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Use of virtual meeting and survey technology to assess Covid-19-related mental well-being of healthcare workers

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Received 1st August 2022; accepted 21 November 2022
Available online 28 November 2022

KEYWORDS
Covid-19; Healthcare workers; Louisiana; Mental health; Mental wellbeing

Summary
Background and aims. — Healthcare workers (HCWs) throughout the world have been exposed to economic and existential stress during the Covid-19 pandemic. The American Medical Association (AMA) has documented that increased healthcare burden correlates with increased stress, burnout, and psychological burden in HCWs. However, limits on personnel, time, and in person interactions make it challenging to assess mental health outcomes during a pandemic. This pilot study used virtual technology to efficiently assess these outcomes.
Introduction

With the rise of the coronavirus disease, healthcare systems felt the global strain of being pushed past their limits, including facing resource and capacity insufficiencies [1]. This strain may be felt disproportionately by healthcare workers (HCWs), who were reported by one survey to be more likely than others to worry about being infected by the virus, exposing their loved ones to the virus, and knowing someone who has died from Covid-19 [2]. HCWs appear to be further affected by their integral role in combatting the spread of this deadly virus. This has been shown through the exploration of HCWs psychological responses to previous epidemics of infectious disease. Those working directly with patients have been shown to experience increased rates of depression, anxiety, insomnia, and distress [3–6]. Furthermore, Wang et al. (2021) found a significant association between Covid-19-related physical symptoms, such as sore throat, headache, and cough, even in the absence of positively documented infection, and increased anxiety and depression [7,8]. This proves especially relevant in HCWs, who are routinely subjected to positive Covid-19 cases, long stretches of physical inactivity and chronic sleep deprivation in the presence of long work hours, all of which may impact physical health and contribute to nonspecific symptoms similar to those experienced during Covid-19 [9]. HCWs have been documented to be psychologically affected by the Covid-19 pandemic regardless of direct exposure to high-risk work areas or infected patients; this has negatively impacted the psychological, physical, and social aspects of HCW’s daily functioning [10–12]. Studies showed that conditions such as depression, insomnia, anxiety, burnout, and general distress increased in those directly working with those affected by Covid-19 [3–5].

This psychological strain can have devastating impacts and be borne disproportionately by different groups. Studies have reported an increased death rate by suicide in frontline HCWs, especially with female nurses [3,13,14]. One study found that the increased risk for negative well-being related to Covid-19 is most strongly associated with factors of being female, being < 45 years old, and having higher education [12]. Further, Etheridge and Spantig 2020 found the effect of Covid-19 on subjective well-being to impact women twice as much as men [15]. Several other studies have documented those who identify as women to report disproportionately lowered well-being during Covid-19 [15,16]. However, causative factors for these findings have not been strongly documented [17]. Covid-19’s toll on HCWs well-being is exacerbated by amplifying preexisting mental illness and increasing workplace stressors [14].

Decreased well-being due to the Covid-19 pandemic is thought to be caused by an amalgam of all aforementioned stressors. The psychological burden of these factors may be explained by the “allostatic load” theory [18]. This theory explains how high acuity of significant and stressful events triggers an acute adaptive physiological and psychological
response designed to meet the anticipated demand of the task. This acute stress response involves changes in neurotransmitters, neuropeptides, and the body’s organ systems to prime the brain and body for an acutely stressful event [19]. If this response is not terminated after the trigger, or if the trigger is sustained chronically, deleterious psychological and physiological effects may result, including abdominal fat deposition, muscle wasting, bone mineral loss, hypertension, insulin resistance, increased risk for cardiovascular disease, and hippocampal dendritic remodeling. These detrimental effects may predispose the individual to stress-related conditions such as depression and posttraumatic stress disorder (PTSD) [11,20,21]. This risk is especially pertinent in HCWs, whose immune systems may be further affected by chronically inadequate sleep and increased workplace stress with rising demands from the pandemic [22].

Between January 2020 to May 2021, the World Health Organization reported 115,493 deaths among HCWs due to Covid-19 around the globe [23]. The vulnerability to tragic outcomes in HCWs is related to the aforementioned factors, compounded by individual risks of exposure through direct patient care, and inadequate supply or reuse of personal protective equipment (PPE), the latter of which has been documented as a significant causative factor for the increased susceptibility of Covid-19 among HCWs [17,24,25]. Long working hours during the Covid-19 pandemic were also associated with increased infection rates among HCWs [9]. Studies have shown that those factors can significantly impact the physical and mental health of this group [26–30].

