-19 in the past but not have experienced symptoms of the virus for more than 8 weeks. The demographic variables for the demographic matching of groups include gender, age, race/ethnicity, and degree level (e.g., bachelors, masters, doctoral), and the latter to the extent possible. The sample for the qualitative component will be 25 individuals drawn from the HCWs with long COVID group associated with the quantitative component of the project.

**Procedures**. HCWs will be recruited from Emory Healthcare and Grady Health System, including from the Long COVID Clinics at these sites. The non-HCW sample will be recruited from the Long COVID Clinics at Emory Healthcare and Grady Health System, as well as using a snowball sampling method in which HCW participants will be invited to nominate people they know from a similar demographic background. Prior to participating in the quantitative component of the study, participants will provide written informed consent. They will then complete the assessment battery online via REDCap, a secure web application for building and managing online surveys and data bases. REDCap will be used to administer and collect electronic data described in the "Quantitative Assessment Battery" section below. Capacity to provide informed consent will be evaluated through acceptance of the consent statement provided by REDCap prior to beginning the quantitative assessment battery. Individuals unable to give consent will not be included. Following consent, participants will complete the full online battery in accord with the order presented under the "Quantitative Assessment Battery" section of this protocol. Following completion of the online questionnaire, REDCap will indicate to the participant that the survey has concluded, thank them for their participation, and give them a link to access a $20 gift card online. In addition, HCWs with long COVID who complete the online assessment battery will be invited to participate in the focus groups. If they consent to do so, they will be scheduled for one of the online focus groups, which will occur via a Zoom platform that is HIPAA compliant. At the completion of a focus group, participants will receive another online $20 gift card.

**Quantitative assessment battery**. Participants will first complete a Demographics and COVID Questionnaire created for this study, which will include key sociodemographic (e.g., gender, age, race/ethnicity, degree) and COVID-19 (e.g., presence/absence of confirmed diagnosis, month diagnosed, treatments, hospitalization, current symptoms, duration of symptoms) information. They then will complete the following measures, all of which have strong psychometric properties (reliability, validity) and are often used to examine the relevant constructs among HCWs. In terms of psychological symptoms, depression and anxiety will be measured using the Depression Anxiety and Stress Scale [13] (DASS-21), and of PTSD will be examined using the Impact of Event Scale-Revised [14] (IES-R). Burnout will be measured using the Maslach Burnout Inventory-General Survey (MBI-GS) [15], moral injury will be assessed via the Moral Injury Symptom Scale – Health Professional (MISS-HP) [16], and quality of life will be examined with the World Health Organization Quality of Life Brief Questionnaire (WHOQOL-BREF) [17]. The Connor Davidson Resilience Scale (CD-RS), Posttraumatic Growth Inventory-Short Form (PTGI-SF), and the Flourishing Scale (FS) will examine resilience, post-traumatic growth, and flourishing respectively [18-20].

**Focus groups**. Five virtual focus groups with HCWs with long COVID will be conducted to address Aim 3. Each 60-minute focus group will include 5 members and a moderator (investigative team member). Building upon the recommended strategies from Emory's Caring Communities [21], the focus groups will be structured around a set of predetermined questions related to recommendations for best practices for wellness strategies and tips for implementing these strategies in a practical and effective manner. The focus groups will be recorded and transcribed for subsequent thematic analysis. The focus group data will be analyzed using qualitative data analysis software. The findings will be used to create the evidence-informed and contextually responsive Wellness Toolkit.

**Data analytic plan.** To answer each of the first two specific aims and protect against Type 1 errors that might occur if multiple analyses of variance (ANOVAs) are performed independently, three multivariate analyses of variance (MANOVAs) will be conducted. The independent variable will be group; for Specific Aim 1 HCWs with long COVID will be compared to HCWs without long COVID but with a prior history of COVID and for Specific Aim 2 HCWs with long COVID will be compared to non-HCWs with long COVID. For each of these specific aims, the dependent variables for the first MANOVA will be psychological symptoms (DASS, IES-R), for the second MANOVA will be psychosocial distress (MBI-GS, MISS-HP, WHOQOL-BREF), and for the third MANOVA will be resilient functioning (CD-RS, PTGI-SF, FS). For any overall multivariate analysis that is significant, we will examine the univariate *F* tests for each dependent variable associated with the overarching construct (psychological symptoms, psychosocial distress, resilient functioning) to determine which variable(s) contributed to the significant overall effect. These MANOVAs and subsequent ANOVAs will control for COVID-19 variables that may impact psychological symptoms, psychosocial distress, and resilient functioning regardless of long COVID or HCW status. Such variables may include, but not be limited to, timing of initial diagnosis and duration between infection onset and assessment, which will be gathered via the Demographics and COVID Questionnaire.

For Specific Aim 3, focus group participants' comments will be analyzed using Dedoose, an online software program for analyzing qualitative and mixed methods data (www.dedoose.com). Dedoose was chosen because of its facilitation of collaboration, visual interactive data analysis interface, and ability to be used cross platform. A team of three individuals trained in the conduct of qualitative research will draw on techniques of grounded theory to analyze the data. They will identify emergent patterns and generate a guiding framework to explain these patterns. First, the team will read the data in its entirety and develop a structured codebook that will include inductively derived codes that represent common and/or unique ideas that emerge from the data as well as deductively selected categories to organize the dataset. Then they will conduct multiple rounds of codebook revision until they obtain good interrater reliability of the codes (pooled kappa $\geq$ 0.8) to ensure the clarity of coding definitions and their consistent application. Second, the analytic team will review and consolidate these codes into a list of key themes and subthemes designed to characterize the range of experiences of HCWs with long COVID and their recommendations for contextually relevant wellness strategies. Third, we will use an iterative process to refine and organize these themes into a guiding framework for the Wellness Toolkit, that will delineate a series of wellness strategies related to psychological symptoms, psychosocial distress, and resilient functioning.

## Anticipated Findings and Project Significance

While clinical trials for safe and effective antiviral agents and vaccines are ongoing and being accelerated, the long-term sequelae of SARS-CoV-2 infection increasingly have been acknowledged as concerning. To optimize the management of the clinically the prevalent syndrome of PASC, it deserves more empirical attention and collaboration between researchers and individuals with lived experience.  To avoid the problems encountered in the research focused on the acute phase of the pandemic, it is imperative that systematic studies be conducted on the trajectory of people recovering from COVID-19. Such research is likely to be most meaningful if it involves participation of an interdisciplinary group of researchers. The proposed project capitalizes on the interprofessional and cross-institutional (Emory School of Medicine, Morehouse School of Medicine, Georgia Institute of Technology) partnerships forged including those at Grady Health System and Emory Health Care through the Long COVID Clinics. This project will provide invaluable information about the psychological symptoms, psychosocial distress, and resilient functioning of HCWs with long COVID as compared to HCWs without long COVID but with a history of COVID and non-HCWs with long COVID. The study is designed to shed light on the unique effects of long COVID on HCWs, an essential population during this pandemic and beyond and one that has received little empirical attention. Based on these findings, additional studies can be developed to maximize understanding of these subject areas. The project also will lay the foundation for the creation of Wellness Toolkit that will include contextually relevant and evidence-based strategies to enhance the psychological well-being of HCWs with long COVID. The goal of our interprofessional team is that this Wellness Toolkit is a “living document” that can incorporate future public health guidance and the perspectives of a growing number of HCWs living with long COVID, who have substantial clinical experience alongside lived experience. Most importantly, we hope that the findings enable healthcare systems to better fulfill their moral obligation to support HCWs in recovering from this pandemic.

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