Moreover, HCWs in different contexts and cultures may have different outcomes, and different groups may exhibit differential vulnerability in different cultures. In the United States, it has been reported that African-Americans are more likely to hold positions as HCWs that are exposed to infection, have experience difficulties with providing for their families during Covid-19, or to directly know someone who has died from Covid-19 [24,25,31,32]. In Asia-Pacific countries, nurses were less psychologically affected compared to other HCWs [26,27]. Furthermore, the prevalence of anxiety and depression varied among HCWs from India, Indonesia, Malaysia, Singapore and Vietnam [26]. It is important to provide support to all HCWs and to take account of these differential impacts and vulnerabilities.

When analyzing protective factors identified in different countries, it was found that the population in China was more likely than other countries to wear a face mask, even in the absence of Covid-19 related symptoms [33]. Chinese respondents who wore face coverings were associated with lower levels of stress in comparison with the Americans, who showed higher levels of stress while wearing face coverings [33,34]. Compared with China, Spain utilized less face coverings and showed higher rates of adverse mental health experiences [35]. The Polish population and the Iranian population were both less likely than the Chinese population to wear face coverings [36,37]. In Malaysia, a protective factor that was identified to reduce stress and anxiety among the population was owning a communication tool such as a television, radio, smartphone, or laptop [38]. In the Vietnamese population, people began to stop sharing utensils, a culturally appropriate activity, due to fear of contracting Covid-19 [39]. It is imperative that global protective factors be identified in order to decrease mental and physical adverse health outcomes amongst the population.

Psychological resilience has been documented as one of the most protective factors for perceived well-being during the Covid-19 pandemic [40,41]. Resilience is defined as the ability to maintain normal functioning in the face of stressful disruptions by anticipating and preparing for the stressor [42,43]. In 2020, Heath et al. found resilience in the context of significant stressors to depend on several factors, namely confidence in professional support and training, coping style, ability to respond adaptively during stressors, and existing interpersonal problems or mental health conditions. Specifically, improving coping mechanisms has been shown to correlate to resilience [44]. Yan et al. (2020) found coping mechanisms of frequent contact with social support systems and colleagues to be protective against stress [12]. Data specific to HCWs reveal similar findings: resilience and social support protect against depression, psychological distress, and thoughts of death [45].

The psychological distress and widespread impact on well-being caused by the Covid-19 pandemic are predicted to continue during future healthcare crises. Understanding group-specific and region-specific barriers to factors affecting the well-being of HCWs is imperative to aid those currently suffering from the fallout of the pandemic and mitigate future burdens in HCWs. Studying these factors in time- and resource-constrained settings can be challenging, but these challenges can potentially be addressed using virtual technology. The current study used virtual presentation and assessment technology in our local setting.

Methodology

The American Medical Association (AMA) created a survey titled "Coping with Covid-19 for Caregivers Survey" to assess healthcare workers’ and students’ well-being during Covid-19. This 20-question survey includes questions regarding demographics, medical specialty/interest, and experiences of Covid-19 as a healthcare worker. Specific items addressed the perception of stress experienced that day, worry of transmitting Covid-19 to loved ones, concern about compromised integrity with Covid-19 decision-making, childcare concerns, and thoughts about general depression, suicidality, and burnout. Items were scored 1-4 by a Likert scale, with 1 considered “not at all,” 2 and 3 considered “high,” and 4 as “very high.” The AMA allows for up to five additional questions to be added to their survey, so researchers at LSU Health Sciences Center - Shreveport (LSUHSC) included five questions regarding support service utilization, perseverance, and resilience during Covid-19 (free response), and two items to further understand students’ areas of medical interest.

The Coping with Covid-19 for Caregivers Survey included demographic items such as gender, race/ethnicity, years in practice, outpatient vs. inpatient, and specialty. In addition, the survey contained 10 core questions about overall stress, fear of infection and transmission of the virus, perceived anxiety or depression due to the Covid-19 pandemic, work overload, childcare issues, sense of meaning and purpose, feeling valued by one’s organization, and the degree
of benefit from healthy snacks in combination with mental health and inbox management support (available online at http://mcpiqojournal.org). The items typically ran from a choice of 1 (not at all/minimal) to 4 (very high/to a great extent); 3 and 4 were considered high (e.g., high stress).

The survey was sent out to approximately 300 participants at the Louisiana Addiction Research Center Mental Health Summit in Shreveport, Louisiana, on April 22, 2021. Participants included local physicians, LSUHSC medical residents and students, LSUHSC allied health professionals and students, and LSUHSC physician alumni. There were 81 respondents.

The data collected were analyzed to determine overall wellness outcomes related to Covid-19 in order to highlight the specific needs of HCWs, to encourage the need for social policy changes and for educational opportunities to help alleviate Covid-19-related negative wellness outcomes amongst HCWs.

Basic descriptive statistics were used to portray stress levels and predictors for Covid-19-related stress among health care workers and the differences seen based on race/ethnicity, gender, years of practice, and practice location (outpatient vs. inpatient). The high [3] and very high [4] categories on the survey’s Likert scales were combined to describe stress levels, fear due to exposure/transmission, anxiety, depression, and workload. Respondents who selected “Prefer not to answer” (n = 1) or “Nonbinary/third gender” (n = 1) were removed from this analysis.

| Table 1 | Demographics and responses of 81 healthcare workers on coping with COVID Survey. |
|---------|--------------------------------------------------------------------------------|
| Demographics                           | n  | %  |
| **Gender**                             |    |    |
| Male                                   | 14 | 17 |
| Female                                 | 65 | 80 |
| **Race**                               |    |    |
| American of European descent (Caucasian) | 52 | 64 |
| American of non-European descent (Black, Asian, and Native American) | 25 | 31 |
| **Years in practice**                  |    |    |
| 1–10                                   | 29 | 36 |
| > 11                                   | 47 | 58 |
| **Practice setting**                   |    |    |
| Inpatient                              | 19 | 27 |
| Outpatient                             | 51 | 73 |
| **Responses to specific questions**    |    |    |
| High stress (modest and to very high)  | 52 | 64 |
| High fear of exposure/transmission (moderately and to a great extent) | 66 | 81 |
| Anxiety/depression (moderately and to a great extent) | 61 | 75 |
| Work overload (moderately and to a great extent) | 67 | 83 |
| Enhanced meaning and purpose (somewhat, moderately and to a great extent) | 68 | 84 |
| Feeling valued by organization (somewhat, moderately and to a great extent) | 67 | 83 |
| **Factors that would help mitigate stress** |    |    |
| Inbox support (somewhat, moderately, and to a great extent) | 45 | 56 |
| Access to mental health support (somewhat, moderately, and to a great extent) | 60 | 74 |
| Healthy food available (somewhat, moderately, and to a great extent) | 64 | 79 |

Numbers may not add to 81 or 100% in specific categories due to missing data or health care workers with responses other than those listed.

Results

Of the 81 respondents, 80% were female, 64% identified as Americans of European descent, 73% were practicing in the outpatient setting, and 58% were in practice for more than 11 years. We found “high stress” in 52 (64%) participants, based on their response to a single question asking them to identify their current level of stress. High stress was defined as anyone who responded, “very high,” “high,” or “modest.” There were 66 (81%) HCWs who feared (moderately or to a great extent) of exposure or transmission, 61 (75%) who described high levels of anxiety or depression, and 67 (84%) who noted work overload. Meaning and purpose were increased (moderately or to a great extent) in 68 (84%), and 67 (83%) felt valued by their organization (moderately or to a great extent) (Table 1).

Stress levels were higher in women (28%), in those working in the inpatient setting (26%), and those early in their career (31%). Twenty-seven percent of Americans of European descent endorsed stress as compared to 20% of Americans of non-European descent. Further, high anxiety and depression were reported in more women than men (23% vs. 7% respectively) and more Americans of European descent than Americans of non-European descent (21% vs. 17%, respectively). Regarding those who reported work overload, 48% were female, 53% practiced in an inpatient setting, and 52% had practiced for 1 to 10 years. Forty-eight percent of Americans of European descent endorsed work overload as compared to 40% of Americans of non-European descent.
Table 2  Comparisons of stress and work-life factors by sex, location, and years in practice.

|                          | Stress, No. (%) | Fear of exposure, No. (%) | Anxiety and depression, No. (%) | Work overload, No. (%) | Meaning and purpose, No. (%) | Feeling valued, No. (%) | Burnout, No. (%) |
|--------------------------|----------------|---------------------------|-------------------------------|-----------------------|----------------------------|------------------------|-----------------|
| **Gender**               |                |                           |                               |                       |                            |                        |                 |
| Male                     | 1 (7%)         | 3 (21%)                   | 1 (7%)                        | 4 (29%)               | 8 (57%)                   | 8 (57%)                | 1 (7%)          |
| Female                   | 18 (28%)       | 19 (29%)                  | 15 (23%)                      | 31 (48%)              | 27 (42%)                  | 31 (48%)               | 18 (28%)        |
| **Race/Ethnicity**       |                |                           |                               |                       |                            |                        |                 |
| Americans of European Descent | 14 (27%)   | 12 (23%)                  | 11 (21%)                      | 25 (48%)              | 21 (40%)                  | 22 (42%)               | 15 (29%)        |
| Americans of Non-European Descent | 5 (20%)   | 8 (32%)                   | 4 (16%)                       | 10 (40%)              | 13 (52%)                  | 14 (56%)               | 5 (20%)         |
| **Practice Setting**     |                |                           |                               |                       |                            |                        |                 |
| Inpatient                | 5 (26%)        | 5 (26%)                   | 3 (16%)                       | 10 (53%)              | 8 (42%)                   | 6 (32%)                | 8 (42%)         |
| Outpatient               | 10 (20%)       | 14 (27%)                  | 9 (18%)                       | 22 (43%)              | 22 (43%)                  | 26 (51%)               | 10 (20%)        |
| **Years after training in practice** |            |                           |                               |                       |                            |                        |                 |
| 1–10 years               | 9 (31%)        | 9 (31%)                   | 6 (21%)                       | 15 (52%)              | 13 (45%)                  | 12 (41%)               | 10 (34%)        |
| > 11 years               | 10 (21%)       | 12 (26%)                  | 9 (19%)                       | 20 (43%)              | 20 (43%)                  | 24 (51%)               | 9 (19%)         |

High (3) and very high (4) categories on Likert scales from 1 to 4 were combined. Respondents who selected "Prefer not to answer" (n = 1) or "Nonbinary/third gender" (n = 1) were removed from this analysis.

Burnout levels were highest among women (28%), those in the inpatient practice setting (42%), and those in their early career (34%). Twenty-nine percent of Americans of European descent endorsed burnout as compared to 20% of Americans of non-European descent (Table 2).

The results showed that most respondents (77%) said they are not likely to reduce their devoted hours in clinical care or research in the next 12 months, and 81% answered that they would not leave their practice or research within two years. When asked about barriers regarding support service utilization, 25% prefer to seek help from alternative sources (such as family members or friends), 22% prefer to handle their problems by themselves, 16% are concerned about confidentiality, and 15% said that mental health services are not accessible or convenient (Table 3).

Regarding perseverance and resilience during Covid-19, most respondents said that their driving forces were the feeling of helping patients (30%); supporting their coworkers, friends, and family (26%); and the need to support their family (25%) (Table 4).

**Discussion**

This study evaluated well-being in North Louisiana HCWs during March of 2021 with the goal of understanding their unique needs to inform potential future policy changes. Results showed Covid-19 has taken a toll on HCWs in this region, a result consistent with other communities.

Hamel et al. (2020) reported HCWs were more likely than others to worry about exposing their loved ones to the virus. Our study echoed these findings, directly correlating to results observed in this study’s population in North Louisiana, where 81% of North Louisiana respondents feared “exposing themselves, or their family to Covid-19” [2]. This fear is also consistent with data from the 2003 outbreak of SARS, a pandemic of similar magnitude and repercussions as Covid-19. The well-being of HCWs during the SARS outbreak was studied from 2004 to 2005, with results indicating HCWs withstood significant emotional distress attributed to quarantine, concern for family members, fear of self-contagion, job stress, and intrapersonal isolation [11]. In our study concerning HCWs of North Louisiana during the times of Covid-19, HCWs withstood high stress (64%), possessed significant fear of transmitting Covid-19 to loved ones (81%), endured heightened anxiety and depression (75%), and faced significant work overload (83%). Results from both SARS and Covid-19 outbreaks show HCWs endure significant psychological distress during times of healthcare system strain. Stress was further stratified by Race/Ethnicity. Our investigation showed that 27% of Americans of European Descent indicated they were stressed, compared to 20% of Americans of Non-European Descent. Our data reinforce the existing need for HCWs mental health support during times of similar healthcare strain [46].

Pieh et al. (2020) collected data monthly to assess the effects of Covid-19 on mental well-being amongst the general population [15]. The study showed females to be more susceptible to an overall decline in mental well-being than males [15]. Similar results were seen in the North Louisiana region. Compared to men, women reported greater stress levels (28% vs. 7%), a higher fear of exposure to Covid-19 (29% vs. 21%), more anxiety and depression (23% vs. 7%), a greater work overload (48% vs. 29%), and higher rates of burnout (28% vs. 7%). Similarly, women indicated less of a feeling of meaning and purpose (42% vs. 57%) and felt less valued by their employer (48% vs. 57%) than men. These data highlight a mental health disparity regarding Covid-19 according to sex. Healthcare systems need to acknowledge...
Table 3  Specific questions about mental health during COVID-19.

| Responses to specific questions                                                                 | n  | %  |
|-------------------------------------------------------------------------------------------------|----|----|
| **How would the following improve your ability to sustain through the COVID-19 crisis?**         |    |    |
| Staff or colleague support for inbox, documentation, and order entry                           | 34 | 42 |
| Healthy food available at all hours                                                             | 39 | 48 |
| Personal access to mental health care                                                           | 32 | 40 |
| **What is the likelihood that you will reduce the number of hours you devote to clinical care or research over the next 12 months?** |    |    |
| Definitely/Likely/moderate                                                                       | 10 | 12 |
| Slight/None                                                                                      | 62 | 77 |
| **What is the likelihood that you would leave your practice or research within two years?**     |    |    |
| Definitely/Likely/moderate                                                                       | 13 | 16 |
| Slight/None                                                                                      | 56 | 81 |
| **Over the past two weeks, how often have you been bothered by little interest or pleasure in doing things?** |    |    |
| Nearly every day or half the days                                                                | 20 | 25 |
| Several days                                                                                     | 30 | 37 |
| **Over the past two weeks, how often have you been bothered by feeling down, depressed, or hopeless?** |    |    |
| Nearly every day or half the days                                                                | 12 | 15 |
| Several days                                                                                     | 30 | 37 |
| **What may prevent you from seeking mental health services or support?**                        |    |    |
| I am concerned about what others would think if they knew I sought help                          | 5  | 6  |
| I am concerned about confidentiality                                                              | 13 | 16 |
| Such services are not accessible or convenient                                                   | 12 | 15 |
| I am concerned this would impact my professional licensure                                       | 5  | 6  |
| I am concerned this would impact my employment                                                   | 3  | 4  |
| I prefer other sources of help (family, friends, etc.)                                           | 20 | 25 |
| I prefer to handle my problems by myself                                                         | 18 | 22 |
| I cannot afford it                                                                                | 8  | 10 |

Table 4  Perseverance and resilience during COVID-19 among healthcare workers.

| In your own words, what has been the driving force behind your perseverance during the SARS-CoV-2 Pandemic? | n  | %  |
|-----------------------------------------------------------------------------------------------------------|----|----|
| The feelings of being able to help patients                                                               | 24 | 30 |
| The support of coworkers, friends, and family                                                            | 21 | 26 |
| The need to support the family                                                                           | 20 | 25 |
| Doing self-care and having an increased sense of faith                                                    | 10 | 12 |
| The need for a job                                                                                         | 6  | 7  |
| None                                                                                                       | 5  | 6  |
| The feelings of being able to help coworkers                                                              | 2  | 2  |

disparity to find solutions for female HCWs in order to bridge this gender gap.

The comparisons of stress and work-life factors between HCWs in the inpatient vs outpatient setting indicated that HCWs in the inpatient setting experienced greater negative effects to well-being when compared to their outpatient counterparts. Inpatient HCWs reported a 42% burnout rate, compared to a 20% burnout rate in the outpatient setting. Inpatient HCWs also indicated slightly less of a sense of meaning and purpose (42% vs. 43%) and felt less valued by their employer (32% vs. 51%) than outpatient HCWs. A potential cause could be workload, with inpatient workers reporting a greater work overload (53%) than outpatient workers (43%). This highlights the need for adequate mental, physical, and emotional support for all HCWs, with increased focus on inpatient workers. Appropriate policy implementation can mitigate similar HCWs stress during future times of healthcare strain.

When asked to identify the driving force behind their perseverance during the Covid-19 pandemic, HCWs’ top three answers were: 1—the feeling of being able to help patients (30%), 2—the support from coworkers, friends, and family (26%), and 3—the need to support their family (25%). When asked what could improve their ability to sustain well-being through the crisis, 48% indicated the availability of healthy food at all hours, 42% indicated staff or colleague support, and 40% indicated personal access to mental health care. As previously stated, 48% of HCWs did not feel valued by their employer, which can lead to feelings of decreased meaning and purpose. To help motivate, encourage, and sustain employees during times of healthcare strain, healthcare systems must show their employees that they value not only...
their physical health but also their mental health. These data may be used to inform future resource allocations for HCWs.

Based on our findings, it can be concluded that HCWs desire mental health support from friends, family, or by dealing with stress on their own. With this knowledge, healthcare systems could provide alternative methods for their employees to de-stress, as well as provide and emphasize the demand for essentials of daily living. These basic needs could be met by creating an area within the hospital that provides employees with free meals while at work, snacks, and a place to sleep and shower. Hospitals could also provide team-building exercises as well as reduced/free subscriptions to stress relieving activities, such as yoga, to support their employee’s mental health. Additionally, for those HCWs who do desire mental health or spiritual services, providing various options for employees, both onsite and via telehealth, could accommodate more employees needs and desires [47].

While the pandemic has created well-being challenges for HCWs, new opportunities have emerged as well. Tele-mental health services rapidly became commonplace during the early months of the pandemic with multiple studies validating the efficacy of Internet CBT (iCBT) [48–52]. The open access iCBT program "My Health Too" has shown promise in providing psychoeducation and coping strategies for HCWs [53]. iCBT has also been effective in reducing symptoms of depression, anxiety and PTSD in HCWs [54,55]. The twenty-four hour a day accessibility and confidentiality offered by such programs are additional factors likely to appeal to HCWs.

A limitation of this study includes the limited sample size and sample population. Of the 81 participants, 65 were women. Having additional men and an overall more diverse sample population would increase the external validity of the findings. Furthermore, most responses were outpatient HCWs. Lastly, the results reflect HCWs well-being in Northwest Louisiana; data can be generalized only to areas with similar population demographics.

Despite the limitations, these results highlight a common theme of decreased HCWs well-being during times of healthcare system strain. With the data from HCWs of Northwest Louisiana during Covid-19, policy changes need to be implemented to allow access to vital personal protective equipment (PPE), mental health services, basic needs of living, and overall support for this vulnerable population. Further research needs to be conducted on the continued impact of Covid-19 on HCWs. It would be beneficial to compare the well-being of HCWs at various points throughout the pandemic, and the lasting impacts on HCWs over time, even after the pandemic wanes.

Conclusion

In conclusion, the Covid-19 pandemic has negatively affected the well-being of HCWs in North Louisiana. HCWs are more stressed, more fearful, reported more anxiety and depression, and more work overloaded. This is a similar trend that has been seen during other times of healthcare strain. Mental health support, work modulation, and various provisions should be explored as means to reduce Covid-19-related negative impacts. The use of online data collection system provided by the AMA and an online summit was appropriate for collecting information on the impact of Covid-19 on mental health. The results collected in this resource sparing manner that is more easily implemented during a pandemic, which places constraints on time, resources, and in person interactions, were similar to those collected by conventional means. This pilot study supports the larger scale implementation of this technology for health informatics research related to mental well-being in healthcare workers.

Human and animal rights

The authors declare that the work described has not involved experimentation on humans or animals.

Informed consent and patient details

The author declare that to observe the rights and privacy of all human subjects, informed consent was obtained from all participants. This study was approved by the Institutional Review Board of Louisiana State University Health Sciences Center, Shreveport.

Funding

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

Author contributions

All authors attest that they meet the current International Committee of Medical Journal Editors (ICMJE) criteria for Authorship.

Disclosure of interest

The authors declare that they have no competing interest.

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